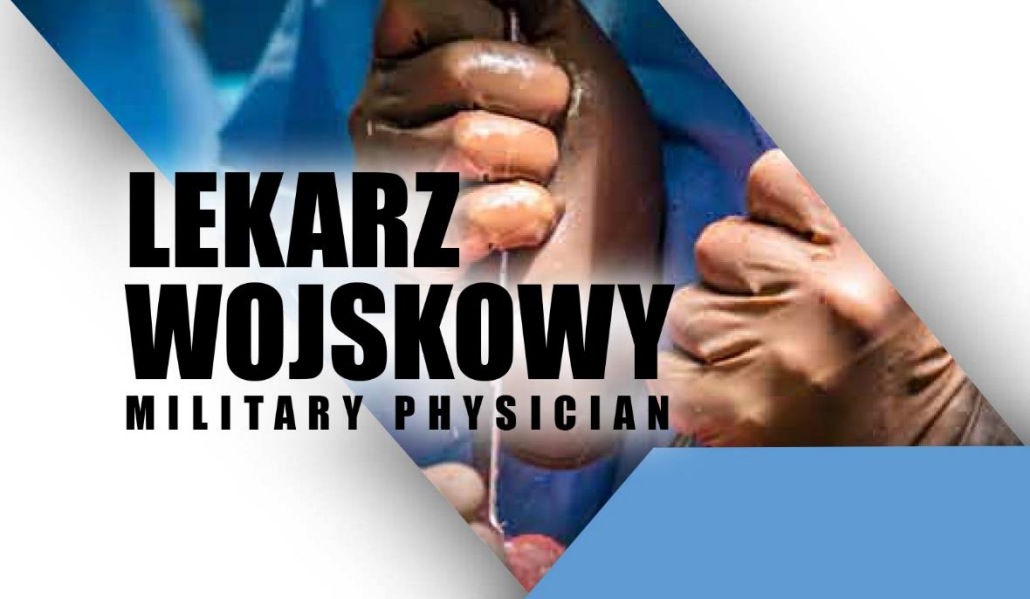
LEKARZ WOJSKOWY

MILITARY PHYSICIAN



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- Assessment of sequelae and prognosis after moderate craniocerebral trauma
- Urinary tract injuries in the paediatric population
- Arterial hypertension in the practice of Emergency Medical Service
- The challenges facing Polish foreign policy AD 2023

WOJSKOWY
INSTYTUT MEDYCZNY
PAŃSTWOWY INSTYTUT BADAWCZY

Informacje dla autorów

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"Military Physician" has been published continuously since 1920, currently as a quarterly of the Military Institute of Medicine in Warsaw, Poland.

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   Books:
   Rudzki E. Alergia na leki: z uwzględnieniem odczynów anafilaktycznych i idiosynkrazji. Lublin, Wydawnictwo Czelej, 2002: 338–340
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Letter from the Editor-in-Chief

Welcome!

Before you is the fourth issue, which concludes the first volume of the “Military Physician”. With this, the 2022 publishing year has come to an end. It was an extremely busy period for the entire Editorial Team, as we made many of the previously announced changes.

This issue is mainly dedicated to injuries, and therefore features review papers assessing sequelae and prognosis after craniocerebral trauma, as well as papers on trauma in orthopaedics and urology, including paediatric urology. To continue further on this topic, we also present an overview of the history of military surgery (from 1945 to the present) at the Military Institute of Medicine – National Research Institute. I would also like to draw your attention to a very interesting piece discussing the challenges that Polish foreign policy faces in 2023 and the consequences for our service.

I would like to thank our Reviewers for their contribution to the preparation of papers for publication in the “Military Physician”. As is our tradition, the last issue of the year we are publishing a list of those involved in reviewing papers in 2022.

To the entire Editorial Team, all the Authors, and Reviewers, I express my sincere gratitude for their efforts in preparing the 2022 issues. I hope that the next issues in the first volume of the “Military Physician” will reach an even higher scientific level and, consequently, step by step, our journal can find its place among prominent international medical journals.

May the New Year 2023 bring you health, prosperity, and continued success.

Prof. Bolesław Kalicki MD, PhD

The Editorial Board of the “Military Physician” would like to thank the Reviewers for their effort, commitment, reliability, and conscientiousness in reviewing the papers submitted in 2022. Reviewers of the “Military Physician” in 2022:

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Contents

PRINCIPLES OF COLOR DOPPLER IMAGING USED IN OPHTHALMOLOGY (PART II) PRESENTED ON THE EXAMPLE OF SELECTED ABNORMALITIES

Zasady użycia kolorowego Dopplera w badaniach okulistycznych (cz. II) na przykładzie wybranych patologii

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Abstract: Doppler imaging is a non-invasive, repeatable and reliable method of qualitative and quantitative assessment of blood flow in the ocular vessels. The article explains the benefits of using Doppler imaging in everyday ophthalmic practice and its possibilities in the differential diagnosis and monitoring of the patient's condition by physicians of different specialities. Furthermore, the article lists most common ophthalmological pathologies using cases from the author's own practice, with a discussion of the acquired images. The issues related to the safety of the use of ultrasound in ophthalmology are described in detail, paying special attention to the applicable standards based on the Mechanical Index and Thermal Index, defining the limit exposure of the eyeball to the effects of the ultrasound beam emitted by the ultrasound transducer. The limitations of this method, which should be taken into account when using this modality, are also described.
Key words: ophthalmology, ultrasound, color Doppler.

Streszczenie: Badanie Doppler jest nieinwazyjną, powtarzalną i wiarygodną metodą oceny jakościowej i ilościowej przepływów w naczyniach gałki ocznej. W artykule wskazano na korzyści stosowania badań dopplerowskich w codziennej praktyce lekarskiej i jej możliwości w diagnostyce różnicowej i monitorowaniu stanu chorego przez lekarzy różnej specjalności. Wskazano na najczęstsze patologie okulistyczne z wykorzystaniem przypadków z własnej praktyki i omówieniem uzyskanych obrazów. Szczegółowo opisano zagadnienia związane z bezpieczeństwem stosowania ultradźwięków w okulistyce ze zwróceniem szczególnej uwagi na obowiązujące normy oparte na indeksie mechanicznym i termicznym, określające graniczne narażenie gałki ocznej na oddziaływanie wiązki ultradźwiękowej emitowanej przez nadajnik USG. Opisano także ograniczenia tej metody, jakie należy uwzględnić w praktyce.

Słowa kluczowe: okulistyka, ultrasonografia, kolorowy Doppler.

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Introduction

The first part of the article presented the theoretical basis of Color Doppler Imaging (CDI), the nomenclature and indications for performing Doppler tests in ophthalmology, including the technique and specificity of blood flow in individual retrobulbar vessels. In this article, we focus on the presentation of selected pathologies, limitations and safety rules.

Selected pathologies

Ocular ischaemic syndrome is typically caused by an acute or chronic stenosis of the internal carotid artery, less often of the ophthalmic artery or the arteries directly supplying the optic nerve disc. In CDI, it is characterised by a decreased peak systolic (PS) and end diastolic (ED) velocity, as well as an elevated resistive index (RI). Such a flow deficit is presented in Figure 1.

A particular form of acute retinal ischaemia, manifested by a sudden, unilateral loss of vision, is **embolism of the central retinal artery.** A CDI test confirms the absence of blood flow signal in the CRA. In some patients, the blood flow in the ophthalmic artery and its branches is reversed, as a result of "intercepting" the blood from the external carotid artery vascular system by anastomoses which are the supratrochlear and supraorbital arteries (Fig. 2).

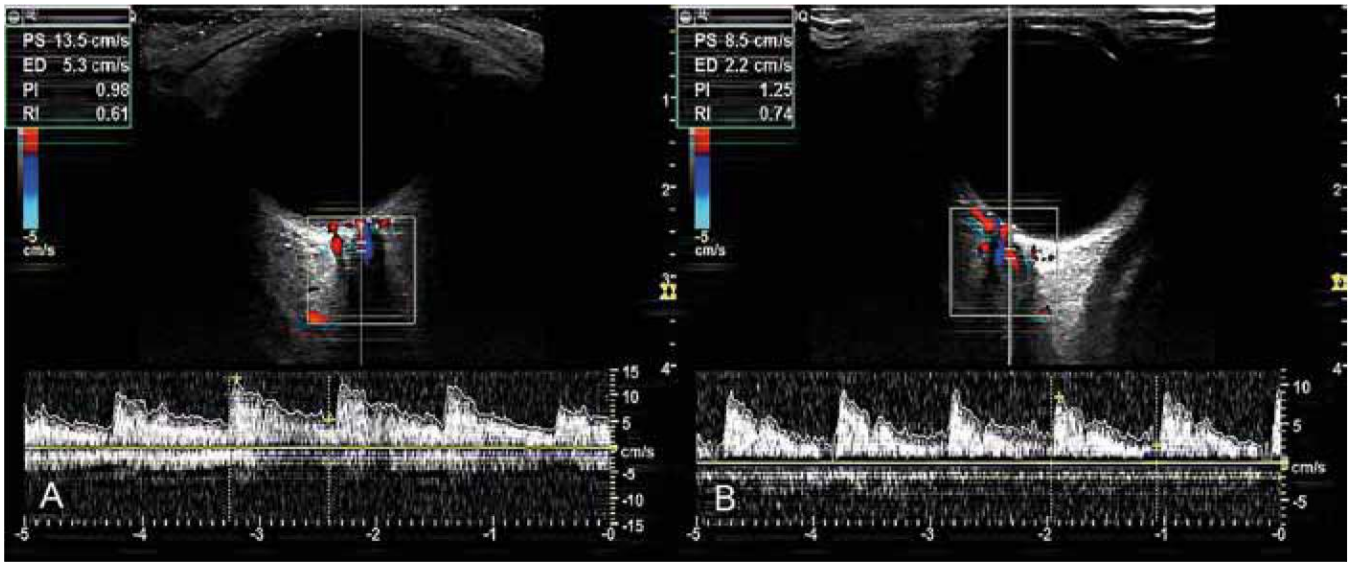

Figure 1. CDI of the central retinal arteries (CRA) in one patient.

Figure A presents normal CRA flow parameters in the left eye and a normal blood flow spectrum in the vessel.
Figure B presents a reduced blood flow in the CRA in the right eye due to a haemodynamically significant stenosis of the internal carotid artery.
PS – peak systolic velocity, ED – end diastolic velocity, MD – mean diastolic velocity, PI – pulsatility index, RI – resistive index, TAMAX – time-averaged maximum velocity.

An accurate CDI assessment is a prognostic factor in the evaluation of intracerebral blood flow insufficiency and monitoring of the patients following endovascular treatment of carotid stenoses [1, 2].

Cavernous fistula is an example of venous malformation, in which a color Doppler study can confirm clinical observations by detecting a dilation of a vein, typically the superior ophthalmic vein, with an atypical, low-resistance flow spectrum, specific for an artery (Fig. 3).

Glaucoma research provide another example of the use of colour Doppler in ophthalmology. CDI studies can be helpful in diagnosing ischaemia of the optic nerve disc, as well as in the monitoring of the effectiveness of treatment. In patients with glaucoma the blood flow in the central retinal artery as well as short posterior ciliary arteries is gradually reduced [3, 4, 5, 6, 7]. Based on the blood flow tests in one of the short posterior ciliary arteries, haemodynamic changes associated with glaucoma are demonstrated in Figure 4.

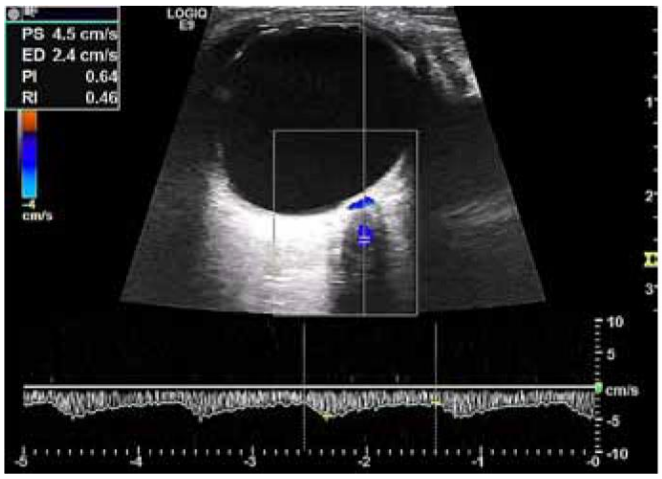

Figure 2. Abnormal, reversed and decelerated blood flow in the central retinal artery (CRA), marked in blue.

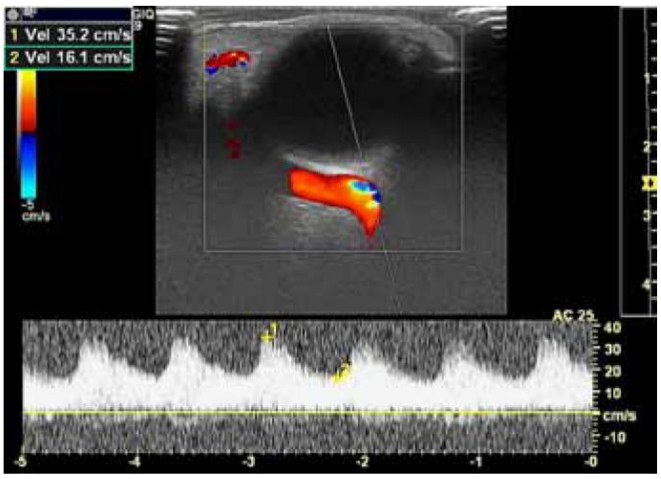

Figure 3. Measurement of the blood flow in a pathologically dilated superior ophthalmic vein (SOV). A spectrum typical of an artery. Suspected cavernous fistula elevating the blood flow in the orbital venous system.
The angle of insonation (AC) determined by the researcher is 25 degrees. Vel = 35.2 cm/s – maximum flow velocity in the vessel, Vel = 16.1 cm/s – end diastolic velocity.

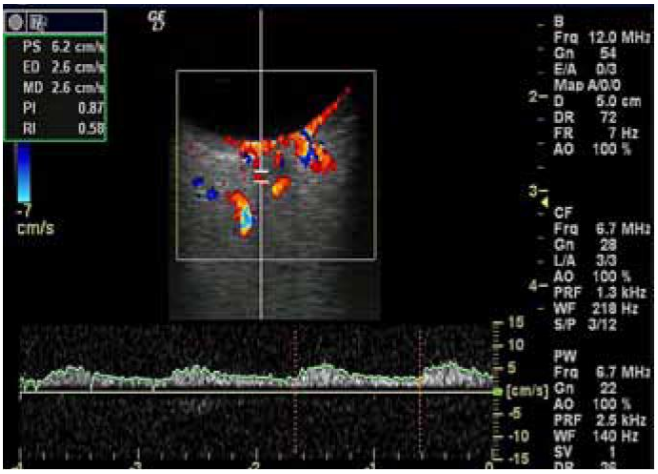

Figure 4. Reduction of the velocity parameters in SPCA (short posterior ciliary artery) measured by CDI in a patient with primary open-angle glaucoma.

Similar changes are observed also in the case of vascular abnormalities associated with AMD and diabetes [8, 9, 10].

A Color Doppler Ultrasound is an excellent tool for the assessment of focal intraocular lesions, as it can show tumour foci smaller than 3 mm. In the case of a **melanoma**, the early detection of tumour increases patient's chances of recovery [11]. A typical image of intraocular melanoma is a convex lesion, with smooth walls, protruding into the eyeball, usually demonstrating a homogeneous structure. Both the significant elevation of the melanoma and its rich vascularisation are unfavourable prognostics (Fig. 5).

Differential diagnosis should include metastatic lesions into the eyeball for lung cancer, breast or reproductive organ cancer.

Cavernous haemangioma is an example of a benign tumour, although it may cause a mass effect in the retrobulbar space, resulting in compression of the optic nerve, vessels or oculomotor muscles, and in proptosis. The lesion in an ultrasound test is typically homogeneous, but it may present the levels of blood sedimentation. A CDI test demonstrates a scant vascularisation of the lesion. The intraconal tumour presented in Figure 6 is an example of such a pathology.

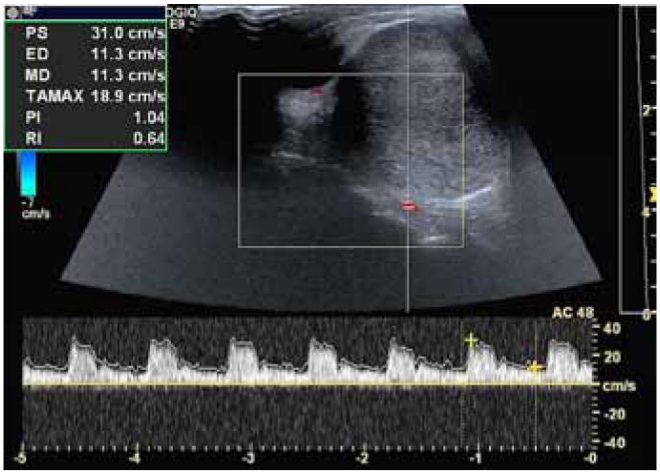

Figure 6. An extensive, solid retrobulbar mass adjacent to the ophthalmic artery. The blood flow velocity measurement site in the ophthalmic artery is marked in red. The angle of insonation (AC) is 48 degrees. PS – peak systolic velocity, ED – end diastolic velocity, MD – mean diastolic velocity, PI – pulsatility index, RI – resistive index.

Orbital lymphoma is a rare extranodal location of non-Hodgkin's lymphomas, with the incidence estimated at 0.01-1% [12]. Extraocular orbital lymphomas should be distinguished from intraocular ones, classified as primary central nervous system lymphomas, associated with different prognosis and treatment methods [13]. Figure 7 presents the infiltration by MALT (mucosa associated lymphoid tissue) lymphoma. The extraconal lesion in the medial part of the orbit caused a lateral displacement of the

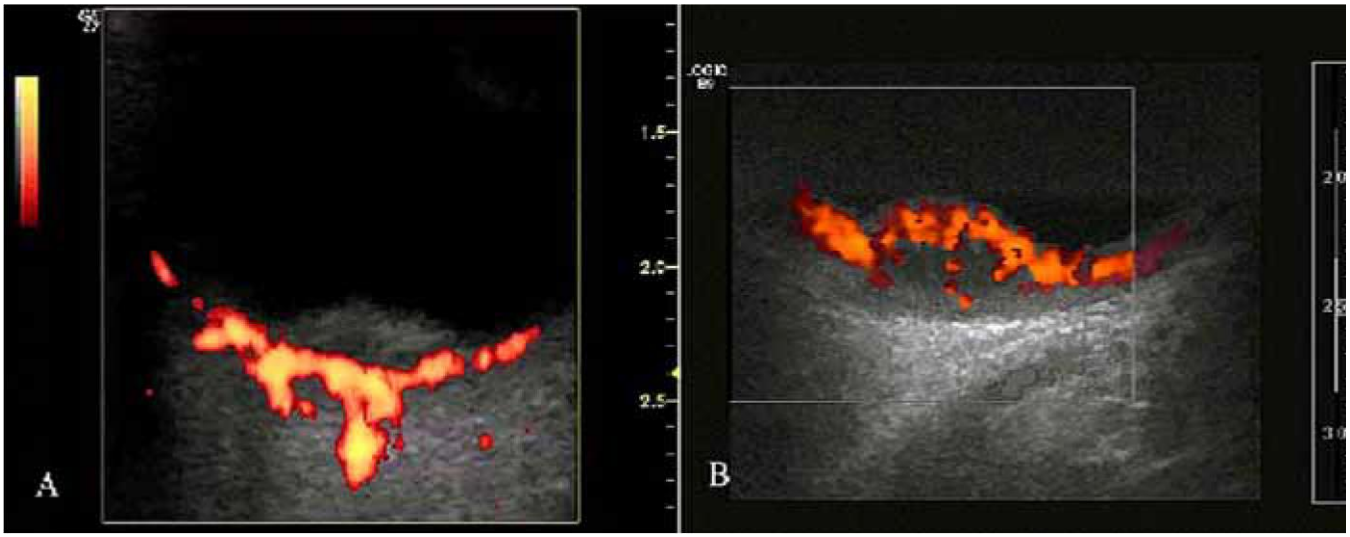

Figure 5. Color Doppler Imaging study (CDI). Power Doppler (PD) presentation, used for qualitative assessment of blood flow.
Figure A demonstrates blood flow in the choroid and an avascular focus on the posterior wall of the eye, in the form of an elevated pigmented nevus.
Figure B presents a highly vascularised focal lesion, undermining the choroid, consistent with melanoma.

eyeball and the reduction of its mobility. MALT tumours are characterised by a low echogenicity of infiltrations, similar to that of watery liquid. A Doppler test using a convex 3.5 MHz probe offers the image of a wide section of the orbit. The test demonstrates the vascularisation of the lesion from the side of one of the ethmoidal arteries.

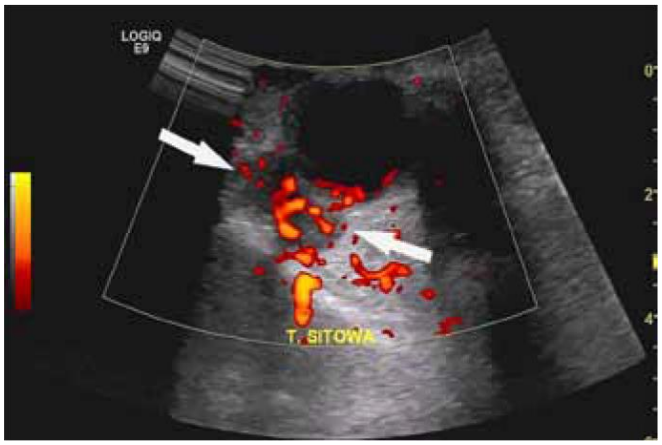

Figure 7. MALT (mucosa associated lymphoid tissue) lymphoma in the intraocular space is marked with white arrows. The tumour is located in the medial part of the orbit, causing a lateral displacement of the eyeball and protruding towards the medial angle of the orbit. Vascular penetration to the MALT invasion area in the medial part of the orbit, from the ethmoidal artery (CDI signal marked in orange).

Safety of the procedure

In 1976, the US Food and Drug Administration (FDA) started exploring the use of ultrasound in medical diagnostics. Four output exposure limits were established: for the testing of peripheral vessels – 720 mW/cm^2, in cardiology – 430 mW/cm^2, for obstetrics and other applications – 94 mW/cm^2, and for ophthalmological testing – 17 mW/cm^2. In 1992, in order to optimise the use of CDI, the FDA introduced a general limit of 720 mW/cm^2 for all applications, except for ophthalmological tests. At present, standards based on a mechanical index (MI) and a thermal index (TI) apply. It has been experimentally proven that the eye is particularly prone to thermal and mechanical injuries due to excessive ultrasound energy. Therefore, the FDA and World Federation for Ultrasound in Medicine and Biology imposed strict thermal (TI) and mechanical (MI) limits for these applications, based on the index values: TI < 1.0 and MI < 0. For comparison, the standards (based on animal models) for tests other than ophthalmological and gynaecological studies are MI < 1.9 and TI < 6. In practice, it is recommended to reduce the testing time to the absolutely required values, and to follow the ALARA (As Low As Reasonable Achievable) principle.

Limitations

A Doppler assessment of blood flow in retrobulbar vessels should be conducted using the proper methodology, based on knowledge and consideration of a number of limitations. The most important ones are presented in the table.

Table. Limitations for Doppler (CDI) tests in ophthalmology.

Tabela. Ograniczenia zastosowania badań dopplerowskich (CDi) w okulistyce.

Type of limitation	Effect on the measurement
Significant stenosis of carotid arteries	Reduction of the velocity parameters in the retrobulbar arteries on the side of the stenosis
Absence of vessels in 2D ultrasound images due to their insufficient diameter (Figure 8)	Difficulty with obtaining a proper angle of insonation [14] Obstructed vessels cannot be identified (false-negative results)
Difficulty in identification of individual ciliary arteries [15]	Only the ciliary arteries in the perineural position, as opposed to the peripheral ciliary arteries, are responsible for the vascularisation of the optic nerve, and directly affect haemodynamic changes in the optic disc. The peripheral branches supply blood to the choroid.
Aliasing (Figure 9)	An artefact in spectral imaging due to inaccurate estimation of blood flow velocity in the vessel, i.e. determination of too low values on the scale.
CDI sampling gate in the area of lamina cribrosa	Lamina cribrosa is a location where the central retinal artery is physiologically narrowed, resulting in a significantly elevated blood flow velocity, falsifying the CDI results. The measurements should be performed at 2-3 mm behind the optic disc.
Calcifications or drusen on the posterior wall of the eye [16, 17] (Figure 10)	They imitate the Doppler shift signal and impair the assessment of the central retinal artery and the ciliary arteries (twinkling artefact).

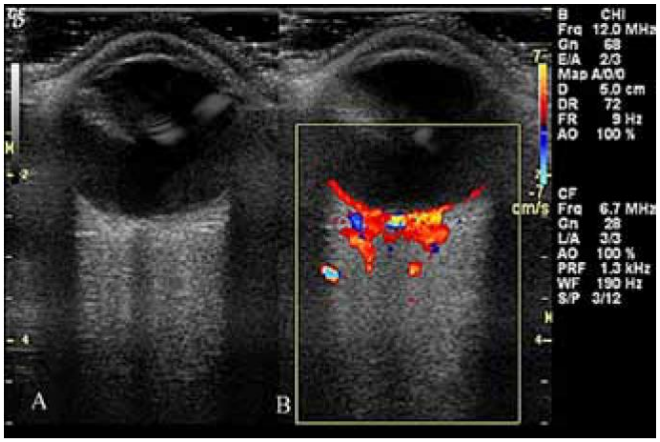

Figure 8. B-presentation of the eyeball and retrobulbar space without highlighting vessels (A) and the image enriched by CDI (B) demonstrating blood movement in the vessels invisible in the B-presentation.

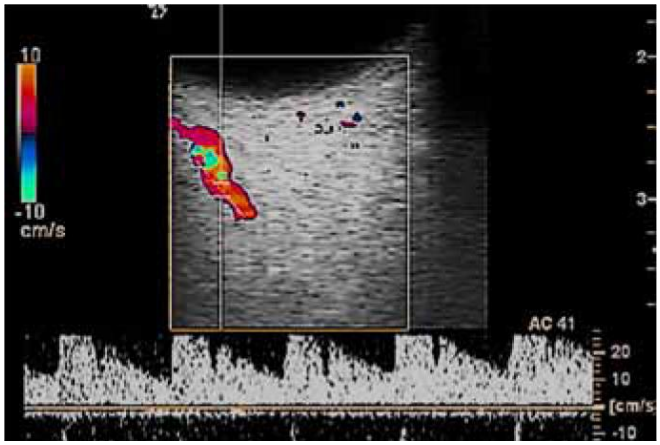

Figure 9. Aliasing demonstrated in a test of blood flow in the ophthalmic artery (OA). One may observe that the blood flow velocities exceeding those defined on the measurement scale are "cut off" and added below the baseline.

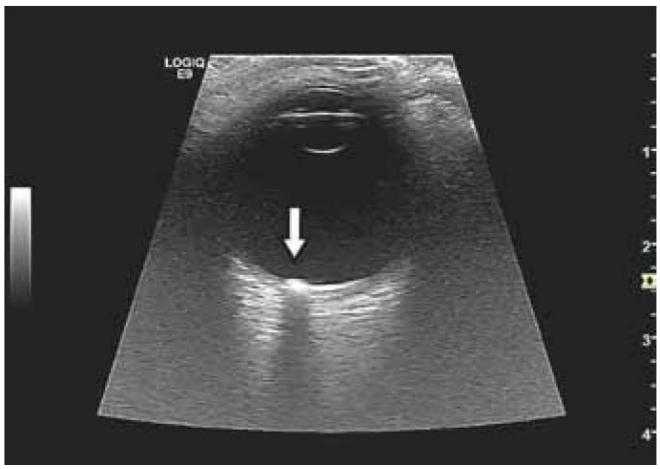

Figure 10. Calcification (marked with the white arrow) in the eyeball wall impairs the assessment of the optic disc and the retrobulbar space.

CDI is a diagnostic technique of proven clinical value and high reliability, providing a proper test methodology is followed [18, 19].

Conclusions

Colour Doppler ultrasound offers a reliable qualitative and quantitative assessment of the vascularisation of the focal lesions in the orbit and the haemodynamics in the retrobulbar area.

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REVIEW ARTICLE

URINARY TRACT INJURIES IN THE PAEDIATRIC POPULATION

Urazy układu moczowego w populacji pediatrycznej

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Abstract: An injury is defined as a local and general anatomical and functional alteration caused by any external factor affecting the organism. Due to the specific anatomical structure and different body proportions, a child is less resistant to external factors than an adult. The relatively thin subcutaneous and muscular layers protect the child's internal organs to a lesser degree. The kinetic energy of the injury is much less attenuated and can accumulate in deeper layers, causing injury to internal organs. Blunt injuries are the most common, accounting for 87% of cases, up to 40% of which are traffic injuries. The latter are among the most serious ones, as they often affect multiple body structures, involving internal organs, bone fractures, head or respiratory trauma. The most common injuries in hospitalised children include craniocerebral trauma (approximately 70%) and osteoarticular injuries (approximately 20%). Urinary tract injuries lead to the hospitalisation of only about 3% of trauma patients. Injuries to the kidneys, ureters or bladder usually coexist with abdominal and pelvic injuries. The most common injuries to the urinary tract include: kidney injuries (over 50% of cases), ureteral injuries (1–3%), bladder and urethral injuries (approximately 10%). Due to anatomical differences, urethral injuries usually affect male patients.
Key words: children, treatment, urinary tract injuries.

Streszczenie: Urazem nazywamy każde zadziałanie zewnętrznego czynnika na organizm, które powoduje anatomiczne i czynnościowe zmiany miejscowe i ogólne. Dziecko – ze względu na swoją budowę anatomiczną i inne proporcje ciała – jest mniej odporne na działanie czynników zewnętrznych niż dorosły. Narządy wewnętrzne dziecka są chronione w mniejszym stopniu przez stosunkowo cienką warstwę podskórną i mięśniową. Energia kinetyczna urazu jest znacznie mniej tłumiona i może kumulować się w warstwach głębszych, wywołując obrażenia narządów wewnętrznych. Najczęstsze są urazy tępe – stanowią one 87% przypadków, a 40% z nich to urazy komunikacyjne. Urazy komunikacyjne należą do najgroźniejszych, gdyż często są urazami wielonarządowymi, obejmującymi narządy wewnętrzne, złamania kości, urazy głowy czy układu oddechowego. Do najczęstszych urazów u hospitalizowanych dzieci zaliczamy urazy czaszkowo-mózgowe (ok. 70%) oraz urazy kostno-stawowe (ok. 20%). Urazy układu moczowego są przyczyną hospitalizacji tylko u ok. 3% pacjentów pourazowych. Urazy nerek, moczowodów czy pęcherza współistnieją zwykle z urazami jamy brzusznej i miednicy. Do najczęstszych uszkodzeń układu moczowego możemy zaliczyć: urazy nerek (ponad 50% przypadków), urazy moczowodów (1–3%), urazy pęcherza i cewki moczowej (ok. 10%). Ze względu na różnice anatomiczne urazy cewki moczowej zwykle dotyczą pacjentów płci męskiej.
Słowa kluczowe: dzieci, leczenie, urazy układu moczowego.

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Introduction

An injury is defined as a local and general anatomical and functional alteration caused by any external factor affecting the organism. Due to the specific anatomical structure and different body proportions, a child is less resistant to external factors than an adult. The relatively thin subcutaneous and muscular layers protect the child's internal organs to a lesser degree. The kinetic energy of the injury is much less attenuated and can accumulate in deeper layers, causing injury to internal organs. Blunt injuries are the most common ones, amounting to 87% of cases, with 40% of them being traffic injuries [1]. The latter are among the most serious ones, as they often affect multiple body structures, involving internal organs, bone fractures, head or respiratory trauma. The most common injuries in hospitalised children include craniocerebral trauma (approximately 70%) and osteoarticular injuries (approximately 20%). Urinary tract injuries result in hospitalisation in only approximately 3% of post-trauma

patients [2]. Injuries to the kidneys, ureters or bladder usually coexist with abdominal and pelvic injuries. The most common injuries to ~~of~~ the urinary tract include: kidney injuries (over 50% of cases), ureteral injuries (1–3%), bladder and urethral injuries (approximately 10%). Due to the anatomical differences, urethral injuries are typically found in male patients [3].

Kidney injuries

Kidney injuries are usually caused by falls from a height or traffic accidents, less often by sports accidents. Some of them result from an external force affecting a changed kidney, such as in the case of hydronephrosis, tumour, an anatomical kidney displacement or rotation, or a horseshoe kidney. In the majority of cases, conservative treatment is applied. The only indication for surgical treatment is haemorrhage from the renal pedicle or parenchyma, resulting in haemodynamic abnormalities.

Kidney injuries can be divided into:
grade 1 – renal contusion without rupture of the parenchyma;
grade 2 – non-expanding perirenal hematomas, cortical injury up to 1 cm long;
grade 3 – rupture of the renal cortex without urinary extravasation;
grade 4 – parenchymal rupture with an injury to the pelvivalyceal system;
grade 5 – injury to the renal pedicle and shattered parenchyma.

The most common symptoms of kidney trauma include: pain in the lumbar area on the side of the injury, tumour, resistance in the abdominal cavity, renal colic, bruising in the lumbar area or in the upper abdominal quadrants and pain upon palpation in this area. A relationship between the presence or degree of haematuria and severity of the renal injury has not been definitively established. Absence of haematuria or microhaematuria does not exclude renal trauma, although these symptoms are observed in most patients with a kidney injury.

To assess the extent of the injury, imaging tests are required, such as ultrasound or computed tomography studies. In general urinalysis we may find microhaematuria (or haematuria in case of significant trauma). In haemodynamically stable patients, absolute immobilisation in bed until the symptoms of bleeding disappear is recommended, as well as continuous monitoring of the patient's vital parameters: arterial blood pressure and pulse, control of haemoglobin and haematocrit levels. Protective antibiotic therapy should be introduced (usually a second-generation cephalosporin) and continued until the clinical picture and the results of laboratory and the imaging tests stabilises. Less than 5% of renal injuries are life-threatening, and hypovolaemic shock in patients with kidney injury nearly always results from coexisting trauma. Therefore, management must be multi-directional and based on the patient's condition [4].

Apart from the patients with haemodynamic abnormalities, indications for surgical treatment include the need to verify surgically any coexisting injuries, or the presence of an enlarging pulsating perirenal haematoma, suggesting damage to the renal artery [5]. Unfortunately, the surgery usually involves the nephrectomy of the injured kidney.

The patient following renal trauma should remain under out-patient supervision, in order to control the degree of renal injury after a few months. This usually involves an renoscintigraphy ~~isotope kidney study~~.

Ureteral injury

Ureteral injuries are among the rarest – they constitute 1–3% of all the urinary tract injuries. They can be divided into two groups: injuries associated with multi-organ trauma and iatrogenic injuries due to endoscopic procedures. Due to its position, small size and considerable mobility, the ureter is not easily damaged by external factors [6].

There are no pathognomonic symptoms of uretral trauma. As many as 80% of uretral injuries are not diagnosed immediately after the trauma, as they are observed primarily in severe multi-organ trauma and are masked by any coexisting injuries. Urinary leak into the retroperitoneal space is manifested by abdominal pain, up to the symptoms of paralytic ileus. If both ureters, or the ureter of the only kidney, are injured, then oliguria or anuria may develop. A haematuria is found in only 50% of injured ureters.

Urinary leak outside the urinary tract can be detected in an ultrasound or computed tomography test. Every ureteral injury requires surgical treatment.

The typical mechanism resulting in ureteral injury is excessive hyperextension in the lumbar area, with subsequent ureteral stretching and rupture, or ureteral avulsion from the renal pelvis. This type of injury is typically a consequence of a traffic accident, during which a child is exposed to strong external forces.

Due to the dynamically developing options of endoscopic treatment in urinary tract diseases (also in children), especially regarding minimally invasive therapy of urolithiasis, the number of complications associated with ureteral injury is increasing. The most severe ones include avulsion of the ureter from the urinary bladder or avulsion of the ureter at the pelviureteric junction. Both complications must be treated surgically, and the continuity of the ureter must be restored.

Milder injuries include lacerations, the creation of a false passage, puncture perforation of the ureteral wall by a pneumatic probe or laser, and complete perforation of the ureter with a ureterorenoscope. Treatment involves installation of a JJ catheter in the kidney, ensuring a good urine outflow from the kidney and further observation with ultrasound control. In most cases, the perforation closes spontaneously, and complete recovery is achieved [7].

Injuries of the urinary bladder

Urinary bladder injuries are typically associated with pelvic fractures. Depending on the site of trauma and the location of injury, we distinguish two types: intraperitoneal and extraperitoneal injuries. The basic study to differentiate between the two is an ultrasound test.

In extraperitoneal urinary bladder injury, limited fluid in the surrounding tissues is found, and the clinical symptoms are not severe. The dominating ones include pain in the pubic symphysis area and haematuria. Following imaging tests, a Foley catheter may be placed in the bladder, and conservative treatment may be applied.

Intraperitoneal trauma to the urinary bladder is managed differently. The clinical symptoms are severe. Urine penetrates into the peritoneum, causing inflammation. The child experiences vomiting and pain in the entire abdomen, while muscular defence is found during the clinical examination. The inflammation markers are elevated. The basic management in such cases is surgical treatment, involving closure of the damaged urinary bladder wall, antibiotic therapy and the placement of cystostomy or a Foley catheter. The catheter should be kept until the bladder heals.

Urinary bladder injuries in children during endoscopic procedures are extremely rare, and the insertion of a Foley catheter alone suffices for the healing of the injury, without any permanent sequelae [8, 9].

Urethral injuries in boys

Urethral injuries in girls, due to their anatomy, are presented only in case studies and are not included in any statistics [10]. Trauma injuries of the urethra in boys are rare. Clinically, the urethra is composed of two anatomical parts: the anterior segment comprises the pendulus and bulbar section of the urethra, and the posterior segment comprises the membranous urethra. Injuries may involve a complete urethral transection, partial rupture, tear, contusion and partial rupture of the wall [10]. Injuries of the membranous urethra are typically associated with pelvic fractures and have serious consequences. In these cases, urethral transection is usually observed. The main symptoms include haematoma in the groin, upward displacement of the urinary bladder, absence of urine outflow and haemorrhaging from the meatus. Radiological diagnostics are very useful, such as ultrasound and contrast-enhanced computed tomography tests, demonstrating the injury site and the degree of the urethral damage [10]. In such cases, the placement of a catheter to the urinary bladder via the urethra is contraindicated. The treatment of choice involves a cystostomy, ensuring proper urine outflow and the planning of a reconstructive surgery at a later date.

In the case of an injury to the anterior urethra, the following symptoms dominate: bloody discharge from the urethra, urinary retention, haematoma and penile oedema [11]. Such an injury usually follows a fall on a hard object, a blow to the groin or a fall from a bike. The management varies, according to the degree of urethral injury. Initially, a catheter to the urinary bladder is gently placed and kept for approximately 4 weeks. If a catheter cannot be placed, to prevent further damage to the urethra, a cystostomy is performed, and the injury site is left for future reconstruction. Following a urethral injury, both after a conservative treatment or a reconstruction, the patient should be kept under observation for several weeks, as delayed secondary urethral stenosis may develop [12]. The treatment of choice involves calibration of the narrowed section (although it is often ineffective) or excision of the stenosis with end-to-end anastomosis.

Conclusions

Urinary tract injuries are relatively rare in children. The most common ones involve kidneys, less often ureters and the urinary bladder. Urethral injuries are usually found in teenage boys, while in girls they occur occasionally. All urinary tract injuries require careful, comprehensive diagnostics using the available imaging methods in order to assess the size and extent of the injury, so that optimal procedures can be applied to ensure complete healing, without permanent sequelae.

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REVIEW ARTICLE

INTERVENTIONAL CARDIOLOGY PROCEDURES IN PATIENTS WITH CONGENITAL HEART DEFECTS – A COMPENDIUM FOR THE PAEDIATRICIAN AND FAMILY DOCTOR

Zabiegi kardiologii interwencyjnej u pacjentów z wrodzonymi wadami serca – kompendium dla pediatry i lekarza rodzinnego

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Abstract: Percutaneous cardiac procedures performed in children with congenital heart defects have become a safe and minimally invasive alternative to cardiac surgery. The dynamic development of percutaneous treatment is a real challenge for the paediatrician and family doctor. In their daily medical practice, they have to deal increasingly often with managing patients after such procedures on the occasion of other diseases. The widespread availability of non-invasive diagnostic methods (echocardiography, magnetic resonance imaging, computed tomography) makes it possible to plan minimally invasive diagnostic or interventional procedures, which may include a palliative procedure, the next stage of treatment or a final treatment procedure.
Keywords: the cath lab, percutaneous treatment, endocarditis infectiosa.

Streszczenie: Przezskórne zabiegi kardiologiczne, wykonywane u dzieci z wrodzonymi wadami serca, stały się bezpieczną i mało inwazyjną alternatywą dla zabiegów kardiochirurgicznych. Dynamiczny rozwój kardiologii interwencyjnej w ostatnich latach jest prawdziwym wyzwaniem dla lekarza pediatry oraz lekarza rodzinnego. W swojej codziennej praktyce lekarskiej muszą coraz częściej mierzyć się z prowadzeniem pacjentów po takich zabiegach przy okazji innych chorób. Powszechna dostępność diagnostycznych metod nieinwazyjnych (badanie echokardiograficzne, rezonans magnetyczny, tomografia komputerowa) umożliwia zaplanowanie małoinwazyjnego postępowania diagnostycznego bądź interwencyjnego, na które może składać się zabieg paliatywny, kolejny etap leczenia lub końcowy zabieg leczniczy.
Słowa kluczowe: pracownia hemodynamiki, zabiegi interwencyjne, profilaktyka izw.

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Types of percutaneous procedures

Haemodynamic laboratories provide procedures of various degrees of difficulty, requiring specific experience from the personnel. The deadline of the procedure depends on the type and complexity of the defect, severity of haemodynamic instability, patient's age and current status. Diagnostic cardiac catheterisation is an element of the therapeutic process that allows doctors to form an individual management plan for the patient. It is a gold standard for the measurement of blood pressure in the main veins, right atrium, right ventricle (measurement of the systolic, diastolic and end-diastolic pressure) and pulmonary artery, as well as for the measurement of the pulmonary artery wedge pressure [1]. Moreover, the values of the systemic and pulmonary blood flow, oxygenation of arterial and venous blood, and pulmonary and systemic vascular resistance are evaluated [2]. It can be used to trace the exact anatomy of the coronary vessels and demonstrate vascular malformations, additional systemic-pulmonary anastomoses or fistulas. The direction and size of intracardiac leaks at the level of large vessels can also be assessed. Using pharmacological tests with nitric oxide, diagnostic cardiac catheterisation is the basic test to diagnose pulmonary hypertension [3].

Interventional cardiac catheterisation is performed in experienced centres, where indications are determined collectively by a treatment planning team. This management includes primarily life-saving procedures conducted in the first days of life: Rashkind procedure (balloon atrial septostomy) in complex, duct-dependent heart defects; balloon angioplasty of critical aortic coarctation; and valvuloplasty of the valves in major vessels

[4]. In daily practice, the most common procedures include palliative procedures or advanced treatment stages [4]: valve enlargement (pulmonary, aortic valve); dilation of vessels (narrowed pulmonary branches) (Fig. 1);

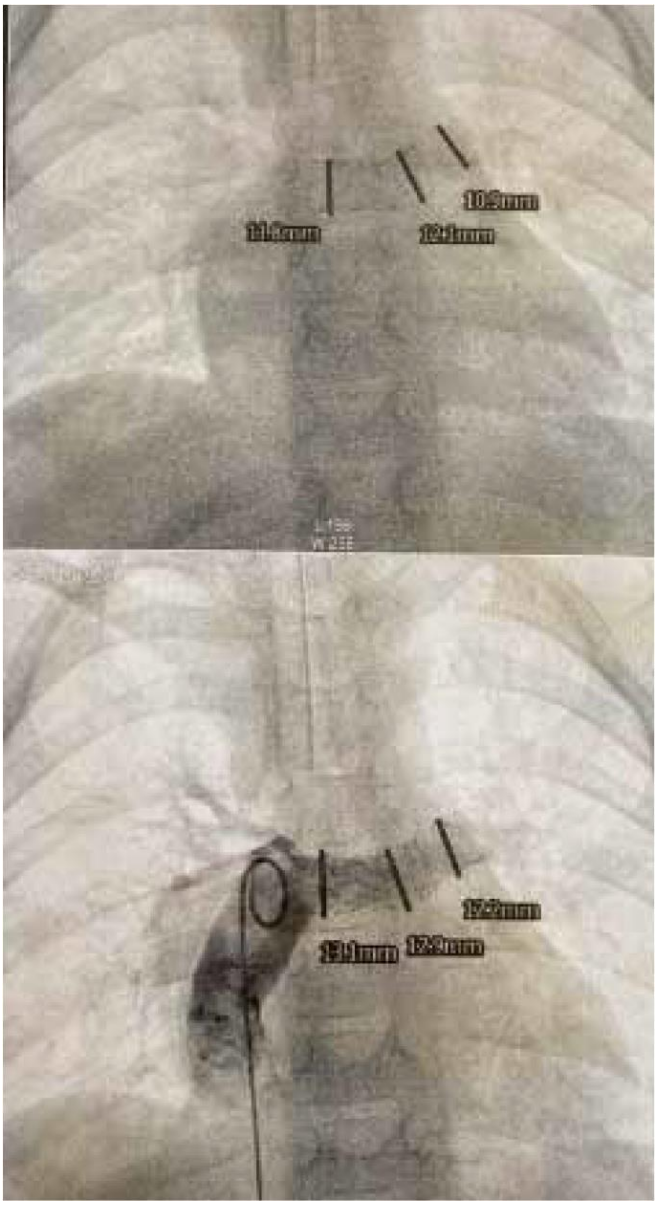

Figure 1. HLHS post-TCPC. Status post implantation of 3 stents to LPA (S. Góreczny)

communication: balloon angioplasty, stent implantation; valve implantation: Melody, Edwards Sapien [5]; closure of fenestrations, additional systemic-pulmonary anastomoses, fistulas (Fig. 2).

Frequently hybrid procedures are performed in the operating theatre, that is a surgical procedure that requires a simultaneous, additional percutaneous intervention. Interventional procedures, including the closure of an atrial septal defect [6], of a ventricular septal defect [7] or of patent ductus arteriosus, are increasingly popular alternatives to cardiosurgical procedures, and they are performed in increasingly young children (Fig. 3). In paediatric practice, the least common ones are the

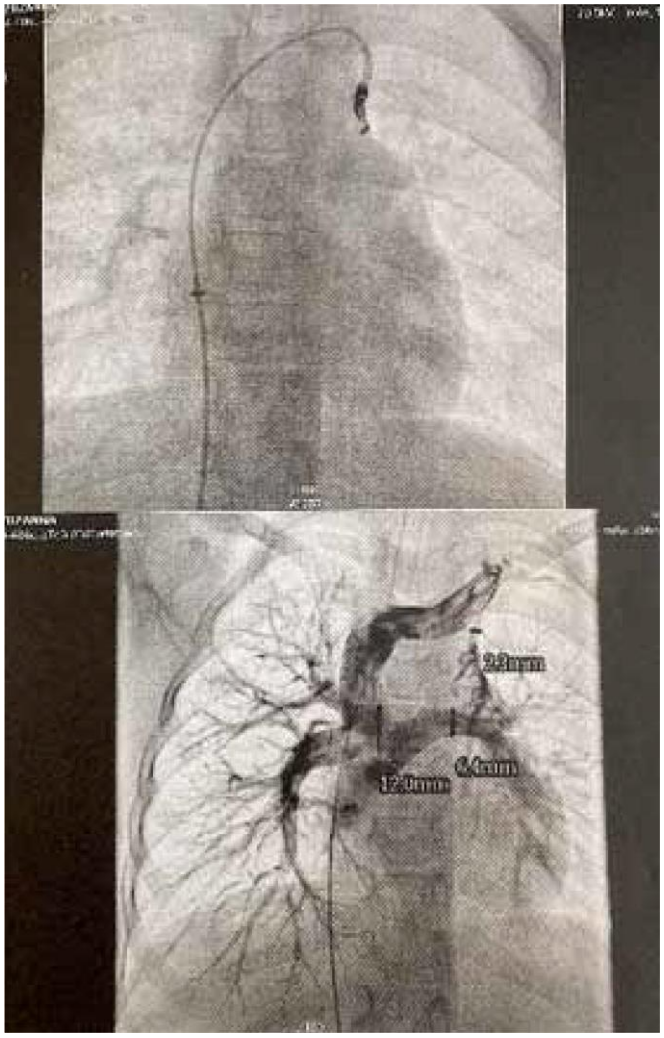

Figure 2. Status post closure of a collateral circulation with Tornado (T. Moszura).

procedures involving removal of a foreign body or local thrombolysis.

Examples of interventional procedures

At present, the most common method for the closure of patent ductus arteriosus is an interventional closure with an intravascular coil or Amplatz occluder. This method is considered safe and highly effective, with very rare complications. The possibility of an interventional occlusion of a septal defect is determined based on its location, size and development of the limbus of the foramen ovale. The most common systems for occlusion are *Amplatzer Atrial Septal Occluder* and *Gore Helex Septal Occluder* [8]. The imaging study to determine if a percutaneous closure can be performed is transoesophageal echocardiography, usually performed immediately before the procedure. Long-term treatment outcomes are very good. The effectiveness rate of the procedure after a few years is 100%. Transvascular occlusion of septal defects can be an alternative to a surgical procedure but it applies only to muscular defects, due to the high risk of a complete block associated with the procedure [8]. The defects are closed using an Amplatz occluder. Treatment outcomes are good.

Figure 3. PDA. Occlusion using the Jackson coil 3/3 mm (T. Moszura).

Percutaneous implantation of the pulmonary valve has been performed in Poland for 12 years, and it is an increasingly popular procedure in patients with complex cardiac defects, following surgical correction with the use of a pulmonary homograft or Contegra, who require reoperation. Implantation of the Melody valve (Medtronic Melody Transcatheter Pulmonary Valve), available in Poland, is associated with increasingly good results in paediatric patients. Implementation of the Edwards-Sapien valve in the pulmonary position in older patients is less frequently reported. The results of interventional treatment of native aortic coarctation are comparable to surgical treatment. Both balloon angioplasty and stent implantation in the stenotic section of the aorta are conducted (Fig. 4). The risk of re-coarctation following the intervention is similar to that after a cardiosurgical procedure. Angioplasty and stenting of the narrowed pulmonary branches are considered the treatment of choice in many centres [9]. The treatment outcomes are

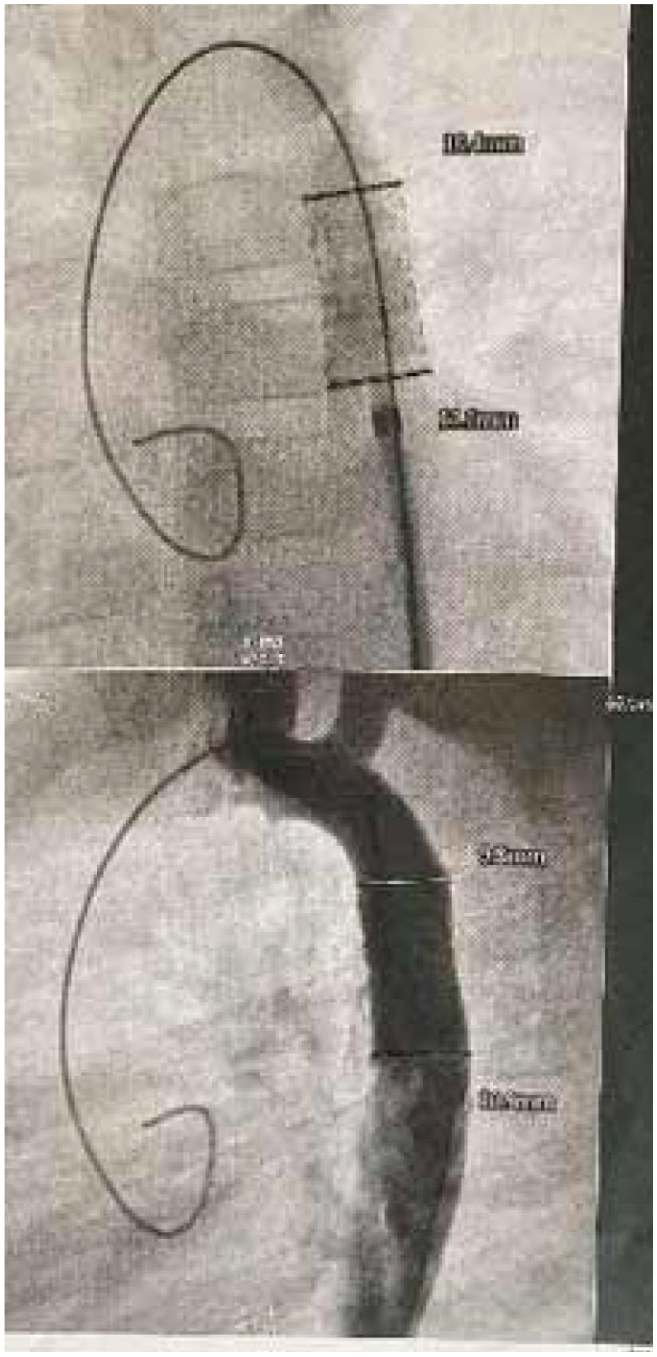

Figure 4. CoA. Placement of the Cook Formula 10 x 20 mm stent in the aortic isthmus (T. Moszura).

good. Frequently it is necessary to expand the stent or to place a new stent in the first one.

Complications due to percutaneous procedures

A percutaneous procedure is relatively safe, but, as with any procedure, it is associated with a risk of complications, including death. The most common ones are local complications in the form of an iatrogenic vessel injury. A systolic-diastolic murmur at the puncture site provides information about a potential perforation and the formation of a fistula, i.e. communication between the artery and the vein, which can be confirmed in a colour

Doppler test. A fistula is often accompanied by blood extravasation. In such cases, strict bed rest and a pressure dressing for three days is recommended. If after that time the fistula is still open, it is recommended to treat it surgically and close it in a scheduled mode, As a result, an obstruction may occur in the vessels, and in the case of thrombosis, collateral circulation may develop [10]. Frequent adverse effects include allergic reaction to the contrast medium, in the form of a rash, itching, burning, peripheral oedema and reaction to anaesthetics, manifested by hypotony, nausea, vomiting, headache and vertigo. Dangerous complications include supraventricular and ventricular arrhythmias, bradycardia and a complete heart block. The rarest, but most dangerous, adverse events include clots forming on implants, haemolysis due to implant displacement, and iatrogenic endocardial injury or myocardial infarction [10].

Contraindications for interventional procedures

The most important contraindications for the procedures in paediatric practice include severe haemorrhagic diathesis, chronic therapy with anticoagulants, where INR remains over 2, uncontrolled electrolytic disorders in the form of hypo- or hyperkalemia, severe ventricular and supraventricular cardiac rhythm disorders and a complete atrioventricular block, resulting in haemodynamic instability.

Vascular accesses used in interventional procedures

Depending on the type of cardiac defect and the options available to the operator, the procedure is conducted using various access sites. Typically, it is the femoral vein or artery. Another common access is the internal jugular vein or the brachial vein. Access from the carotid artery, following its surgical opening and preparation, is used less frequently. The least common access in paediatric patients is through direct puncture of the hepatic vein or the umbilical vein. After the placement of the vascular access, a sheath is introduced, and a proper catheter to conduct the angiographic and haemodynamic test is inserted. In the laboratory, the operator has a wide range of guides and catheters in various sizes, marked using the French scale, which determines their approximate outer diameters, expressed in millimetres (1F = 0.33 mm) [10]. The choice is based on the patient's age, the anatomy of the defect and the aim of the test. For angiography, Pigtail catheters are typically used. For right heart catheterisation in paediatric patients, Swan-Ganz catheters are used [10].

Preparation for an interventional procedure in an outpatient setting

The preparation of a child for the heart catheterisation procedure is also the responsibility of the family doctor and the paediatrician who normally take care of the child. It is important to remember that the patient should have at least two weeks of convalescence after an infection, involving antibiotic therapy or symptomatic treatment. Patients awaiting an elective procedure should be vaccinated following the vaccination schedule [11]. They should receive a full cycle of hepatitis B vaccination. Additional vaccinations are recommended, especially against pneumococci and influenza. Children under one year of age should receive full prophylaxis against RSV infections. It applies especially to patients with heart insufficiency and children with pulmonary hypertension. Girls during menstruation should not be referred to an elective procedure. Regular dental care and effective dental treatment is the key factor in reducing the risk of infective endocarditis during the postoperative period [11]. Most chronic medications, including acetylsalicylic acid, do not need to be discontinued. However, digoxin and warfarin must be stopped a few days before the procedure.

Preparation for the procedure in a hospital setting

At admission to the hospital, basic laboratory tests should be performed, including complete blood count with platelet count, assessment of C-reactive protein levels, activated partial thromboplastin time, international normalised ratio (INR), the concentration of electrolytes and creatinine, and blood group determined in two tests. If the patient received anticoagulation treatment, warfarin should be stopped for at least two days before the procedure. INR should be below 1.5 (according to the American literature, below 1.8). If the risk of thrombosis is elevated, heparin should be administrated instead of an anticoagulant. Patients using metformin should switch to insulin at least 48 hours before the procedure. A current echocardiographic test, ECG test and, in patients with a history of cardiac dysrhythmia, a 24-hour Holter monitor test should be performed. A control Holter ECG is also performed before the implantation of the Melody valve and the closure with the occluder of an atrial or a ventricular septal defect [10]. Patients with renal insufficiency or an allergy to the contrast medium should be prepared for the procedure following the applicable standards. Children with a positive history of allergic reaction to contrast media should receive 2–3 doses of oral steroids (e.g. prednisone) or hydrocortisone one day before and on the day of the test [11]. Currently available non-ionic low-osmolarity contrast media do not cause major allergic reactions. On the day of the procedure, one dose of an antibiotic is administered for the prevention of infective endocarditis, following current guidelines and the internal protocols of the centres. Heart catheterisation in children is conducted in general anaesthesia, with blood products prepared, so written consent of the legal guardian for the procedure and potential blood transfusion in the case of complications is required. In patients over one year of age, double consent is necessary.

Management of the patient after the interventional procedure

After the procedure the patient is monitored for 24 hours. Children recover relatively fast and soon return to their ward. Waking up from anaesthesia should take place in the haemodynamic laboratory or in the recovery room. In most cases, patients do not require constant monitoring at the Intensive Care Unit, except for those in a severe general condition, who received the procedure as a life-saving intervention. Strict bed rest for 24 hours applies in the case

of arterial puncture, and up to 12 hours in the case of venous puncture. At present, the aim is to activate the patients soon after the procedure if possible, and the time spent in the lying position should be reduced. In the postoperative period, intensive intravenous hydration is applied, followed by oral hydration and feeding. The patient receives prophylactic low-molecular-weight heparin subcutaneously (1 mg/kg/day; in the case of diagnostic catheterisation, for one day, and in the case of interventional procedure, for three days after the procedure). Very often children need temporary administration of analgesics and antiemetics. Before discharge from the hospital, the patient should receive a follow-up echocardiography to assess the effectiveness of treatment and the severity of potential complications (Fig. 5). A control ECG test is recommended for all patients. If the septal defect is closed with an implant, a follow-up Holter monitor test should be performed. A Doppler ultrasound of the punctured vessel is recommended to exclude an iatrogenic injury. In patients who receive chronic anticoagulatory treatment, the target warfarin dose should be restored, initially, by overlapping heparin and the anticoagulant, then switching to warfarin alone, to achieve the target INR level.

Figure 5. Cardiac ECHO, a visible Amplatzer following ASD II closure (N. Kowalska).

Management of patients following percutaneous procedures in the primary healthcare setting

Hospitalisation takes 3 to 5 days after the procedure if no complications occur [10]. Patients after interventional procedures must limit their physical activity immediately after discharge from the hospital, and then they should carry it out on a recreational basis, at least until the complete endothelialisation of the implants occurs. A paediatric cardiologist decides if the child can participate actively in physical education classes, and a sports physician decides if the child can practice competitive sports, based on the test results. It applies in particular to the patients who underwent a septal defect closure, closure of the ductus arteriosus or stent implantation. Competitive sports, contact games, jumping on a trampoline, medicine ball throws and training at a gym are forbidden. Children are encouraged to engage in recreational physical activity, i.e. gymnastics, warm-up exercises, jogging, swimming at a pool or dancing. Horse riding is contraindicated for three months after the procedure if it was performed via femoral access. After stent implantation, acetylsalicylic acid should be used at a dose of 3–5 mg/kg/day, as well as mandatory prophylaxis of infective endocarditis for 6 months after the procedure [11]. If a residue shunt persists after the procedure, infective endocarditis (IE) prophylaxis is to be administered for life. Administering a single dose of antibiotic 30–60 minutes before a dental procedure is recommended. This applies to procedures that require manipulation in the gum area or periapical region, or are associated with discontinuation of the mucous membrane, including removal of dental plaque and root canal treatment [11]. Amoxicillin or ampicillin at 50 mg/kg p.o. or i.v. are used, or ceftriaxone/cephalexin at 50 mg/kg i.v. If the patient is allergic to penicillins, clindamycin at 20 mg/kg p.o. or i.v. is administered [11]. Currently, IE prophylaxis is not recommended when the child is getting a body piercing. Prophylactic activities, such as strict oral hygiene and regular dental check-ups twice a year, reduces the risk of IE significantly. The diagnosis of IE is based on the results of a transthoracic and transoesophageal echocardiographic test, positive blood cultures from at least three samples collected at 30-minute intervals, and the presence of clinical symptoms. If infective endocarditis develops within 12 months after the procedure, it is considered a healthcare-associated infection, and antibiotic therapy must be introduced immediately, following the current standards. It should include vancomycin (30 mg/kg/day i.v. in 2 divided doses), in combination with gentamicin (3 mg/kg/day i.v. or i.m. in one dose) and rifampicin (900–1200 mg i.v. or p.o. in 2 or 3 divided doses). Rifampicin should be introduced after 3–5 days of effective antibiotic therapy. If the infective endocarditis develops after 12 months following the interventional procedure, ampicillin (12 g/day i.v. in 4–6 divided doses) with cloxacillin (12 g/day i.v. in 4–6 divided doses) and gentamicin should be introduced. Patients allergic to beta-lactam antibiotics should receive vancomycin (30-60 mg/kg/day in 2–3 divided doses) with gentamycin (3 mg/kg/day i.v. in one dose). When the results of blood cultures are available, the antibiogram determines the antibiotic therapy, following the current guidelines [11]. Children with congenital heart defects after an interventional procedure must receive regular cardiac check-ups throughout their lives. Frequently, repair procedures are necessary. An exception applies to patients following the closure of patent ductus arteriosus, as they should receive specialist care only for 12 months after an effective procedure.

Interventional percutaneous procedures and magnetic resonance

At further stages of their lives, children with complex heart defects often require additional imaging of the circulatory system, such as with magnetic resonance. After an interventional procedure, every patient received proper

documentation and a passport with information about the implanted element and its manufacturer. At present, images obtained with a 1.5 Tesla device are standard. Magnetic resonance imaging can use up to 3 T static magnetic field. It has been documented that the trace ferromagnetic properties of implants do not pose a risk to patients undergoing this test [9, 12].

Conclusions

Comprehensive management of the patient by the paediatrician, family physician and paediatric cardiologist specialising in congenital heart defects is the key to the final therapeutic success. With the rapid development of interventional methods, the treatment and management protocols change very fast, so they need to be reviewed regularly.

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REVIEW ARTICLE

ASSESSMENT OF SEQUELAE AND PROGNOSIS AFTER MODERATE CRANIOCEREBRAL TRAUMA

Ocena następstw i rokowanie po umiarkowanych urazach czaszkowo-mózgowych

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Abstract: Traumatic brain injury (TBI) is one of the most common causes of hospitalization and interventions in emergency departments. Epidemiological studies show that their growth is the fastest in highly industrialized countries, ranging from 180 to 546 craniocerebral injuries per 100,000 people, of which approximately 10% are fatal. Head and neck injuries in the victim often coexist. Clinical post-traumatic syndrome is multi-symptomatic, and it is often difficult to determine its severity in the first hours after the injury. New neuroimaging techniques have significantly improved the ability to detect early pathological changes following TBI. Nevertheless, the severity of the post TBI does not correlate with the results of neuroimaging tests and does not correlate with post-traumatic clinical sequelae.

Key words: traumatic brain injury.

Streszczenie: Urazy czaszkowo-mózgowe (TBI – *traumatic brain injury*) są jedną z najczęstszych przyczyn hospitalizacji oraz interwencji w oddziałach ratunkowych. Badania epidemiologiczne wskazują, że wzrost liczby takich urazów najszybciej odnotowywany jest w krajach wysoko uprzemysłowionych i waha się od 180 do 546 urazów czaszkowo-mózgowych na 100 tys. osób, przy czym około 10% z nich to urazy śmiertelne. Urazy głowy i szyi często współistnieją u poszkodowanego. Kliniczny zespół pourazowy jest wieloobjawowy i niejednokrotnie trudno stwierdzić jego nasilenie w pierwszych godzinach po urazie. Nowe techniki neuroobrazowe znacznie poprawiły zdolność wykrywania wczesnych zmian patologicznych powstałych po TBI. Tym niemniej stopień ciężkości przebytego TBI nie wykazuje korelacji z wynikami badań neuroobrazowych i nie koreluje z pourazowymi następstwami klinicznymi.

Słowa kluczowe: urazy czaszkowo-mózgowe.

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Nowadays, nearly half a million people across the world annually experience a traumatic brain injury (TBI). Epidemiological studies indicate that the number of such injuries increases most rapidly in highly industrialized countries, where it oscillates between 180 and 546 TBI per 100,000 people, with approximately 10% of the injuries being fatal [1, 2].

The epidemiological studies conducted in the United States reveal that the incidence of TBI is between 180 and 250 per 100,000 people per year [3]. Over half of the patients requires hospitalisation and a stay at an emergency department. Groups with a high risk for TBI have been identified. They include people living in regions characterised by a low socioeconomic status. It applies to very young individuals, teenagers and young adults, as well as elderly people. Men experience trauma more often (the general index of traumatic brain injuries is 1.46 higher) than women per 100,000 people. Mortality following TBI varies, according to the severity of the trauma, and it is higher in people with severe intracranial injuries and in the elderly. The causes of trauma mostly include falls from a height, followed by traffic accidents and injuries resulting from a blow to the head with various objects. It is a common belief that TBIs pose a serious public health problem, and are the main cause of epilepsy. The factors predisposing to head injury include, in particular, contact sports (e.g. boxing, ball games) and high mountain climbing. This phenomenon largely affects young and professionally active people. A proper diagnostic and therapeutic management determines faster recovery and return to active professional and social activity.

TBI is defined as a trauma-induced impairment of the brain function, in the presence of at least one of the following: loss of consciousness, loss of memory in the peritraumatic period, change in the mental status during the trauma, or

symptoms of focal brain injury. The head injury may be minor: the loss of consciousness is then no longer than 30 minutes, the Glasgow Coma Scale (GCS) score is over 13 after 30 minutes, and the trauma-induced memory loss subsides within 24 hours. A moderate trauma (mTBI) is diagnosed based on a GCS score of 9 to 12 points, and a GCS score of 8 points or less represents a severe TBI. Head and neck injuries often co-occur. A trauma to the cervical spine may result in a brain injury also in the absence of a blow to the head. Clinical post-traumatic syndrome is multi-symptomatic, and it is often difficult to determine its severity in the first hours after the injury. It comprises numerous symptoms, of varying intensity and in various combinations. Typically, they include headache (most often), vertigo, emotional imbalance (including irritability), reduced concentration, insomnia, fatigue and autonomic symptoms, such as nausea, vomiting, orthostatic hypotension, elevated sensory perception (photosensitivity and phonophobia) and anosmia [4, 5]. TBI is a general systemic injury, and it not only leads to impairment of the neurological functions, but also affects the circulatory system, especially the heart and internal organs [6]. Numerous studies demonstrate that TBI may cause heart rhythm disorders, including ST-T changes, elevated levels of enzymes from the cardiac muscle (CK, CK-MB and LDH), reduced left ventricular ejection fraction (LVEF) parameters and regional wall motion abnormality (RWMA) [7, 8].

Nearly 2/3 of all the closed traumatic brain injuries are mild and moderate, with concussion being the main clinical syndrome [9]. Most patients recover from mTBI, without a specialist medical intervention, within a few weeks. In a third of them a subjective post-traumatic syndrome develops within three months, comprising neurotic symptoms and vegetative disorders. Most often they include headache and vertigo, excessive fatigue, difficulties with concentrating, depressive states and panic attacks. A physical examination does not reveal any symptoms from the nervous system. A year after the trauma, 7-15% of patients still report symptoms affecting their social functioning and some of them never return to work [10].

The diagnostics of TBI and post-traumatic syndromes employ numerous neurophysiological and neuroimaging tests, such as electroencephalography (EEG), computed tomography (CT), magnetic resonance imaging (MRI) or spectroscopy (SPECT-HMPO) [11]. A head CT is currently the gold standard in TBI diagnostics. In most patients after TBI and with normal brain CT results, the symptoms do not subside and the patient's condition does not improve by two weeks after the trauma [12]. In mild to moderate TBI (GCS scores of 3-12) it was revealed that some changes demonstrated in CT are associated with a poorer prognosis. After a mild injury, the presence of pathological lesions and their distribution in the brain is not always visible in CT imaging, and their prognostic value is difficult to establish.

The American guidelines for the management of patients after TBI recommend a routine CT without contrast (level A recommendation) in patients who experienced TBI with a loss of consciousness or post-traumatic amnesia only in the presence of at least one of the following symptoms: headache, vomiting, patient's age over 60 years, in patients who have used drugs or alcohol, with short-term memory deficits, signs of trauma on the body (especially over the supraclavicular area), after an epileptic seizure, in patients with GCS score < 15 and focal neurological symptoms or in those who have a history of coagulopathy [13]. Following the guidelines, a CT without contrast (level B) should be considered in patients after a head trauma without a loss of consciousness or general post-traumatic amnesia. The test is also recommended if the following occur: focal symptoms or changes in a neurological examination, vomiting, severe headache, patient's age ≥ 65 years, clinical symptoms indicating a skull base fracture, a GCS score of < 15, a history of coagulopathy, if according to the physician, the mechanism of trauma was dangerous for the patient.

Few studies on the presence of pathological lesions in neuroimaging tests demonstrated that most lesions in the central nervous system have no significant prognostic value in multivariable models assessing the sequelae of an injury [14, 15]. In some of these studies the results may be due to a limited number of subjects. However, even the recent large-scale studies revealed negative results regarding the correlation between post-traumatic lesions in the nervous system and a long-term prognosis. Based on the analysis of the database of the patients from a trauma centre in the Netherlands, Jacobs et al. [16] found that the abnormalities demonstrated in CT imaging were not associated with the observed significant clinical improvement in the prediction model of TBI sequelae based on the analysis of the clinical variables alone in mild TBI patients. In particular, this applied to the head CT outcomes in the prediction model based on characteristics such as demographic data. However, it should be emphasised that advances in CT imaging technology significantly improved the quality of images in the last decade. CT scanners in modern trauma centres have cameras with 64 to 320 rows of detectors, and rotate by 360° in less than 0.3 second, offering thin slices, high-resolution multidimensional reconstructions and acquisition of the entire head in under 1 second [17]. These changes improved significantly the ability to detect early pathological abnormalities resulting from TBI. Equally important are neuroimaging follow-up tests in patients after a head injury. In a large-scale study carried out in the United States in patients after mTBI, a follow-up head CT, conducted with the use of newer devices, revealed intracranial haemorrhage in 37% of subjects, while the mean positive head CT rate in US emergency departments in such tests is approximately 9% [18, 19]. Also another recently published study by van der Naalt et al. [20] reports that the abnormalities demonstrated in CT scans were not associated with the clinical status of patients during the appointment at two weeks after the trauma, as well as at 6 months.

The severity of the TBI does not correlate entirely with the results of neuroimaging studies [21]. The most commonly observed CT abnormalities include subarachnoid and intraventricular haemorrhage, brain contusion, pericerebral haematomas and skull fractures. Often various post-traumatic changes are found in the same patient. They usually result from an injury caused by a linear acceleration

mechanism. An intraventricular haemorrhage with cerebral contusion and injury to the deep structures is observed more often after trauma in which rotational motion is involved [22]. Pericerebral haematomas and contusions in subcortical white matter (e.g. in the superior frontal gyrus) are common, and they are relatively mild consequences of a rotational head trauma.

Based on the results of two large-scale observational studies conducted on different continents, cerebral contusion, subarachnoid bleeding, pericerebral and intraventricular haematomas are associated with adverse prognosis within 1 year after the mTBI. The studies demonstrated that the results of CT imaging help to identify early the patients in a life-threatening condition and at risk of developing permanent sequelae of the trauma. A CT test can reveal early the post-traumatic lesions requiring an immediate neurosurgical intervention. Patients after mTBI with abnormal CT findings, who do not require an urgent operation, should remain under a regular, periodic form of clinical observation [23, 24].

It remains unclear why for some people the symptoms after TBI subside relatively fast, while others suffer from prolonged symptoms and a significant impairment of executive functions. Some knowledge of the prognostic factors is then necessary for the planning of further treatment and rehabilitation. Numerous clinical and experimental studies reveal the impairment of cerebral, focal or general circulation, as well as permanent damage to the neural networks, especially in the frontal and temporal lobes, even after mTBI [25]. To identify them, CT or MRI tests that evaluate perfusion and diffusion may be helpful.

Post-traumatic headache (PTH) is the most common symptom after TBI, occurring in approximately 92% of cases [26]. Its prevalence remains high, at 58%, within the first year after a mild injury. Previous history of headaches increases the risk of PTH in elderly patients. The clinical phenotype of PTH resembles migraine in approximately 3/4 of cases. Compared to the patients with spontaneous chronic headaches, patients with PTH demonstrate a considerable impairment of the cognitive functions, they more often experience somatic symptoms, are more frequently unemployed, have a lower quality of life, and more often experience post-traumatic stress disorder (approximately 30%). Typically, they experience headache every day or almost every day. The pathogenesis of post-traumatic headache is not well understood. A few hypotheses suggest the potential mechanism of their origin, which may differ between individuals, and are not mutually exclusive. These mechanisms include:

- Impaired descending nociceptive modulation system due to disruption of the axonal function [27],
- impaired regulation of the cerebral circulation,
- occurrence of the phenomenon of cortical spreading depression [28],
- stimulation of the trigeminal nerve due to neurogenic meningitis and encephalitis [29],
- microglial activation and degranulation of the mast cells [30],
- direct injury to the extracranial nociceptors [31],
- cervicogenic headache [32].

Each of these mechanisms may result in a post-traumatic headache. Post-traumatic headaches occur immediately after the head trauma. Typically, they subside spontaneously after a few days. A headache may occur after a trivial or a severe head injury, and its intensity and duration are independent of the type and severity of the trauma. Paradoxically, pain develops more frequently after mild and moderate head injuries.

A headache is an integral component of post-traumatic syndrome, comprising vegetative and emotional disorders, often of a neurastenic and depressive nature. Patients complain about problems with memory, difficulties with concentration, excessive fatigue, anxiety and sleep disorders. Neuroimaging studies help to exclude the organic nature of the headache, which may affect the entire head and intensify with head movements. When the cervical spine is injured during trauma, especially in the case of whiplash injuries, cervicogenic headaches may occur, while post-traumatic neuropathic pain in the epicranial aponeurosis may be less common. The headaches may be acute or chronic, occurring in the first two weeks after the trauma and persisting for over 8 weeks after the injury. Post-traumatic headache becomes a chronic symptom in nearly 60% of patients [33]. 33% of patients report headaches a year after the trauma, and 15-20% report them after three years [34].

The International Classification of Headache Disorders (ICHD-3) includes a separate chapter: “Headaches attributed to trauma or injury to the head and/or neck”, which describes many different types of post-traumatic headaches [35]. They include persistent headaches attributed to trauma or injury to the head, persistent headaches attributed to whiplash, persistent headaches attributed to other trauma or injury to the head and/or neck and persistent headaches attributed to craniotomy. To identify a causal relationship, the headache must occur within 7 days from the injury. Persistent headaches attributed to a moderate to severe traumatic injury to the head do not have specific characteristics. According to experts, such pain occurs within 7 days after a head trauma or regaining consciousness, and persists for over 3 months after the trauma. It also has to occur after a head injury that meets at least one of the following conditions:

- loss of consciousness for at least 30 minutes,
- Glasgow Coma Scale score of less than 13 points,
- post-traumatic amnesia persisting for over 48 hours,
- presence of a post-traumatic lesion confirmed in an imaging test (intracerebral haematoma, subarachnoid haemorrhage, cerebral contusion, fractured skull).

Apart from a lack of typical characteristics, the pain occurs within 7 days after the trauma.
In practice, establishing a causal relationship is particularly difficult in patients with persistent pain that occurred 7 days after the trauma. Treatment of post-traumatic headaches is based on pharmacotherapy with the use of nonsteroidal anti-inflammatory drugs and psychotherapy,

and in chronic post-traumatic headache, on antidepressants and psychotherapy. Patients with persistent headaches and post-traumatic syndrome require an additional consultation with a psychiatrist.

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THE CHALLENGES FACING POLISH FOREIGN POLICY AD 2023

Wyzwania polskiej polityki zagranicznej AD 2023

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Abstract:

Introduction and objective – The presentation of the challenges Poland faces in the military security of the state in the context of Russian aggression in Ukraine.

Material and methods – Analysis of the documents, mass media materials and other research works.
Results – Identification of the nature of the challenges and methods to deal with them.

Conclusions – Russia is the main challenge for Poland. Poland's insufficient potential in the context of the Russian threat forces it to look for additional, external sources of strength. There are three of them: USA/NATO; Other nations in similar situation with a particular importance concerning Ukraine and the most determined – the Baltic States; EU – which however is getting weaker; Polish armaments, close cooperation with the U.S. based on the Polish will and capacity to contribute to the common transatlantic security as a leading US ally in the region, close cooperation with Ukraine and the Baltic states are the recommended methods to meet the Russian challenge.
Key words: Poland, Russia, defense, deterrence, war.

Streszczenie:

Wprowadzenie i cel – Prezentacja wyzwań stojących przed polską polityką zagraniczną w wymiarze bezpieczeństwa wojskowego państwa w kontekście rosyjskiej agresji na Ukrainę.
Materiał i metody – Analiza materiałów źródłowych (oficjalnych dokumentów państwowych i organizacji międzynarodowych, wystąpień publicznych polityków itp.), doniesień medialnych i literatury przedmiotu. Wyniki – Określenie natury wyzwań i metod stawienia im czoła.
Wnioski – Głównym wyzwaniem dla bezpieczeństwa RP jest Rosja. Niedostatek potencjału Polski w kontekście zagrożenia rosyjskiego zmusza ją do poszukiwania dodatkowych, zewnętrznych źródeł siły. Są nimi: 1) USA/NATO;
2) państwa w podobnym położeniu, co Polska z największym wśród nich – Ukrainą i najbardziej zdeterminowanymi – państwa bałtyckie; 3) słabnąca i nie mająca znaczenia wojskowego UE. Zbrojenia własne wystąpienie w roli wiodącego sojusznika regionalnego USA, zdolnego przejąć część ciężarów wspólnego bezpieczeństwa transatlantyckiego oraz ścisła współpraca z sojusznikami w regionie – to najważniejsze rekomendacje do działania.
Słowa kluczowe: Polska, Rosja, obrona, odstraszanie, wojna.

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Russia's devastating aggression against Ukraine that begun on 24 February 2022, which was not the beginning of a war (it had begun in 2014) but only a new stage marked by a high intensity of combat operations on a scale unknown in Europe since 1945, presented Poland with the old/new challenge of Russian imperialism in all its harshness. However, Russia was also the main threat of the reborn Polish foreign policy in all the decades following 1989, i.e. since Poland regained its independence. In fact, it was the desire to build a system that would protect Poland from once again passing under Russian dominion that was the main motive for Poland's accession to NATO and an important reason for joining the European Union (despite the lack of military significance of the latter). The feeling of being threatened by Russia was also the 'political fuel' of all Polish regional initiatives:

- from the co-founding of the Visegrad Group – established on 15 February 1991 following the massacre of Lithuanians by the Soviet Army under the TV tower in Vilnius on 13 January 1991, which triggered – precisely in Visegrad – the coordinated process of Poland's, Czechoslovakia's and Hungary's exit from the dependency structure of the Soviet Union,
- through the Eastern Partnership,
- the Bucharest Nine,
- the Lublin Triangle,
- and the Trilogue of Poland, Romania, and Turkey,
- to the Three Seas Initiative
- and the most recent Polish-Ukrainian-British agreement, clearly already concluded in the shadow of the looming Russian strike against Ukraine.

This sense of menace from Moscow also motivated Polish military activity within the multinational expeditionary missions led by NATO and then the EU in Bosnia and Herzegovina and Afghanistan, in the Iraq mission led by the United States, or in Congo (2006) and Chad (2008-2009) under the command of the European Union [1], where Poland sent more or less numerous military contingents. After all, the participation in the above mentioned operations was not an expression of Polish ambitions to shape the situation in those countries, but a demonstration of allied solidarity, primarily with the USA as the leader of the North Atlantic Alliance. NATO's military power and prestige act as a deterrent against Russia, keeping the countries sheltered under the US alliance umbrella out of the reach of Russian military operations. Poland was no exception as to the nature of this policy, because all countries experiencing the Russian threat, from Estonia to Bulgaria, behaved in this way. Poland's uniqueness, however, lies in its size. Few Poles realise that the 2004 expansion of the European Union to incorporate 10 Central European countries meant an increase in the number of EU citizens by 38 million Poles and the 36 million inhabitants of the other nine countries that joined the organisation at the time. Another sign of Poland's uniqueness and the magnitude of the challenges tackled repeatedly by Polish foreign policy is the fact that Poland is the only country in modern world history to have lost all its neighbours over three years (1990-1993), as none of the countries that existed and bordered Poland in 1990 survived past 1993. This example is a perfect illustration of the 'tectonic activity' of the political zone surrounding our country, which, by contrast, appears to be a haven of stability. That stability, however, has been disrupted for centuries by Russia (although, admittedly, often not alone). The country remains the main challenge for Polish foreign policy even now – AD 2023. The threat it poses is also the main driver behind Polish foreign policy towards the US and NATO, on the regional level and, to a large extent, also towards the EU.

The following considerations, which provide evidence in favour of the above argument, are an interpretation of the facts, based on publicly available information from the media. They give, therefore, a certain picture of the reality, an attempt to explain not what happened – because this can be generally reconstructed from the relevant accounts without any risk of error – but rather why all that happened. What intentions and plans lay behind the moves of the various players in the international game, what followed and what challenges Poland's foreign policy in AD 2023 faces as a result. Until the passage of time opens to researchers the archives containing the materials and documents produced today in connection with the decision-making processes and their outcomes described in this paper, all we have left is guesswork and speculation. When asking about the causes of events, it is necessary to provide answers based on the available data. The widening scope of accessibility will certainly modify the picture of reality outlined below, confirming or disproving individual sections. This article is therefore a 'photograph' of the state of the current knowledge as it is being created, rather than a 'film' recounting the whole process that is, after all, still unfolding, its conclusion unknown. Accordingly, the author does not aspire to exhaust the topic but only to signal some already identifiable directions of inquiry as to the nature of the surrounding political reality and the resulting challenges for the foreign policy and the security of the Republic of Poland AD 2023.

Throughout its history, Poland has fought 18 wars with Russia, including the wars waged by the Grand Duchy of Lithuania supported by Polish reinforcements from 1492 onwards. Russia was also the central superpower that destroyed the First Republic and controlled, indirectly from 1717 and directly from 1795, most of its lands, and from 1815 ruled over almost all Polish territories. The Russian Empire that mutated into the Soviet Union was also one of the two partitioning powers that destroyed the Second Polish Republic and controlled Poland between 1944 and 1989. The Russian challenge is therefore an ongoing challenge for Poland. Due to the libertarian system of the First Republic and the democratic system of present-day Poland, with natural tendency to extend the sphere of democracy, security, and prosperity to the states located between Poland and Russia, the very existence of an independent Poland undermines the stability of Russian rule over Belarus and hinders its restoration in Ukraine and the Baltic states. For centuries, the Polish idea of a union of 'free with free and equal with equal', stemming from the libertarian-republican tradition of the First Republic, was the main alternative of the Central European order compared to the concept that the Russian Empire was trying to impose on our region: the imperial idea of a Great Russia spreading the slogan of the Third Rome, the Pan-Slavic idea or communist universalism with its ambitions to rule the world and, above all, to destroy the 'hostile West'. For Russia, the embodiment and archetype of the enemy is the 'traitorous Pole' serving foreign powers: the Jesuits (under Batory and Sigismund III), the Jacobins (in the time of Kościuszko and in the years 1830–1831), Napoleon I (in 1812) and Napoleon III (in 1863–1864), being a 'dog on the Entente's chain' in the years 1919–1920, and finally acting as a 'CIA agent' paid by the Americans after 1945. Thus, in this view, Poland is a special enemy – it is a traitor to Slavism or (in keeping with the era) a traitor to the idea of proletarian revolution, and a traitor is someone worse than an ordinary enemy. Present-day Poland is, in addition,

'ungrateful for having been saved from fascism', i.e. from Hitler. The whole set of facts, both real and imagined, means that the independent Republic of Poland and the Russian Empire cannot exist side by side in peace. For imperial Russia (and there is no other, and to date, with the exception of the brief episode of Alexander Kereinsky's rule from 20 July to 8 November 1917, there never has been) cannot tolerate an independent Poland destabilising Russian rule over Belarus and Ukraine with its 'freedom plague'. However, without this rule, there is no Russian Empire. Nor can democratic Poland 'stay out of the line of fire', i.e. stop influencing Ukraine or Belarus, as no democratic Polish government will be able to prohibit its citizens from providing support to the freedom movements in these countries, or to enforce such an unimaginable prohibition. Besides, Russia will never believe in the durability of such a hypothetical line of Polish policy either, and will not rest the security of its rule over the lands and peoples in question on such a belief.

All the considerations presented in the previous paragraph serve to prove the fundamental argument in our discussion: If it wants to remain an independent state, Poland is bound to come into inevitable conflict with the Russian Empire. This clash is unavoidable. This is because Russia knows neither the concept of compromise nor peaceful coexistence with its neighbours. It divides the world into enemies and vassals, and Poland has only these two roles to choose between.

Therefore, since a confrontation with Russia (to be clear – not necessarily militarised, but at least political) is imminent and cannot be avoided, the main challenge for Polish foreign policy is – as in previous generations – to address the issue of how to handle it to win.

Before we proceed to a detailed consideration of this particular issue, let us make three general remarks, which are true for any historical and political science topic and quite obvious, yet often ignored in the analyses carried out, usually leading to erroneous conclusions:

1. Politics (both the currently and in the past) should be looked at as a film and not as a photograph. After all, it is dynamic in nature and changes over time. The state of affairs as described at any given time – the potential, the intentions of the parties, their view of reality, and the public mood determining (especially in a democracy) what is and what is not possible to achieve – is constantly evolving. An argument that is true at a given moment may therefore be false as a diagnosis of the situation at a previous or subsequent moment in history.

2. Decisions are not based on reality but on the image of reality that exists in the minds of the decision-makers. The decision-makers, on the other hand, are only human – they make mistakes, become emotional, interpret the information they gather through their cultural code and, correspondingly, predict (accurately or not) the moves of the other players in the international game. They also often forget that the political signals they send, constructed in line with the sender's cultural code, will be read through their recipient's cultural code, which may not necessarily be the same, often leading to disastrous consequences, such as disregarding serious warnings before making a move and ultimately provoking a war.

3. A democracy only permits whatever is agreed to by the electorate, the citizens, who are at the same time the producers of the resources available to states, i.e. the elected and revocable decision-makers who govern them. The costs of an action, if it is to be a strategic (and therefore costly) one must, therefore, have public acceptance. Agreement between governments alone is not enough. Europe is no longer a continent of absolute monarchies. Nor is the United States such a monarchy. Moreover, the fact that significant sections of society hold views of some kind is as much a political fact as the number of divisions or the stock of bank assets. Whether a commonly held view is true or false is relevant to the ultimate effect of the actions taken in response to that view; it determines the possibility of those actions being taken regardless of the accuracy or otherwise of the reality assessment expressed in that view.

Poland's security is built on its own national power potential. It is the only one we can absolutely count on. However, Russia's potential is greater than Poland's. From this fundamental fact arises an equally fundamental need: the necessity for Polish foreign policy to seek external (additional) sources of power to redress this imbalance. There are three such sources of external potential from which Poland can draw:

1) **NATO** – and actually the leader of this alliance, the United States, which is the only one with the technical capacity to project military power over long distances on a scale that ensures effective deterrence of Russia and the repeatedly demonstrated political capacity to use this force.

2) **Nations in a parallel political position to Poland**, with similarly strong feelings about the Russian threat and the will to counter it: Estonians, Finns, Lithuanians, Latvians, Swedes, and Ukrainians, and to some extent Georgians, Moldovans, and Romanians (who see the reality but may not be willing to pay the cost of the conflict). Czechs and Slovaks may join this group to a certain extent (the latter as long as they associate Russian expansionism with paving the way to Hungarian territorial revisionism through Moscow's demolition of the principle of inviolability of borders in Europe). In addition to Poland, the core of this group includes Ukraine and the Baltic States, as the countries with the greatest sense of threat, most determined to oppose Russia. These are countries that refuse to accept that capitulation spares blood – on the contrary, it leads to the extermination of the leadership layers of conquered peoples. This experience from World War II and the post-war period, still fresh in the memory of the grandparents' generation, was brought back to life

by Russian crimes in Ukraine. They strengthened the determination of the said nations to resist the threat posed by the Kremlin, dispelling any remaining illusions (if any) about the nature of a possible Russian occupation. Meanwhile, the success of the Ukrainian Armed Forces against the Russian invasion destroyed the prestige of the Russian army as the 'second most powerful army in the world' and inspired the above nations to believe that effective resistance is possible. Among these nations, the Ukrainian nation has the greatest demographic, industrial, territorial and, therefore, military potential. Ukraine is therefore of primary importance to Poland in terms of external potentials. Polish-Ukrainian cooperation in stopping Russian imperialism is, consequently, decisive for the effective action of the entire region. Without a strong relationship between Poland and Ukraine, the other states do not have the potential to successfully resist Russian expansion.

3) **The European Union** has significant economic potential and the sanctions it has imposed on Russia have a significant impact on the Russian economy and its production capacity in terms of weapons, equipment, gear and military supplies. Nevertheless, the EU does not count as a military force and, for a number of reasons worthy of a separate and extensive study, it will never have the military power necessary to deter or stop Russia, nor will it have the political will to use it. The EU, which is in the midst of its fourth consecutive crisis (the debt crisis from 2008 onwards, the immigration crisis from 2015, the 2020-2021 COVID crisis and the energy crisis triggered by Russian aggression against Ukraine in 2022), will not be able to generate the financial resources to cope with all the challenges involved and to additionally arm itself on a strategic as opposed to a symbolic scale.

Of the three listed sources of external power that Poland can draw from to counterbalance Russian potential, only the regional potential is a constant factor. This is because the constituent nations will not emigrate anywhere, will not cease to be threatened by Russia, at least as long as Poland is threatened by it, nor will they change their priorities in foreign policy, as the Russian threat is existential both for them and for Poland, and is a major and non-negligible foreign policy challenge.

As a pillar of NATO, the United States is currently the key external force that guarantees Polish security in terms of defence and deterrence. It is irreplaceable in both of these tasks. This is true of defence because no one has a military capability even close to that of the US, nor the chance to build one. With regard to deterrence, on the other hand, it is an equally indispensable factor, since deterrence is a psychological influence on the decision-making process of a potential aggressor to dissuade them from making a decision to attack, and decisions, as indicated above, are based on the image of reality in the minds of decision-makers. In this context, the reputation of the US armed forces is therefore irreplaceable, as all countries opposed to the United States fear confronting them – and this includes Russia, which threatens Poland.

The United States is a democracy. This fact should be treated not as an ornament in the speeches of diplomats and politicians but as an analytical category representing one of the factors determining the US ability and political will to use military power to shape the international balance of power.

US democracy has been waging a constant expeditionary war since 11 September 2001, sending tens of thousands of troops on successive missions abroad. Over the past 21 years, millions of soldiers have come and gone with the rotations (174,711 US soldiers served overseas in 2021 alone) [2]. When we add their families and friends, we get a picture of the voting impact of this on the electorate in the US. The politicians who make the decisions to send troops overseas have to win elections to obtain or extend their democratic mandate to govern the country. Fighting an expeditionary war in distant countries and sending own armed forces made up of citizens (not mercenary foreigners) is a huge political overload for any democracy. The result is a natural and growing tendency for successive politicians seeking the votes of the electorate to try to find opportunities to lift at least some of the financial and human burden resulting from the United States' assumption of the role of an international security stabiliser in numerous regions of the world off the shoulders of the American people. This has been a constant line of policy in Washington in recent years, regardless of who occupied the White House. Any differences were in the method of achieving the stated objective, not its acceptance or rejection. It was this political need during the Obama administration that gave rise to effective US incentives for Japan to abandon the maintenance of only a Self-Defence Forces and build a real army, capable of taking over some of the responsibility of maintaining security from the US military as part of the US alliance system in the Far East. President Donald Trump attempted to repeat the positive experience from Japan's case with regard to South Korea, the Sunni Gulf monarchies, Israel and European NATO allies. The meeting with Kim Jong Un in Hanoi (27-28 February 2019), in theory about North Korea's nuclear weapons, ended with Trump's press conference whose essential message was to urge South Korea to increase its contribution to the cost of collective security in the Far East [3]. And the fact that this meeting was held in the capital of Vietnam, which traditionally feels threatened by China, was also a political nod to that country, despite the 1964–1973 war, that it too could find its place in the system of American alliance in Southeast Asia against the growing power of the People's Republic of China.

The Warsaw Middle East Conference, held on 13 and 14 February 2019, was in turn an attempt to create an alliance between the Sunni Persian Gulf monarchies, with Saudi Arabia in the centre, and Israel to curb the Iran's Shia threat. The attempt failed, but it was a manifestation of the same political thought, i.e. the search for leading regional allies who, in a given area, would be able to take some of the

burden of collective security off the shoulders of the US, a move that would be welcomed by the American electorate.

In continental Europe, i.e. the region of most interest to us, Germany is the favourite among the candidates to be the leading US ally (the relationship between the United States and the insular United Kingdom is in a class of its own, and the close strategic cooperation between the two powers the United Kingdom is unparalleled). This is due to its demographic and economic potential, its geographical location and its tradition of American military presence, which is linked to the huge US military infrastructure embodied by the Ramstein US force base. Several generations of US servicemen have been stationed there, and since the military profession is often inherited, which is part of the US strategic culture, it is standard and natural for the majority of the US military elite to think about the US military presence in Europe. All these factors promote Germany to the role of the most desirable US ally – the anchor of the US military presence in continental Europe. Germany's willingness to take on the role that the US managed to assign to Japan in the Far East was tested by the demand that the US's European allies within NATO allocate 2% of GDP to armaments. Germany, however, rejected this demand [4] and thus did not complete the task set by Washington. Trump learnt his lesson and set his sights on Central Europe, including Poland. For the second time in its history, Poland became '*un allié de remplacement*' ('substitute ally'), as French diplomacy described us in the inter-war period (dreaming of recreating an anti-German alliance with a powerful Russia and then the USSR, rather than with a medium-sized Poland). In this day and age, with English as the *lingua franca*, this solution could be described from Washington's point of view as a second-best solution. President Joe Biden chose Germany again. This was most likely the reason behind his decision to accept Nord Stream 2 [5]. Biden's official objectives, formulated back during the election campaign, were mutually contradictory and, in fact, one was election rhetoric and only the other was the actual intention. These objectives were to 'counter Russia's aggression' and 'impose real costs on Russia for its violations of international norms' [6] and to 'rebuild good relations with Europe' [7]. US relations with the countries of NATO's eastern flank flourished during President Trump's term, so it was essentially a matter of rebuilding relations with Germany and France, strained severely under the 45th US president. This objective was also clear to Trump's European opponents [8]. It was not possible to simultaneously punish Russia for its aggression by blocking Nord Stream 2 and to deepen relations with Germany, the main European supporter of the pipeline running along the Baltic Sea bed from Vyborg (Viipuri, seized by the Soviets from Finland in 1940) to German Greifswald. Ultimately, it was clear from the outset that the second objective would win and be coated with the rhetoric that 'strengthening transatlantic ties is more important than punishing Russia'. After Trump's experience with German reluctance to raise the military budget and Germany taking from the US the lion's share of the burden and responsibility for the military security of NATO's eastern flank (i.e. Berlin playing the same role Tokyo plays in the Far East), Biden's goals were arguably more concerned with the hopes attached to political rather than military collaboration with Germany. As could be suspected, the US expected two things from Germany:

1) to ensure such a level of peace on the Russian side of Europe that Kremlin-initiated troubles do not pull back US forces and resources on NATO's eastern flank, as Washington prefer to concentrate in the Far East;

2) that Germany, as the leading power of the European Union, should ensure EU solidarity with the US against China.

The strategic objective that drives US foreign policy is to weaken the international position of China, considered in the country on the Potomac as the main threat to US supremacy in the world. In this context, it would be highly preferable to deprive China of its Russian ally. This can be done in two ways. The first of the conceived (and preferred) ways to achieve this was to get Russia to abandon its alliance with the PRC and go over to the US camp, or at least to remain neutral in US-China disputes. This is what all US-Russian 'resets' have served to achieve, regardless of their official name. That assumption was the reason for President George Bush Junior's declaration that he had 'looked into Putin's eyes and got a sense of his soul', [9] the pinnacle of Washington's efforts at rapprochement with Russia under President Obama, symbolised by the pressing of the 'reset' button on mutual relations in 2009 by Hilary Clinton, US Secretary of State, and Sergey Lavrov, Russian Foreign Minister, [10] and Biden's efforts described above. Trump's efforts were relatively least profound in this respect, but he, too, tried to 'cut a deal' with Moscow in Helsinki, without any tangible result [11]. The price of the US-Russian agreement that the United States are dreaming of would inevitably have to be the recognition of Russia's sphere of influence in Central and Eastern Europe, obviously covering Ukraine, and the marginalisation of NATO's eastern flank, i.e. Poland, the Baltic states and Romania, as the most active supporters of taking a hard line on Moscow. Russia, in fact, specified its demands in this regard in the texts of the proposed US-Russian security agreement, published on 17 December 2021, demanding nothing less than the abandonment of the 'open door' policy to NATO for any post-Soviet state, including Ukraine, and the withdrawal of installations and troops of the 'old' Alliance states from the territory of those Alliance members that joined after 27 May 1997 [12].

The second way to deprive Beijing of Moscow's support is to weaken Russia in such a way that it no longer counts as an ally of the PRC. Indeed, all signs indicate that prior to 24 February 2022, this scenario had not been seriously taken into account in Washington. The former, calculated to 'bribe' Moscow rather than defeat it, was more popular. Putin, however, consistently rejected all US offers, taking them as signs of weakness and willingness to back down under Russian pressure. Even at the time of the Russian strike on Kiev, the US was effectively condoning Moscow's victory and subsequent search for a *modus vivendi* with the victorious Kremlin by offering President Zelenskiy assistance in leaving the country [13]. The courageous

decision of the Ukrainian President and the heroic and, most importantly, effective resistance of the Ukrainian Armed Forces and the Ukrainian people, changed the US calculation. Depriving China of its Russian ally by beating Russia with the hands of Ukrainian soldiers became the preferred scenario at the beginning of March. This is because Washington understands that, if necessary, it cannot afford to fight simultaneous wars with Russia and China [14]. The strategy of weakening Russia by supporting Ukraine has since been pursued (although not without hesitation or anti-escalation restraint [15]) with the full support of NATO's eastern flank (with Poland taking a leading role) extended to include Finland and Sweden and declaring unwavering military solidarity against Russia with both Scandinavian states, should they be attacked even while they were still in the accession process and before they formally joined the Alliance [16]. A similar political line of strong support for Ukraine was also adopted by the UK (even quicker than by the US) [17], which was looking for a new role in Europe after Brexit and had its own tensions with Moscow, and by Canada, which was strongly motivated by domestic politics – Canadians of Ukrainian origin are the third largest ethnic group in this country and each government has to reckon with their electoral reactions.

Germany has failed in both of the above priority directions of US policy: neither has it ensured peace from Russia, nor EU's solidarity with the US towards China. Quite the contrary, at the moment of the power transit crisis in Washington, i.e. when Biden was taking over the office from Trump, the German EU presidency took advantage of the brief political paralysis in the US and successfully pushed for an agreement between the European Union and China [18]. The only EU member state protesting against this agreement in the name of solidarity with the United States was Poland [19], which was 'rewarded' with the American approval of Nord Stream 2, which was Germany's 'punishment'. The consequence was that Minister Zbigniew Rau made an ostentatious visit to China [20]. The United States did not learn from the whole situation and, until the autumn of 2021, pursued a policy aimed at politically appeasing Russia together with Germany. The policy involved:

- the earlier decision to extend the New Start Strategic Nuclear Weapons Reduction Treaty on Russian terms [21],
- the above-mentioned withdrawal of sanctions on NordStream2,
- a Biden-Putin meeting involving a disregard for the standpoint of NATO's eastern flank states [22] and Ukraine [23], but with Putin's offer to establish any US-Russian 'cooperation' that could be used to demonstrate a warming of mutual relations (Biden offered Putin cooperation on nuclear arms control, cyber security, and human rights, while Putin's proposal for Biden concerned cooperation on politically correct climate, anti-terrorism and anti-COVID issues [24]).

During the same period, Germany and France sent the Kremlin similar signals of willingness to reach a compromise, i.e.: Borrel's visit to Moscow [25], the attempt to invite Putin to the EU summit in June 2021 [26] (only blocked due to objections from Poland, the Baltic States, Scandinavia, Romania and the Netherlands [27]), Berlin and Paris' condemnation of Ukraine's use of a Turkish drone to smother the firing of Russian howitzers [28]. Combined with the reputational US fiasco in Afghanistan and Biden's gaffe, referring to Russia's minor incursions into Ukraine as a reason for weaker responses [29], this string of signals of weakness sent by the West (US and EU) throughout 2021 must have been unequivocally interpreted in Moscow as consent to invade and was instrumental in the decision to do so.

The growing threat of a massive Russian invasion of Ukraine prompted a change in US policy from autumn 2021 onwards [30], and the Kremlin's large-scale aggression launched with the intention of conquering that country was its turning point. While hopes of installing Germany as the leading regional ally in Europe have not yet been completely abandoned in Washington, there has been a clear shift towards Poland, especially after 24 February 2022 [31].

The implication of the above outlined meanderings of US policy in terms of Poland's security does not negate the initial argument about the irreplaceability of the United States in the role of the main external source of potential necessary to ensure Poland's security against the Russian threat. It does, however, necessitate supplementing it with a conclusion about the volatility of US policy priorities towards Russia. The evolution described above took a negative turn for Poland in 2021 and a positive one in 2022. Both of these turns, however, have actually occurred, and either of them could recur in the event of any change in conditions beyond Polish control, such as the emergence of a challenge to US interests in another sensitive region of the world (the Middle or Far East), drawing US resources away from Europe, or the electoral victory of neo-isolationist forces in the United States (their existence having been demonstrated recently by Trump's statements after the Przewodowo missile incident, which were clearly contrary to Polish interests). The latter does not seem very likely at present but cannot be ruled out in the long term, all the more so as the worrying signs are not limited to the US president's speech alone. In other words, the US is the most important pillar of stability in Europe but as it is not itself a European state, it may not necessarily always want to be one. Poland is therefore operating under a system of US military protection over Europe with an unknown time horizon. It may exist for two more years, or ten, or forty, or perhaps a hundred – we do not know. However, this is the time given to Poland to build a regional security system strong enough to survive on its own or with only limited American and British support, in the face of the Russian threat. Ukraine is a key partner for building such a system.

Its territory is larger than France and the population is approx. 40 million. The large scale of economic emigration in recent years, and now also more than 7 million war refugees and possible further migration waves, make it very difficult to assess the actual number of people living in

Ukraine today. Despite this, the country's demographic potential ranks it among countries the size of Poland. There is no larger state threatened by Russia in our region. The battle-experienced – and, as recent months have shown, undaunted – the Ukrainian army makes the country Poland's most important ally in the event of a possible clash with Russia. It would also be an ally that, in its most basic existential interest, would have to intervene alongside Poland in the event that it was invaded by Russia. A Russian invasion of Poland without first conquering Ukraine is, moreover, a highly unlikely scenario. The potential of the other countries in a similar position (the Baltic states) is much smaller or the level of threat is significantly different, and therefore they are not compelled to fight if Poland is threatened (the Scandinavian countries). Naturally, there are, or are currently being created, legal obligations for joint defence as a result of the membership of Denmark, Norway and the Baltic States in the North Atlantic Alliance and the accession of Finland and Sweden, which is an important factor. However, this does not diminish the fundamental role and potential of Ukraine from the Polish point of view.

The large-scale Russian invasion of Ukraine and the criminal manner in which it was carried out made us aware of the magnitude and nature of the challenges ahead for Poland in terms of military security. The security system for NATO's eastern flank, developed in 2015–2016 and implemented in its essential framework to date, is based on the principle of forward presence and deterrence by punishment. At its core is the deployment of small inter-allied contingents, including troops from leading NATO powers, in areas vulnerable to potential enemy invasion. The political burden of the decision to strike the troops of all the states deployed in the area thus guarded would then be shifted to the invader. The factor of uncertainty as to whether the allies, in the exercise of their treaty obligations, would send their troops if the country thus defended was attacked, would be removed from the invader's calculations. Any speculation about their arrival misses the point if the troops are already there. Since they are, the invader must give its invading troops such combat tasks that take this fact into account, and, therefore, enter into armed conflict not only with the invaded country but also with all NATO countries whose contingents are in the territory under attack. This makes the Alliance more automatic and raises the risk of retaliation from the attacked states, including the superpowers. This model of deterrence was already applied during the Cold War to the West's 'island' in the Soviet 'sea', i.e. West Berlin surrounded by the GDR saturated with East German and Soviet troops. It was not the military might of the American, British and French garrisons stationed in the western districts of Berlin that protected the city from Soviet occupation, but the fact that opening fire on American, British and French soldiers would have been a political decision carrying a different risk than opening fire on the West Berlin police – it would have been the outbreak of a world war. This is why the Soviets never made such a decision. This system was adequate before 24 February 2022. However, the experience of the war in Ukraine indicates that the system should be modified so that it is replaced by a system of deterrence by blocking the possibility of conquering the defended territory. This should be done by deploying a massed military force that would prevent occupation by military means rather than political deterrence. It is therefore a matter of turning forward presence into forward defence and deterrence by punishment into deterrence by denial.

The North Atlantic Alliance, in line with the demands of Poland, the Baltic states and Romania at the Madrid summit this summer, has decided to further militarily strengthen the frontline countries of NATO's eastern flank. However, there has not been a decisive shift from deterrence by forward presence to deterrence based on the principle of forward defence [32]. Polish diplomacy still has to tackle this challenge. The Ukrainian experience is instrumental in justifying this demand. The mass killings committed by Russia on the civilian population of the occupied lands [33] prove that the operational objective of the military defence of Poland must be to prevent the occupation of any part of its territory. Indeed, its temporary loss and subsequent possible recapture on the basis of deterrence by punishment of the aggressor may result in the 'liberation' of mass graves of our murdered fellow citizens, a scenario that we cannot accept under any circumstances.

Attracting the military potential of the United States (and NATO more broadly) and deepening regional cooperation on the eastern flank of the North Atlantic Alliance for joint defence against the Russian threat are therefore the main tasks of Polish foreign policy. Poland and the Baltic states are now at the core of this cooperation, and the key to success is building a joint defence structure with Ukraine. The presence of other countries from the region in this platform, with particular emphasis on Sweden, Finland, and Romania, would be very welcome, and support from the Czech Republic and Slovakia (given their pro-Ukrainian policies in the context of the Russian invasion) highly likely. Hungary remains the gap in this design. This is a separate challenge in the eastern direction due to the incompatibility between Hungarian and Polish policies towards Russia and Ukraine, while at the same time maintaining an alliance between Warsaw and Budapest in their game against the political mainstream of the European Union.

Poland's relations with the core of the European Union are naturally a separate major challenge for Polish foreign policy AD 2023. This challenge, by contrast, is not military but political in nature and would require a separate, extensive analysis [34]. At this point, let us narrow the focus to two basic statements: As indicated above, the European Union does not count as a military force capable of securing Poland against Russia, while the economic sanctions imposed on Moscow by Brussels are an important, albeit far from perfect (saturated with many relaxing exemptions, even if some of them are integrated into subsequent restriction packages over time [35]) instrument for reducing Russia's capacity for aggression.

Conclusions

The Russian challenge that Poland is confronted with yet again presents Poland's foreign policy with three fundamental tasks in the search for additional sources of strength. The first one is to persistently convince the Americans that only weakening Russia as much as possible by rearming the Ukrainian army and defeating the Russians on the battlefield, rather than reaching a compromise with Moscow at the expense of Ukraine or Central Europe more broadly, is the only realistic way to deprive China of its Russian ally.

The second one is to build strong political ties with Ukraine, which would become the axis of a Central European alliance of nations threatened by Russia. Such an alliance should be established either through Ukraine's accession to NATO (which is the optimal solution) or through alliance treaties between the interested countries in our region (from Scandinavia to Romania) with much-needed US-British support.

The third task is to change the system of military deterrence and defence on NATO's eastern flank to replace forward presence with forward defence. Our own military resources are crucial in this regard, both because of their obvious value in increasing Poland's defence capabilities and because they increase our attractiveness as an ally in the region, not to mention serving as a magnet for the United States to promote Poland to the position of the leading US regional ally in Europe (the only one on NATO's eastern flank), which is able and willing to shoulder a significant part of the burden of common security and take it off the shoulders of American electorate.

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ANALYSIS OF BLADDER INJURIES USING THE AAST SCALE IN THE MATERIAL OF THE DEPARTMENT OF UROLOGY OF THE CENTRAL CLINICAL HOSPITAL OF THE MINISTRY OF NATIONAL DEFENSE, MILITARY INSTITUTE OF MEDICINE IN 2018–2022

Analiza urazów pęcherza moczowego z zastosowaniem skali AAST w materiale Kliniki Urologii CSK MON WIM w latach 2018–2022

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Abstract:

Introduction and objective – Bladder injuries account for 3% of all pelvic injuries. They rarely require urgent surgical intervention. The aim of the study was to analyse bladder injuries with an attempt to use the AAST scale to assess their severity.

Results – 21 patients with bladder trauma were hospitalized at the Central Clinical Hospital of the Ministry of National Defense Military Institute of Medicine (CSK MON WIM) between 2018 and 2022. Extraperitoneal bladder trauma was found in 18 (86%) of them, including 3 patients with additional urethral trauma. Intraperitoneal trauma was diagnosed in 3 (14%) patients. A I level injury was confirmed in 9 patients (43%), II level – 5 patients (24%), III level – 2 patients (10%), IV level – 1 patient (5%), and V level – 4 patients (19%).

Bladder injuries were most often a result of a traffic accident (18 patients (86%), a small percentage of them were suicide attempts – 2 patients (10%) or being crushed by a heavy object – 1 patient (5%). Intraperitoneal bladder damage was confirmed in 3 patients (14%), who were qualified for immediate surgical treatment. Extraperitoneal injuries were reported in 18 patients (86%). These injuries were usually treated conventionally by keeping the intrabladder catheter for 14–21 days and did not require surgical intervention. Patients with level III, IV or V injuries required urgent laparotomy with suturing of the bladder utilizing absorbable sutures. In four patients (19%) with level V bladder injuries, accompanying urethral or ureteral trauma were confirmed.

Conclusions – In the assessment of bladder injuries, the AAST scale is effective and has a practical application. Determining the degree of bladder damage allows to optimize effectiveness of the patient's therapy. Performing a CT scan (TraumaScan) is the golden standard in the determination of the degree of an injury, often accompanied by urethrocystography.

Key words: urinary bladder, injuries, AAST scale, management.

Streszczenie:

Wprowadzenie i cel – Urazy pęcherza moczowego stanowią 3% wszystkich urazów miednicy. Rzadko wymagają pilnej interwencji chirurgicznej. Celem pracy była analiza urazów pęcherza moczowego z próbą wykorzystania skali AAST(5-stopniowa skala Amerykańskiego Towarzystwa Chirurgii Urazowej) w ocenie ich ciężkości.

Materiał i metody – W latach 2018–2022 w CSK MON WIM hospitalizowano 21 pacjentów z urazem pęcherza moczowego. U 18 (86%) z nich stwierdzono zewnątrzotrzewnowy uraz pęcherza moczowego, z czego u 3 osób – towarzyszący uraz cewki moczowej. Uraz wewnątrzotrzewnowy stwierdzono u 3 (14%) osób. I stopień uszkodzenia potwierdzono u 9 pacjentów (43%), II – u 5 osób (24%), III – u 2 osób (10%), IV – u 1 osoby (5%), natomiast u 4 osób (19%) – V stopień. Wyniki – Najczęściej urazy pęcherza moczowego były wynikiem wypadku komunikacyjnego (18 osób – 86%), niewielki odsetek stanowiła próba samobójcza (2 osoby – 10%), czy przygniecenie ciężkim przedmiotem (1 osoba – 5%). Wewnątrzotrzewnowe uszkodzenie pęcherza moczowego stwierdzono u 3 pacjentów (14%), którzy zostali zakwalifikowani do natychmiastowego leczenia operacyjnego. Urazy zewnątrzotrzewnowe dotyczyły 18 pacjentów (86%). Uszkodzenia te zazwyczaj były leczone zachowawczo poprzez utrzymanie cewnika wewnątrzpęcherzowego przez 14-21 dni i nie wymagały interwencji zabiegowej. Pacjenci z obrażeniami w stopniach III, IV i V wymagali pilnej laparotomii z szyciem pęcherza moczowego przy wykorzystaniu szwów wchłanialnych. U 4 pacjentów (19%) w stopniu V potwierdzono urazy pęcherza moczowego z towarzyszącym urazem cewki moczowej i moczowodu.

Wnioski – W ocenie urazów pęcherza moczowego skala AAST jest skuteczna i ma praktyczne zastosowanie. Określenie stopnia uszkodzenia pęcherza moczowego pozwala zoptymalizować efektywną terapię pacjenta. W diagnostyce stopnia urazu złotym standardem jest wykonanie tomografii komputerowej TraumaScan, często uzupełnionej o uretrocystografię.

Słowa kluczowe: pęcherz moczowy, urazy, skala AAST, postępowanie.

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Introduction

Bladder injuries account for 3% of all pelvic injuries. They rarely require urgent surgical intervention. Based on their location, they are divided into intraperitoneal and extraperitoneal injuries [1-3]. This is extremely important as it determines the subsequent course of action. The most common causes of blunt trauma to the bladder are traffic accidents, an impact in the lower abdomen, and crushing [2-3]. Penetrating trauma is rare, and occurs mainly in armed conflict zones [2-5]. Iatrogenic injuries most commonly accompany gynaecological, obstetric, urological or surgical procedures [6]. Malignancies, inflammation, and a history of surgery are the main risk factors [6]. Extraperitoneal injuries are almost always associated with pelvic bone fractures and pubic symphysis diastasis [1, 7]. Intraperitoneal injuries most commonly occur as a result of a blow to the lower abdomen and a sudden pressure increase in the filled bladder. The rupture appears mainly in the bladder dome area, which is its weakest point.

Symptoms of bladder injury include lower abdominal pain, haematuria, bloody discharge at the external urethral orifice, haematomas and bruising in the subcutaneous tissue of the perineal area, difficulty urinating, and fever [3, 7].

The diagnosis of bladder trauma is mainly based on a properly taken history, physical examination, and a combination of laboratory and imaging tests. The degree of bladder injury should be assessed using the American Association Surgery of Trauma (AAST) scale before appropriate treatment is implemented [8]. This helps determine the severity of the injury, which has a significant impact on the choice of appropriate treatment. For patients with symptoms of post-traumatic shock, the priority is to stabilise the patient's general haemodynamic condition [9]. Intraperitoneal bladder injuries require immediate surgical intervention and suturing of the injury site, which can be performed simultaneously with other specialist teams [6, 9, 10].

Aim of the study

Analysis of bladder injuries using the AAST scale in the material of the Department of Urology of the CSK MON WIM in 2018–2022.

Material and methods

Twenty-one patients with bladder trauma were hospitalized at the CSK MON WIM between 2018–2022. Extraperitoneal bladder trauma was found in 18 (86%) of them, including 3 patients with additional urethral trauma. Intraperitoneal trauma was diagnosed in 3 (14%) patients. The majority of the study group was female, with 12 patients (57%) in the 18-60 age range. The minority of the study group was male, with 9 patients (43%) in the 22-83 age range. Most of the patients were involved in traffic accidents – 18 patients (86%). A small percentage were those with suicidal disorders – 2 patients (10%) or crushed by a heavy object – 1 patient (5%).

The diagnosis of bladder injuries began with a thorough patient history (if possible) and physical examination. Basic laboratory tests were performed. Injury assessment was carried out using TraumaScan. In cases of diagnostic doubt (urinary bladder described as shrunken on Foley catheter balloon), the diagnosis was expanded to include contrast X-ray urethrocystography.

The severity of the bladder injury was assessed using the AAST scale. A I level injury was confirmed in 9 patients (43%), II level – 5 patients (24%), III level – 2 patients (10%), IV level – 1 patient (5%), and V level – 4 patients (19%).

Table. Characteristics of bladder injuries with AAST grading of injury severity.
tabela. Charakterystyka urazów pęcherza moczowego wraz z oceną ciężkości urazu według skali AAST.

AAST	Number	Injury type	
		Extraperitoneal	Intraperitoneal
1	9 (43%)	9	–
2	5 (24%)	5	–
3	2 (10%)	1	1
4	1 (5%)	–	1
5	4 (19%)	3	1

Results

The AAST scale helped to classify the severity of bladder injuries, along with the type of injury, as shown in Table 1 [8].

Among 21 patients with bladder injury hospitalised at CSK MON WIM between 2018 and 2022, the most common cause of bladder injury was a traffic accident (18 patients – 86%); a small percentage were caused by suicide attempts (2 patients – 10%) or being crushed by a heavy object (1 patient – 5%). No direct correlation was found between the cause and the extent of the injury.

Intraperitoneal bladder damage was found in three patients (14%), who required immediate laparotomy and double-layer bladder suturing. In one patient in the group, a ureteral injury had to be additionally managed.

Figure 1. TraumaScan of a 45-year-old female patient with intraperitoneal bladder injury (AAST grade 3).

Extraperitoneal injuries were reported in 18 patients (86%). These injuries were usually treated conventionally by keeping the intrabladder catheter for 14–21 days and did not require surgical intervention.

AAST grade 1 bladder injury was confirmed in nine patients (43%). During the diagnostic imaging, bladder wall rupture was ruled out and small intramural haematomas were found. Focal hypodense lesions and evidence of active extravasation of the contrast medium outside the bladder wall were observed during urethrocystography in five patients (24%) of AAST grade 2. The patients required conservative treatment by keeping the catheter for a minimum of 14 days.

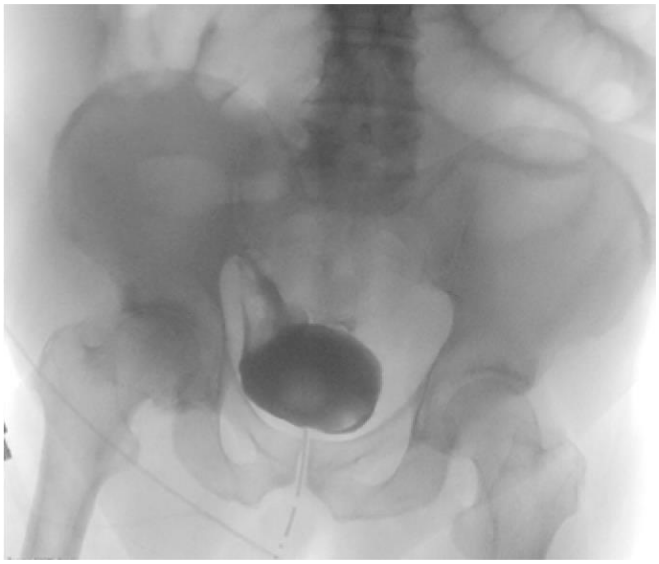

Figure 2. Contrast X-ray urethrocystography of a 55-year-old male patient with intraperitoneal bladder injury (AAST grade 4).

Seven patients (34%) with confirmed AAST grades 3, 4 and 5 bladder damage were treated surgically. During the diagnostic process, damage to the bladder wall, AAST grade 3, was observed in 2 patients (10%) (Fig. 1). One patient (5%) was confirmed to have a 20 mm (AAST grade 4) tear of the upper-lateral bladder wall (Fig. 2). Patients with III, IV and V degree injuries required urgent laparotomy with double-layer suturing of the bladder using absorbable sutures. Injury to the bladder and other organs (urethra and ureter) was confirmed in four grade V patients (19%) with multi-organ trauma. In one case, there was a complete separation of the urethra from the bladder neck (Fig. 3).

Figure 3. Cystography of a 58-year-old female patient with extraperitoneal bladder and urethral injury. A complete separation of the urethra from the bladder neck and bony fragments wedged in the bladder wall (AAST grade V) were found intraoperatively.

Three patients with multi-organ injury (AAST grade I, II and V) after a traffic accident and a suicide attempt could not be stabilised haemodynamically and died within a few hours after the accident (14%).

Discussion

The presented group of patients showed characteristic symptoms of bladder injuries, although not all required immediate surgical intervention. The occurrence of alarming clinical signs, such as bruising in the lower abdominal and perineal areas and haematuria, may involve both extra- and intraperitoneal bladder damage [3, 7].

Assessing the severity of bladder injury using the AAST scale proved helpful in implementing appropriate treatment for patients [8].

The standard assessment of bladder injuries involved a contrast CT scan covering the abdomen and pelvis (TraumaScan). Urethrocystography was performed in cases where: the presence of blood was detected in the retropubic space, other symptoms suggestive of bladder trauma were found or there were diagnostic doubts [9, 11, 12].

Conservative treatment is common in extraperitoneal, uncomplicated bladder injuries [9]. It includes observation of the patient, leaving the catheter in place and prophylactic antibiotic therapy [13]. Bladder drainage is used primarily to prevent an increase in intravesical pressure, which facilitates recovery and accelerates healing [6].

Each patient with intraperitoneal bladder injury required surgical intervention by double-layer suturing of the damaged wall using absorbable sutures [6, 10]. The most common complications of urine extravasation into the peritoneal cavity include inflammation of the peritoneum and subsequent septicaemia, which can lead to the death of the patient [15].

Conclusions

In the assessment of bladder injuries, the AAST scale is effective and has a practical application. Determining the degree of bladder damage allows to optimize effectiveness of the patient's therapy. Performing a CT scan (TraumaScan) is the golden standard in the determination of the degree of an injury, often accompanied by urethrocystography. Generally the injuries are treated conventionally by keeping the intrabladder catheter for 14-21 days. They rarely require urgent surgical intervention.

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DIAGNOSIS AND TREATMENT OF EMERGENCY URETHRAL TRAUMA – OWN MATERIAL STUDY

Diagnostyka i leczenie nagłych urazów cewki moczowej – w materiale własnym

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Abstract:

Introduction and objective – Urethral injuries are a rare injury accounting for less than 1% of all injuries. While most urethral injuries are iatrogenic, urethral injuries associated with multi-organ trauma are also common.

Material and methods – This is a retrospective study of 18 patients with a diagnosis of urethral injury. The following factors were analysed: the mechanism of the injury and the presence of multi-organ trauma, the section of the urethra in which the injury occurred, the extent of the urethral injury and the method of its supply, patient's sex and age. The method of diagnosing urethral trauma was retrograde urethrography or urethrocystoscopy.

Results – In the study group, urethral trauma was found in people aged 20 to 62 years, with a mean age of 41.7 years. The urethra was injured in 10 cases with multi-organ trauma, the mortality rate in this group was 10%. In 7 cases the posterior urethra was damaged, in 2 cases the anterior urethra was injured and in 2 cases the urethra injury concerned women. In 17 cases partial urethral trauma was found and in one a complete urethral rupture. In 15 cases, the urethra injury was treated with a bladder catheter, and in 2 cases a suprapubic cystostomy was performed. In 1 case, the urethra was sutured with single absorbable sutures during a multidisciplinary repair surgery for multiple organ trauma.

Conclusions – Urethral injury is a serious but rare injury. It may occur in patients involved in traffic accidents and those undergoing urethral instrumentation. Due to anatomical conditions, more than 90% of urethral injuries affect men. Early diagnosis and treatment can reduce the risk of complications, such as urethral stricture, erectile dysfunction or urinary incontinence.
Key words: urethra, urethral injury, management.

Streszczenie:

Wprowadzenie i cel – Uszkodzenia cewki moczowej są stosunkowo rzadkim urazem, bo stanowią mniej niż 1% wszystkich urazów. Większość urazów cewki moczowej ma charakter jatrogenny, innymi często spotykanymi są urazy cewki towarzyszące urazom wielonarządowym.

Materiał i metody – Badania dokonano poddając analizie retrospektywnej przypadki 18 pacjentów z urazem cewki moczowej. Przeanalizowano: mechanizm urazu oraz obecność urazu wielonarządowego, odcinek cewki, w którym doszło do urazu, rozległość urazu cewki moczowej oraz sposób jego zaopatrzenia, płeć i wiek pacjentów. Metodą rozpoznania urazu cewki moczowej była uretrografia wsteczna lub uretrocystoskopia.

Wyniki – W badanej grupie uraz cewki stwierdzono u osób w wieku od 20 do 62 lat, a średnia wieku wynosiła 41,7 lat. U 10 pacjentów z urazem wielonarządowym stwierdzono uszkodzenie cewki moczowej. Śmiertelność w tej grupie wynosiła 10%. W 7 przypadkach doszło do uszkodzenia cewki tylnej, w 2 do uszkodzenia cewki wiszącej, a w 2 doszło do urazu cewki u kobiet. W 17 przypadkach stwierdzono uraz częściowy cewki, a w jednym całkowite przerwanie ciągłości cewki moczowej. W 15 przypadkach uraz cewki moczowej zaopatrzono cewnikiem pęcherzowym, w 2 wytworzono cystostomię nadłonową. W jednym przypadku cewkę moczową zeszyto szwami pojedynczymi, wchłanialnymi, podczas multidyscyplinarnej operacji naprawczej urazu wielonarządowego.

Wnioski – Uszkodzenie cewki moczowej jest poważnym, ale rzadkim urazem. Może on wystąpić głównie u pacjentów uczestniczących w wypadkach komunikacyjnych oraz poddanych instrumentacji cewki moczowej. Z uwagi na warunki anatomiczne w ponad 90% uraz cewki moczowej dotyczy mężczyzn. Wczesne rozpoznanie i leczenie pozwala zmniejszyć ryzyko wystąpienia powikłań, takich jak zwężenie cewki moczowej, zaburzenie erekcji lub nietrzymanie moczu.
Słowa kluczowe: cewka moczowa, uraz cewki moczowej, postępowanie.

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INTRODUCTION

Urethral injuries are a rare injury accounting for less than 1% of all injuries. The majority of urethral injuries are iatrogenic, while other common injuries include those caused by high-energy mechanisms, which result in multi-organ injuries and have a high mortality rate. The extent and anatomical location of the injury are important in determining the treatment plan [1].

MATERIAL AND METHODS

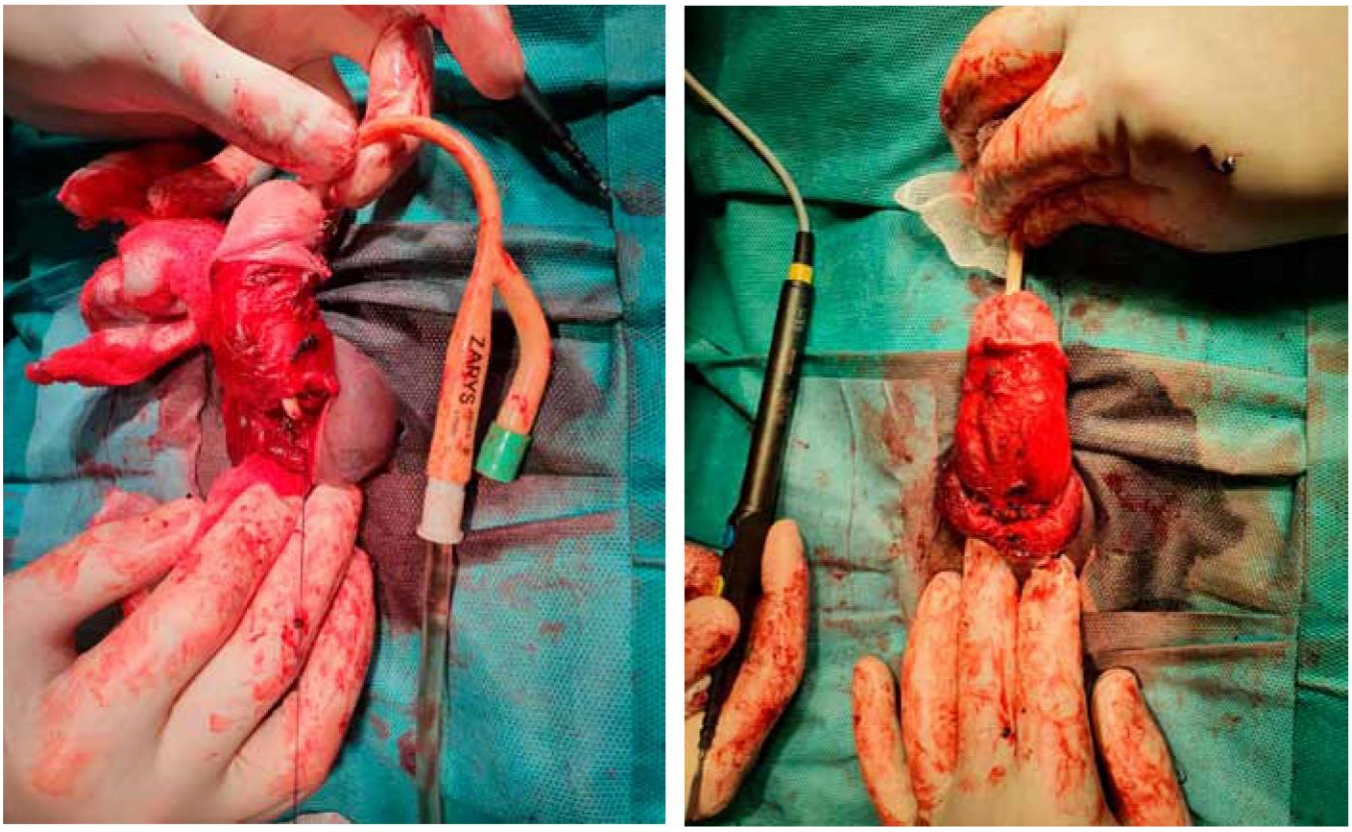
This is a retrospective study of 18 patients with a diagnosis of urethral injury. The patients were hospitalised from January 2018 to May 2022 at CSM MON WIM – 13 patients, and at the District Hospital in Kozienice – 5 patients.

There were 16 cases of urethral injury in men and two cases in women.

The following factors were analysed: the mechanism of the injury and the presence of multi-organ trauma, the section of the urethra in which the injury occurred, the extent of the urethral injury and the method of its supply, patient's sex and age.
The method of diagnosing urethral trauma was retrograde urethrography (RUG) or urethrocystoscopy. A whole-body CT scan using the trauma scan protocol was performed on every patient with suspected multi-organ trauma.

RESULTS

In the study group, urethral trauma was found in people aged 20 to 62, and the mean age was 41.7 years. The urethra was injured in ten patients with multi-organ trauma, the mortality rate in this group was 10%. Seven cases involved posterior urethra damage and two penile urethra damage. In two cases, the urethra injury concerned women. In nine cases, the injury resulted from traffic accidents, of which seven cases involved motorbike drivers. In six cases, the urethra was damaged by the bladder catheter pulled



Figures 1 and 2. Surgical photographs showing the management of a complete urethral rupture in a 27-year-old patient with penile fracture and urethral injury.

out by the patient. In two cases the injury was accompanied by a penile fracture. In one case, the urethral injury was caused by a fall from a height. In 17 cases partial urethral trauma was found, and in one a complete urethral rupture.

In 15 cases, the urethra injury was treated with a bladder catheter, and in two cases a suprapubic cystostomy was performed. In one case the urethra was sutured with single absorbable sutures during a multidisciplinary repair surgery for multiple organ trauma.

MECHANISMS OF URETHRAL INJURY

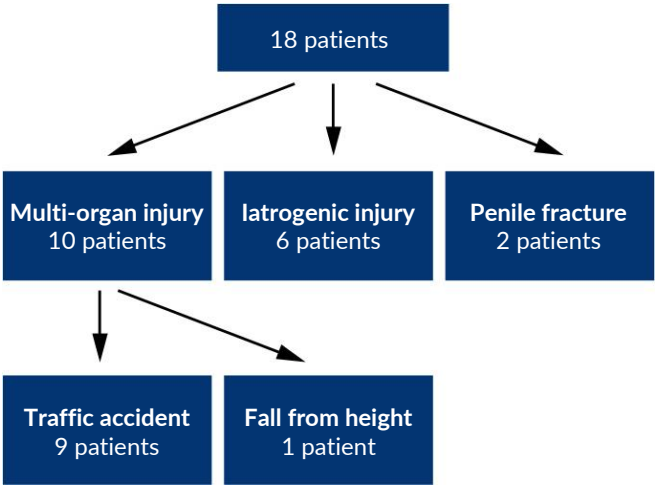


Figure 3. Diagram of the urethral injury mechanism.

DISCUSSION

The male urethra is divided into the anterior and posterior parts by the urogenital diaphragm. The anterior urethra consists of the penile and bulbar urethra, and the posterior urethra of the membranous and prostatic urethra [2]. Anterior urethral injury is more common than posterior urethral injury.

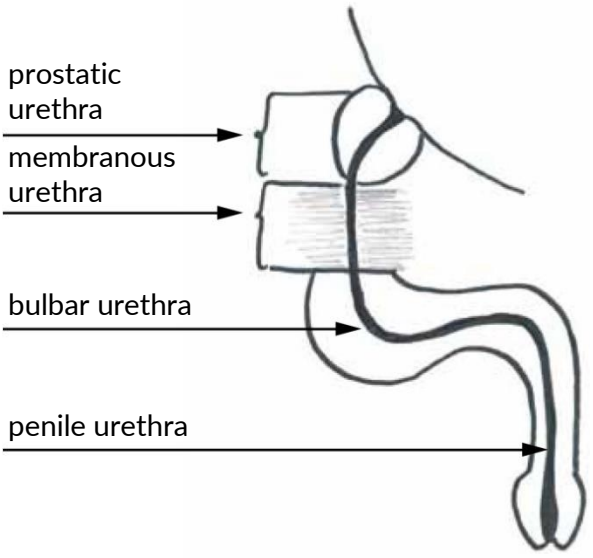


Figure 4. Parts of the male urethra.

The bulbar urethra is the most common site at risk of blunt trauma from compression of the pubic symphysis onto the urethra [3].

According to Falcone et al. 15% of penile fractures are accompanied by urethral trauma [4].

Palminteri et al. reported iatrogenic trauma as the main cause (38.6%) of urethral injury. Systemic trauma was the cause of 10.8% of urethra damage [5]. While in our material, the iatrogenic cause of urethral trauma accounted for 33% of cases, and multi-organ trauma for 56%.

Posterior urethral injury is mostly associated with pelvic bone fractures. The risk of urethral injury increases with the complexity of the fracture. Urethral injuries are divided into partial and complete injuries. Injuries to the prostatic urethra and bladder neck are very rare [6].

Urethral injuries in women is relatively rare. E. Battaloglu et al. found that female urethral injuries represent 6% of all urethral injuries. In our material, they represent 11%, i.e. 2 cases. The reasons for this sex disparity may be the shorter female urethra and the more flexible female urethra and vagina [6].

The most common causes of urethral injuries in women include fractures of the pelvic bones and iatrogenic injuries during treatment of stress urinary incontinence by implantation of a synthetic suburethral sling. Perinatal urethral injuries are very rare [6, 7].

The main sign of urethral injury is blood in the external urethral orifice, but the absence of this symptom does not exclude injury. Complete urethral rupture is accompanied by urinary retention, while haematuria and pain during micturition may be a symptom of partial urethral rupture. Swelling and bruising of the scrotum, labia and/or perineum may be a symptom of urine leak or blood extravasation [8].

Retrograde urethrography (RUG) is the procedure used to assess urethral injury in men, involving the injection of 20–30 mL of contrast medium into the external urethral orifice and radiological assessment of the urethra using an X-ray machine. Retrograde urethrography in women is difficult to perform and interpret due to the short urethra and the swelling of the labia accompanying urethral injury [9].

Another procedure to locate the urethral injury and assess its extent (partial or complete rupture) is flexible urethroscopy. It is the procedure of choice for women and also for men with penile fracture and suspected urethral injury [8].

MRI is a type of scan that allows imaging of urethral injury in patients who have had pelvic trauma. It also facilitates the planning of surgical treatment [7].

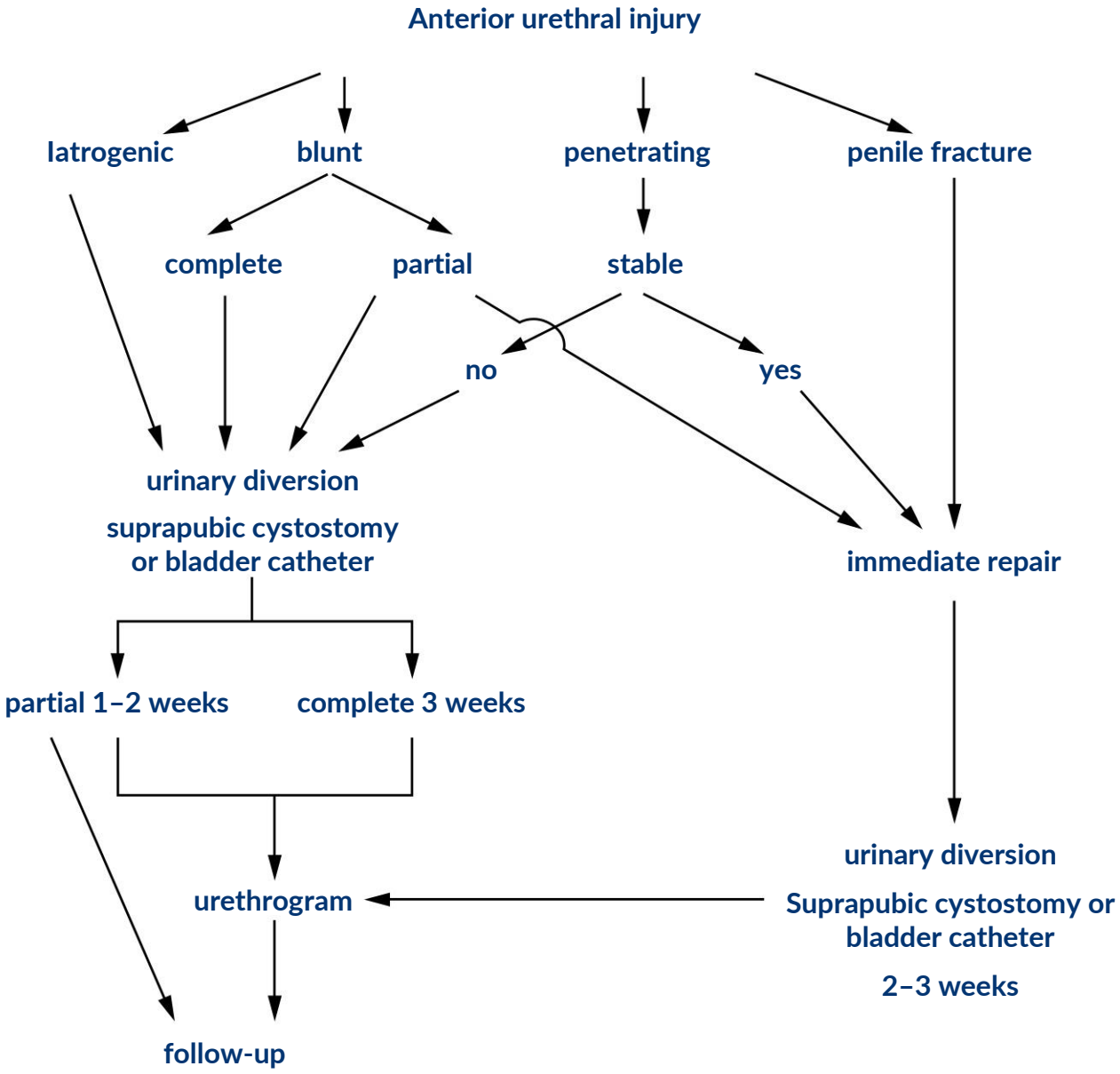


Figure 5. Management of anterior urethral injuries in men Source: EAU Guidelines 2022.

The treatment of urethral trauma depends on the location of the injury and the patient's general condition, sex and associated injuries.

In anterior urethral trauma in ~~a~~ male, immediate urethroplasty is indicated when the injury is accompanied by a penile fracture and any associated additional injuries are not life-threatening. In other situations, suprapubic urinary diversion or endoscopic connection of the damaged urethral segment followed by bladder catheter insertion is recommended. After 2-3 weeks, depending on the extent of the urethral injury, a follow-up retrograde urethrography should be performed and possible extravasation of contrast medium outside the urethra should be assessed [10, 11].

Posterior urethral trauma in men is often accompanied by multi-organ trauma and in many cases the patients are haemodynamically unstable. The recommended treatment is resuscitation and US-guided suprapubic cystostomy [12]. In haemodynamically stable patients with partial urethral injury, the indicated procedure is to attempt transurethral re-connection of the urethral fragments and, if unsuccessful, to create a suprapubic cystostomy. In patients with complete rupture of the posterior urethra at the bladder neck or prostatic urethra, urethroplasty performed up to 48 hours after the injury (i.e. immediate) is required [7].

For patients with complete membranous urethral rupture, an attempt at transurethral re-connection of the urethral fragments is recommended, followed by suprapubic cystostomy if unsuccessful. Urethroplasty is performed 48 hours and up to 6 weeks after the injury, depending on the patient's condition.

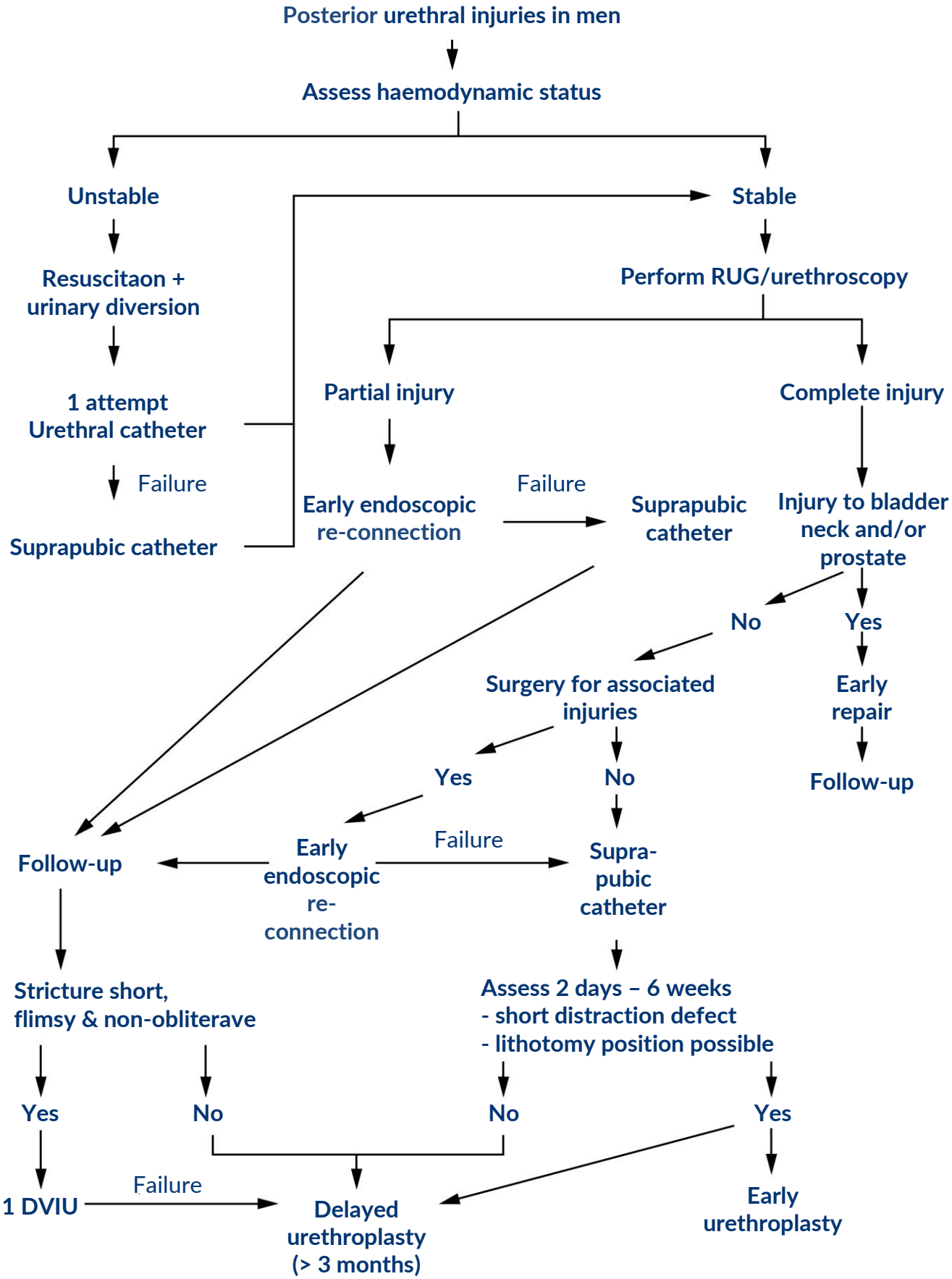


Figure 6. Management of posterior urethral injuries in men
Source: EAU Guidelines 2022.

It is characterised by a lower risk of: urethral stricture, urinary incontinence, onset of erectile dysfunction, and less blood loss compared to immediate surgery [8]. The standard procedure is to perform a delayed urethroplasty 3 months after the injury. At that point, in most cases the pelvic haematoma will have already reabsorbed and it is usually possible to place the patient in the lithotomy position, which allows free access to the posterior urethra [12].

The treatment of urethral injury in women is similar to that of posterior urethral injury in men [7].

CONCLUSIONS

Urethral injury is a serious but rare injury in both male and female patients. It may occur especially in patients involved in traffic accidents and those undergoing urethral instrumentation. Due to anatomical conditions, more than 90% of urethral injuries affect men. Early diagnosis and treatment can reduce the risk of complications such as urethral stricture, erectile dysfunction or urinary incontinence.

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SUPERSELECTIVE EMBOLIZATION OF RENAL VESSELS – THE TREATMENT OF CHOICE IN KIDNEY INJURIES WITH BLEEDING INTO THE URINARY SYSTEM

Superselektywna embolizacja naczyń nerkowych – zabiegiem z wyboru w urazach nerek z krwawieniem do układu moczowego

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Abstract:

Introduction and purpose – Kidney injuries account for 5% of all injuries in patients admitted to hospital and requiring specialist treatment, and most often they affect young men. Kidney injuries can be treated conservatively with organ sparing in the majority of cases. The severity of injury is assessed with the 5-grade American Association for the Surgery of Trauma (AAST) scale. High-risk (grade V) injuries should be treated surgically with organ-sparing surgery. If such treatment is not possible, surgeons may be forced to perform nephrectomy. In grade I-IV injuries with active bleeding, transarterial selective embolization is an alternative allowing organ sparing. This study aims to select a group of patients eligible for transarterial selective embolization, based on the AAST score.

Material and methods – Between 2018 and 2022, a total of 27 patients (external + iatrogenic injuries) were hospitalized at the Department of Urology of the Military Institute of Medicine (CSK MON WIM) - National Research Institute. Their injuries were characterised by health and life-threatening bleeding from the renal parenchyma or renal vessels. The medical intervention applied within the study was transarterial selective embolization (TSE) with tissue adhesives, i.e. Glubran, Histoacryl, Lipidol, and embolization spiral coils or spongostan.

Results – Between 2018 and 2022, 27 endovascular interventions were performed in patients with renal injuries at the Military Institute of Medicine. None of the patients after transarterial selective embolization required urological intervention in the form of nephrectomy. In one case, due to multisite severe bleeding not allowing organ-sparing treatment, renal artery embolization was required. In the remaining patients, the bleeding was successfully stopped.

Conclusions – Transarterial selective embolization is an effective, minimally invasive treatment for high-risk renal injuries.

Key words: AAST scale, selective embolization, kidney injuries.

Streszczenie:

Wprowadzenie i cel – Urazy nerek odpowiadają za 5% wszystkich urazów osób trafiających do szpitala i wymagających zaopatrzenia specjalistycznego i najczęściej dotyczą młodych mężczyzn. Urazy nerek w większości przypadków mogą być leczone zachowawczo z oszczędzeniem narządu. Do oceny ciężkości urazu wykorzystuje się 5-stopniową skalę Amerykańskiego Towarzystwa Chirurgii Urazowej (AAST). Uszkodzenia wysokiego ryzyka (V stopnia) powinny być leczone chirurgicznie poprzez operacje umożliwiające zaoszczędzenie narządu. W przypadku, gdy operacja taka nie jest możliwa, konieczne może być przeprowadzenie nefrektomii. W urazach stopnia I-IV z aktywnym krwawieniem alternatywą umożliwiającą zachowanie narządu jest selektywna embolizacja naczyń nerkowych. Celem pracy było wyselekcjonowanie na podstawie skali AAST grupy pacjentów kwalifikujących się do selektywnej embolizacji naczyń nerkowych.

Materiał i metody – W Klinice Urologii CSK MON WIM-PIB w latach 2018-2022 było hospitalizowanych w sumie 27 pacjentów (urazy zewnętrzne + jatrogenne). Stwierdzone urazy charakteryzowały się istotnym dla zdrowia i życia krwawieniem z miąższu nerki lub naczyń nerkowych. Zastosowana w badaniu interwencja medyczna polegała na wykonaniu selektywnej embolizacji naczyń nerkowych (TSE) przy użyciu klejów tkankowych, tj.: Glubranu, Histoakrylu, Lipidolu oraz spirali embolizacyjnych lub spongostanu.

Wyniki – W latach 2018-2022 w WIM u pacjentów z urazami nerek wykonanych zostało 27 interwencji wewnątrznaczyniowych. Żaden z pacjentów po selektywnej embolizacji naczyń nerkowych nie wymagał interwencji urologicznej w postaci nefrektomii. W jednym przypadku z powodu wielomiejscowego, nasilonego krwawienia konieczna była embolizacja tętnicy nerkowej nie pozwalająca na leczenie organooszczędzające. U pozostałych pacjentów udało się osiągnąć skuteczne zatrzymanie krwawienia.

Wnioski – Wewnątrznaczyniowa embolizacja naczyń nerkowych jest skuteczną, małoinwazyjną metodą leczenia urazów nerek wysokiego ryzyka.

Słowa kluczowe: skala AAST, selektywna embolizacja, urazy nerek.

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Introduction

Kidney injuries account for 5% of all injuries of patients admitted to hospital and requiring specialist treatment, and most often they affect young men [1]. Kidney injuries can be treated conservatively with organ sparing in the majority of cases. Trauma caused by external factors, due to its mechanism of origin, is divided as follows:

- where the integrity of the abdominal walls is not interrupted – blunt trauma,
- where the integrity of the abdominal walls is interrupted – penetrating trauma,
- where both of the above injuries occur – mixed trauma.

Found in 80–90% of all cases, blunt trauma is the most common. Penetrating trauma accounts for only about 10–20%.

Iatrogenic injuries are a specific form of renal trauma. They occur unintentionally during diagnostic and therapeutic medical procedures [2].

The severity of injury is assessed with the 5-grade American Association for the Surgery of Trauma (AAST) scale. This classification enables the selection of an appropriate treatment method in different patient groups and the evaluation of the expected results of management [3]. High-risk (grade V) injuries should be treated surgically with organ-sparing surgery. If such treatment is not possible, surgeons may be forced to perform nephrectomy. In grade I-IV injuries, with active bleeding, arterial embolisation is an organ-sparing alternative [4].

Selective arterial embolisation is a minimally invasive method and has been used since the 20th century. It is used to control bleeding:

- in damage caused during trauma,
- after urological procedures that can be complicated by bleeding (iatrogenic injuries), such as: percutaneous nephrolithotripsy (PCNL) [5] (Fig. 1), percutaneous nephrostomy (PCN) [6] (Fig. 2), nephron sparing surgery (NSS) [7] (Fig. 3), extracorporeal shock wave lithotripsy (ESWL) [8] (Fig. 4), retrograde intrarenal surgery (RIRS) [9] (Fig. 5).

Embolisation is a procedure involving the insertion of material into the lumen of a blood vessel to cause occlusion and local ischaemia of the area supplied by that vessel [10]. In this study, arterial occlusion, from the segmental arteries of the kidney and distally, is defined as superselective.

Aim

The aim of this study was to evaluate the widely used AAST scale and the management resulting from its use. This was the basis for qualifying patients for surgical intervention with minimally invasive, transarterial selective and superselective embolisation based on the European Association of Urology guidelines. The efficacy and safety of the method for the management of life-threatening and health-threatening bleeding after iatrogenic and external renal trauma were evaluated.

Material and methods

At the Department of General, Functional and Oncological Urology at CSK MON WIM, 27 patients with renal injuries were admitted between 2018 and 2022. Their injuries were characterised by health- and life-threatening bleeding from the renal parenchyma or renal vessels. The patients underwent minimally invasive treatment through the use of transarterial selective and superselective embolisation, thanks to the collaboration with the Department of Medical Radiology at CSK MON WIM.

The group of patients included 7 women (25.9%) and 20 men (74.1%) aged 20–84, mean age 55.9.

The cases presented in the study were classified as injuries caused by external factors and iatrogenic injuries from urological interventions such as extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotripsy (PCNL), retrograde intrarenal surgery (RIRS), percutaneous nephrostomy (PCN), and renal sparing surgery (NSS). In the vast majority of cases, both iatrogenic injuries and injuries caused by external factors were isolated kidney injuries. One case involved severe multi-organ trauma with associated damage to one kidney.

In one case bilateral kidney damage also occurred. Due to the similar degree of damage on both sides and the use of an identical procedure, this case was analysed as a single intervention.

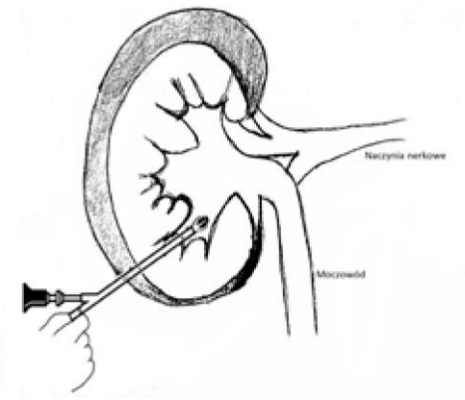

Figure 1. Percutaneous nephrolithotripsy (PCNL).

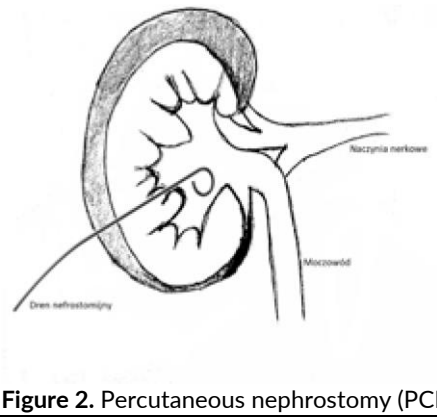

Figure 2. Percutaneous nephrostomy (PCN).

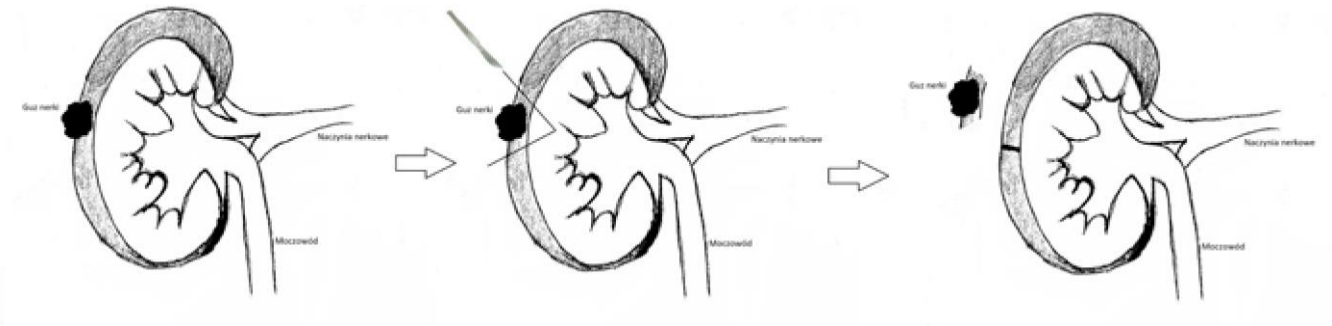

Figure 3. Nephron sparing surgery (NSS).

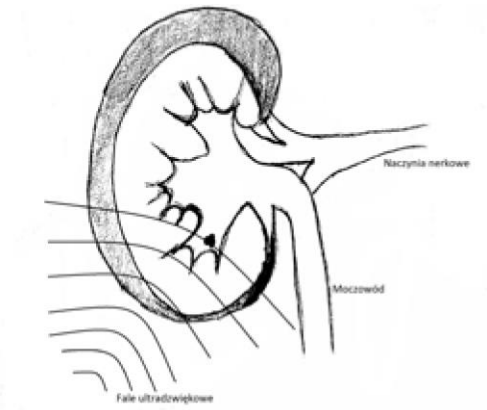

Figure 4. Extracorporeal shock wave lithotripsy (ESWL).

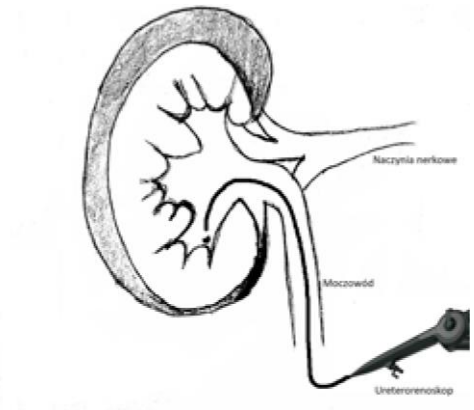

Figure 5. Retrograde intrarenal surgery (RIRS).

Among the 27 patients, iatrogenic damage accounted for 22 (81.5%) cases, of which: 7 (31.8%) were patients of the Department of General, Functional and Oncological Urology at the Military Institute of Medicine and 15 (68.2%) patients were from other urology centres.

The remaining 5 patients (18.5%) presented with external (non-iatrogenic) kidney injuries, i.e. 1 case (20%) – stab wound, 2 cases (40%) – falls from a height and 2 cases (40%) – traffic accidents, of which 1 was multi-organ.

As for iatrogenic injuries, renal trauma was most commonly caused by NSS surgery – 9 cases (40.9%), PCNL – 4 cases (18.2%), PCN – 4 cases (18.2%), RIRS – 2 cases (9.1%), ESWL – 1 case (4.5%), renal biopsy – 1 case (4.5%) and a complication of laparoscopic renal cyst fenestration surgery – 1 case (4.5%) (Fig. 6).

Patients eligible for endovascular intervention in the study presented: 1 patient (3.7%) – grade III injury, 22 patients (81.5%) – grade IV injury, 3 patients (11.1%) – grade V injury, while in one (3.7%) case it was not possible to see and classify the injury site (Fig. 7).

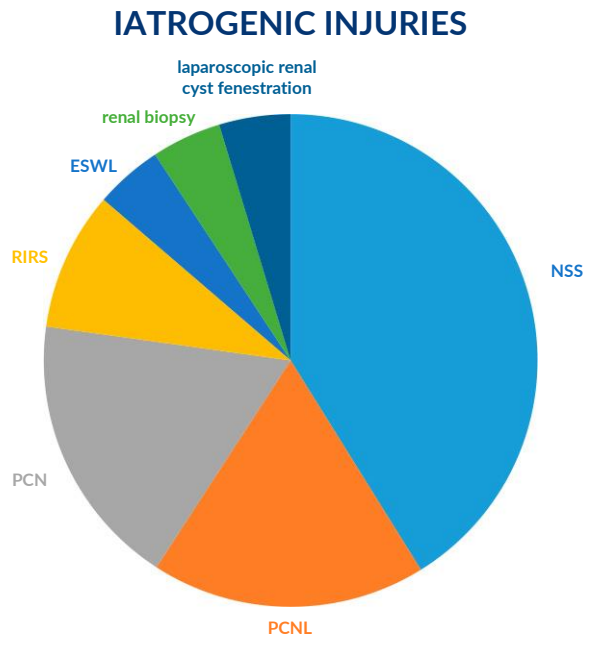

Figure 6. Division of iatrogenic injuries by aetiology.

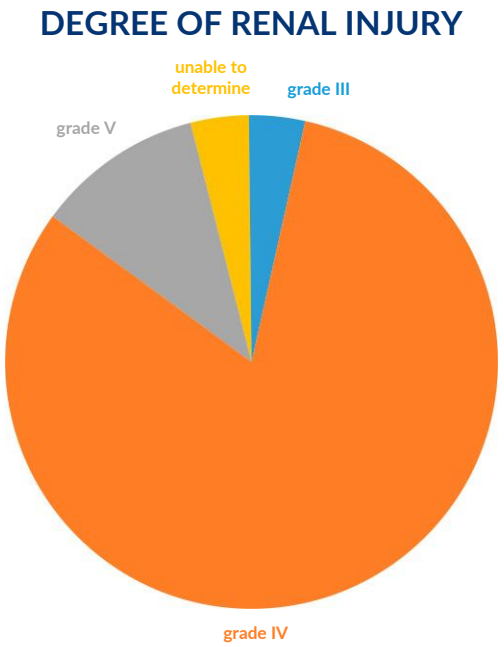

Figure 7. Division of renal injuries based on the AAST scale.

In addition to injuries to the renal vessels and renal parenchyma, pseudoaneurysms were also found in 11 cases (40.7%), mainly in the iatrogenic injury cases. Arteriovenous fistulas were found in three cases (11.1%).

The degree of renal damage was classified in accordance with the AAST scale based on imaging findings from 64-slice computed tomography and intraoperative endovascular renal aortography.

The medical intervention applied within the research was transarterial superselective embolisation (TSE) with tissue adhesives, i.e. Glubran, Histoacryl, Lipidol, and embolization spiral coils or spongostan. Such a procedure allows precise stopping of bleeding from the site of injury with possible sparing of the functional parenchyma of the remaining kidney. If transarterial superselective treatment fails, the endovascular method also enables the embolisation of the renal artery (or arteries), resulting in exclusion of the organ from the bloodstream. The need for treatment with blood products during hospitalisation was also analysed.

The data were collected during a retrospective database analysis of patients hospitalised in the Department of General, Functional and Oncologic Urology, Military Institute of Medicine, Central Clinical Hospital of the Ministry of National Defence.
AAST kidney injury scale:

- Grade I – kidney contusion or a small, non-expanding subcapsular haematoma (Fig. 8).
- Grade II – renal parenchymal laceration ≤1 cm depth with the presence of a non-expanding haematoma. No urinary extravasation is observed (Fig. 9).
- Grade III – kidney parenchyma laceration >1 cm depth without urinary outflow (Fig. 10).
- Grade IV – pelvicalyceal system injury with urinary outflow or segmental vessel injury. Segmental vein thrombosis or segmental artery injury (Fig. 11).
- Grade V – dismemberment of the kidney or renal pedicle avulsion [11] (Fig. 12).

Results

Between 2018 and 2022, 27 endovascular interventions were performed at CSK MON WIM for urgent indications in patients with iatrogenic injuries and injuries caused by external factors.

None of the TSE patients required urological intervention in the form of nephrectomy. In one case, due to multisite severe bleeding not allowing for organ-sparing treatment, renal artery embolisation was required. Effective occlusion of the injured part of the kidney, confirmed by the absence of contrast extravasation and cessation of bleeding, was achieved in all 27 patients that underwent the intervention. Unfortunately, in two cases, further hospitalisation ended in death due to septic complications or associated multiple injuries unrelated to the kidney injury. More than half, that is 15 patients (55.6%), required the transfusion of at least two units of red blood cell concentrate (RBC) during hospitalisation. In patients requiring RBC transfusions, laboratory results showed haemoglobin levels between 6.2 and 9.8 mg/dL, while haematocrit levels ranged between 19 and 27%.

One case required re-embolisation due to persistent haematuria after the initial intervention.

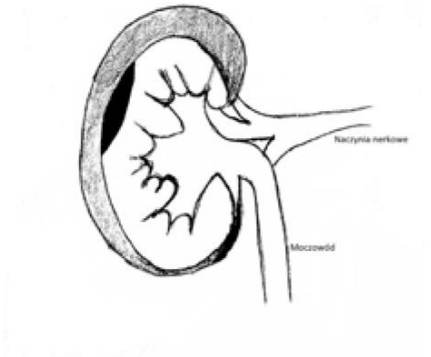

Figure 8. Grade I – kidney contusion or a small, non-expanding subcapsular haematoma.

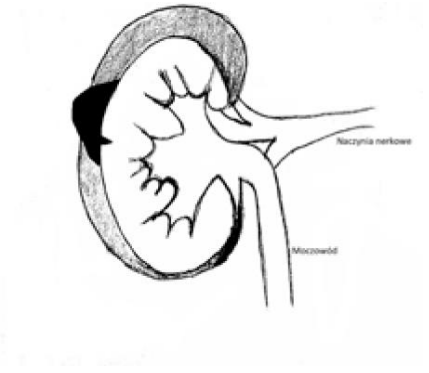

Figure 9. Grade II – renal parenchymal laceration ≤1 cm depth with the presence of a non-expanding haematoma. No urinary outflow observed.

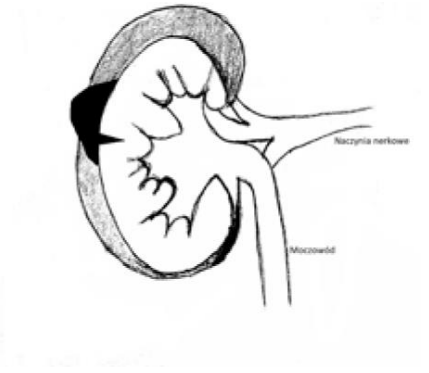

Figure 10. Grade III – kidney parenchyma laceration >1 cm depth without urinary outflow.

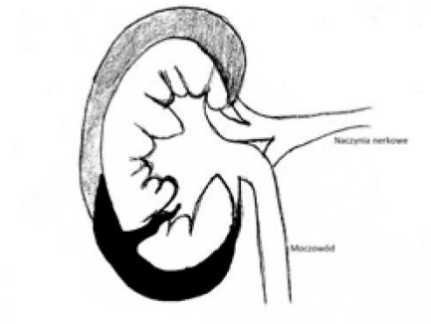

Figure 11. Grade IV – pelvicalyceal system injury with urinary outflow or segmental vessel injury. Segmental vein thrombosis or segmental artery injury.

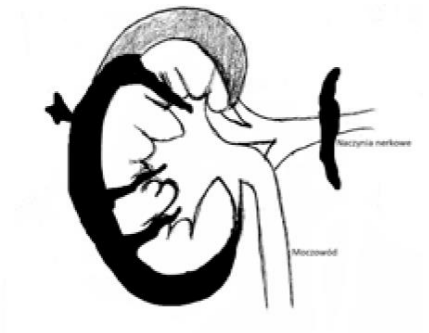

Figure 12. Grade V – dismemberment of the kidney or renal pedicle avulsion.

Discussion

Endovascular procedures involving embolisation of bleeding vessels are a commonly used treatment method. It is an established therapy in upper gastrointestinal bleeding, lower gastrointestinal bleeding, and post-surgical complications of procedures such as cholecystectomies [12]. Considering the results of our study and a literature review, it can be concluded that early transarterial superselective embolisation of segmental renal arteries is also an effective method in iatrogenic renal injuries and injuries caused by external trauma [13-15]. It enables organ-sparing bleeding control, eliminates the need for surgical intervention, thereby reducing the time and cost of hospitalisation and lowering the risk of perioperative complications. TSE offers a very high treatment success rate. However, it is limited in that it is less effective in injuries involving, for example, co-occurring arteriovenous fistulas with rapid blood flow, and when the large vessels of the renal hilum are damaged in grade V injuries [16]. In such cases, repeat embolisations may be necessary. Another aspect is that the patient's co-morbidities should be considered before using transarterial treatment with contrast agents. Diabetes mellitus, hypertension, chronic heart failure or atherosclerosis are risk factors for post-contrast renal failure, which may occur in approximately 0.5% of cases [14]. TSE is contraindicated if the patient has a history of anaphylactic reaction to contrast agents. In theory, there is also a risk of hypertension through the release of renin from the ischaemia-damaged parenchyma and reduced organ function depending on the area affected by the ischaemia [17, 18].

Over time, the function of the embolised kidney improves in most cases, both in laboratory and imaging tests, due to the formation of a collateral circulation supplying the embolised, ischaemic area of the kidney [14].

The availability of the method in centres with a high referral level is also a significant limitation.

In line with the European Association of Urology (EAU) guidelines, grade I–III and partly grade IV kidney injuries are usually treated conservatively [13, 19]. In the literature, the efficacy of TSE in treating injuries > AAST grade III is 52-94.9% and nephrectomy is prevented in 67% of cases [19].

Patients should be monitored by imaging to assess bleeding control and subsequent haematoma reduction. Follow-up ultrasound and CT scanning offer comparable efficacy in

the assessment of post-traumatic haematoma. Ultrasound of the retroperitoneal space and urinary tract may be the method of choice in grade I-IV injuries due to the higher availability, lack of exposure to ionising radiation and lower cost [16].

For grade IV-V injuries, CT appears to be a more clinically useful test, as it can reveal other concomitant injuries. When considering organ-sparing treatment, contrast-enhanced examination of the renal vessels provides significant information about the anatomy of the vessels, possible contrast extravasation, active bleeding, the degree of contrast secretion by the damaged kidney and, in the urographic phase, also about the anatomy of the urinary tract [16].

The main limitation of such a test is primarily its retrospective nature.

Conclusions

The AAST scale facilitates the classification of individual injuries for the appropriate conservative or surgical treatment. The majority of low-risk renal injuries without active bleeding (grades I, II, III and some AAST grade IV cases) can be treated conservatively, based on current EAU guidelines.

Grade I-IV injuries with active bleeding are eligible for organ-sparing, transarterial selective or superselective embolisation.

Grade V injuries are treated surgically, taking into account the need for nephrectomy.

Adherence to the EAU guidelines and appropriate use of the AAST scale enables precise identification of patients requiring surgical treatment. Transarterial selective embolisation is an effective, minimally invasive treatment for high-risk renal injuries. Due to the limited availability of the method, it is important to correctly identify the eligibility of patients for such treatment. It should be considered particularly for patients who are likely to achieve the greatest therapeutic benefit from minimally invasive and organ-sparing treatment.

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ARTERIAL HYPERTENSION IN THE PRACTICE OF EMERGENCY MEDICAL SERVICE

Nadciśnienie tętnicze w praktyce zespołów ratownictwa medycznego

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Abstract:

Introduction and objective – Cardiovascular diseases are one of the leading causes of death in the world. The most common risk factor for the development of this group of diseases is arterial hypertension (Latin: hypertonia arterialis, HA). HA may affect up to 11 million Poles and this number may increase by 50% by 2035. The persistence of elevated blood pressure values and the presence of symptoms accompanying HA prompts patients to call the Emergency Medical Service (EMS). Aim – To analyse the symptoms accompanying arterial hypertension during the intervention of EMS.

Material and methods – The study used an analysis of the medical documentation of the Emergency Medical Card collected in the period 04/2019–02/2021. The study included 302 patients whose main diagnosis at the time of the Emergency Medical Services visit was disease code I 10: Spontaneous (primary) hypertension according to the ICD-10 classification. Microsoft Excel and Statistica13 programs were used for the statistical analysis of the materials.

Results – Women constituted the majority of the analysed group (n = 208; 68.9%). The mean age of all the respondents was 69 years, while the women were older (72 years vs 64 years for the men). The mean systolic blood pressure was 189 mmHg, and the diastolic blood pressure was 100 mmHg. The mean systolic blood pressure in women was higher than in men (190.45 mmHG vs 185.65 mmHg). The most common accompanying symptoms were: malaise, headaches and dizziness. Headaches dominated in women, while chest pain and malaise were predominant in men. Headache occurred in 23.6% of the women and in 14.9% of the men. In turn, the discomfort/pain in the chest concerned men in 23.4% of cases, and women in 12.5%.

Conclusions – EMS interventions due to HA most often refer to elderly women and their systolic blood pressure values are higher than in elderly men. The symptoms associated with high blood pressure are common. Headaches dominate in women and chest pains in men.
Key words: hypertension, headache, EMS.

Streszczenie:

Wprowadzenie i cel – Choroby układu sercowo naczyniowego są jedną z dominujących przyczyn zgonów na świecie. Za najczęstszy czynnik ryzyka rozwoju tej grupy chorób uznawane jest nadciśnienie tętnicze (łac. hypertonia arterialis, HA). HA może dotyczyć nawet 11 mln Polaków, a liczba ta ma szansę zwiększyć się o połowę do roku 2035. Utrzymywanie się podwyższonych wartości ciśnienia krwi oraz występowanie objawów towarzyszących HA skłania pacjentów do wzywania Zespołów Ratownictwa Medycznego (ZRM). Cel – analiza objawów towarzyszących nadciśnieniu tętniczemu w trakcie interwencji zespołów ratownictwa medycznego.

Materiał i metody – W badaniu wykorzystano analizę dokumentacji z Kart Medycznych Czynności Ratunkowych zgromadzonych w okresie od 04.2019 r. do 02.2021 r. Do badania włączono 302 pacjentów, u których głównym rozpoznaniem w trakcie wizyty Zespołu Ratownictwa Medycznego był kod choroby I10: Samoistne (pierwotne) nadciśnienie zgodnie z klasyfikacją ICD-10. Do analizy statystycznej materiałów wykorzystano program Microsoft Excel oraz Statistica 13.

Wyniki – Kobiety stanowiły większość analizowanej grupy (n = 208; 68,9%). Średni wiek badanych wyniósł 69 lat, a u kobiet był wyższy niż u mężczyzn (72 lata vs. 64 lata). Średnie ciśnienie skurczowe wynosiło 189 mmHg, rozkurczowe 100

mmHg. Średnie ciśnienie skurczowe u kobiet było wyższe niż u mężczyzn (190,45 mmHG vs. 185,65 mmHg). Najczęstszymi objawami towarzyszącymi było: złe samopoczucie, bóle głowy i zawroty głowy. U kobiet dominowały bóle głowy, u mężczyzn ból w klatce piersiowej oraz złe samopoczucie. Ból głowy wystąpił u 23,6% badanych kobiet i u 14,9% mężczyzn. Z kolei dyskomfort/ból w klatce piersiowej dotyczył mężczyzn w 23,4% przypadków, a kobiet w 12,5%.

Wnioski – Interwencje ZRM z powodu HA najczęściej dotyczą kobiet, w starszym wieku, które prezentują wyższe niż mężczyźni wartości ciśnienia skurczowego. Występowanie dolegliwości towarzyszących wysokim wartości ciśnienia jest częste. U kobiet dominują bóle głowy, a u mężczyzn bóle w klatce piersiowej.
Słowa kluczowe: nadciśnienie tętnicze, ból głowy, ZRM.

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Introduction

Cardiovascular diseases are one of the leading causes of death in the world. According to the World Health Organisation (WHO), cardiovascular disease-related deaths account for approximately 30% of all deaths worldwide [1]. The most common risk factor for the development of this group of diseases is arterial hypertension (Latin: *hypertonia arterialis*, HA), which is also a major modifiable element in the progression of cardiovascular disease [2, 3]. Epidemiological data indicate that in 2015, the number of people with HA worldwide may have been around 1.13 billion, and WHO projections indicate that this will continue to increase and could reach more than 1.5 billion people by 2025 [4]. An increase in the incidence of HA has also been observed in Poland in recent years. The disease could affect up to 11 million Poles and is likely to increase by up to 50% by 2035. [3]

HA leads to a number of cardiovascular complications, including an increased incidence of stroke, myocardial infarction, peripheral artery disease and renal failure. The persistence of elevated blood pressure values and the presence of symptoms accompanying HA prompts patients to call the Emergency Medical Service (EMS).

Aim

To analyse the symptoms accompanying arterial hypertension during the intervention of EMS.

Material and methods

The study was carried out in Poland, in the Sanok and Lesko districts. Data for the study were extracted from the Emergency Medical Services Forms and the Emergency Team Departure Order Forms. The study was conducted from April 2019 to February 2021. It incorporated the records of 302 patients in which the main diagnosis at the time of the EMS intervention was disease code I10: Spontaneous (primary) hypertension according to the ICD-10 classification. Microsoft Excel and Statistica13 programs were used for statistical analysis of the materials.

Results

In the analysed group, the majority of EMS interventions concerned women (n=208), which accounted for 68.9% of all cases, while interventions for men with HA amounted to 31.1% of all the cases (n=94). The study group consisted of adults only. The age in the study group ranged from 20 to 98 years. The average age for the cases analysed was 69 years. The average age for women was 72 and was higher than for men, for whom the average age was 64. The oldest male patient was 88 and the oldest female patient was 98.

The first BP measurement taken by the EMS was analysed. The analysis showed that the EMS was called for a mean systolic and diastolic BP 189 mmHg and 100 mmHg, respectively. BP values were compared with the sex of the subjects. The mean systolic BP in women was 190.45 mmHg, and the diastolic BP was 100.42 mmHg. The mean systolic BP in men was slightly lower at 185.65 mmHg. The mean diastolic BP for men was similar to that for women, at 101.58 mmHg. The highest systolic and diastolic BP recorded during the EMS intervention was 270 mmHg and 150 mmHg, respectively. The most commonly recorded systolic and diastolic BPs were 180 mmHg and 100 mmHg, respectively.

The study analysed the most common symptoms that accompanied HA reported by patients during the EMS intervention. The most common symptom was malaise, which affected 21.5% (n=65) of the patients. Further symptoms reported by patients included: headache (n=63; 20.9%), dizziness (n=50; 16.6%), chest pain or discomfort (n=48; 15.9%). In the group analysed, 134 people, or 44.4% of the patients, reported other symptoms, which were included in the general category 'Other symptoms'. The obtained results are presented in Table 1.

Table 1. Symptoms associated with HA during EMS intervention.
Tabela 1. Objawy towarzyszące nadciśnieniu tętniczemu w trakcie interwencji ZRM.

Symptoms associated with HA													
Dizziness		Headache		Chest pain/discomfort		Palpitations		Malaise		Nausea and vomiting		Other symptoms	
N	%	N	%	N	%	N	%	N	%	N	%	N	%
50	16.6	63	20.9	48	15.9	15	5.0	65	21.5	34	11.3	134	44.4

Source: Own study.

Table 2. Selected other symptoms associated with HA
Tabela 2. Niektóre z innych dolegliwości towarzyszących nadciśnieniu tętniczemu.

Selected other common symptoms associated with HA									
Abdominal pain		Dyspnoea		Epistaxis		Anxiety / nervousness		General weakness	
N	%	N	%	N	%	N	%	N	%
7	2.3	20	6.6	11	3.6	28	9.3	20	6.6

Source: Own study.

Table 3. Correlation between symptoms associated with HA and patients' sex.
Tabela 3. Zestawienie objawów towarzyszących nadciśnieniu tętniczemu z płcią badanych.

Sex	Dizziness		Headache		Chest pain/discomfort		Palpitations		Nausea and/or vomiting		Malaise		No symptoms	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
M	12	12.8	14	14.9	22	23.4	4	4.3	8	8.51	22	23.4	14	14.9
F	38	18.3	49	23.6	26	12.5	11	5.3	26	12.5	43	20.7	43	20.7

Source: Own study.

Table 4. Number of symptoms associated with HA.
Tabela 4. Liczba objawów towarzyszących nadciśnieniu tętniczemu.

Number of symptoms associated with HA									
No symptoms		1 symptom		2 symptoms		3 symptoms		4 or more symptoms	
N	%	N	%	N	%	N	%	N	%
57	18.9	120	39.7	89	29.5	33	10.9	3	1.0

Source: Own study.

'Other symptoms' included 19 symptoms reported by HA patients. The most common symptom in this category was anxiety/nervousness, reported by 9.3% (n=28) of the patients. Further symptoms included dyspnoea and general weakness, both reported by 6.6% (n=20) of the patients. Symptoms very rarely reported by HA patients that were not included in the tables: numbness of the limbs and/or face, tinnitus, balance problems, visual difficulties, and body tremors. The obtained results are presented in Table 2.

The study compared the reported symptoms associated with HA with the sex of the subjects. Among women, the most common symptom associated with HA was headache, which affected 23.6% (n=49), malaise (20.7%; n=43) and dizziness (18.3%; n=38). No symptoms associated with high BP were reported by 20.7% (n=43) of the women examined. In men, the most commonly reported symptom was chest pain and/or discomfort and malaise, both 23.4% (n=22), followed by headache (14.9%; n=14). No symptoms associated with high BP were reported by 14.9% (n=14) of the men examined.

Analysis of the above findings revealed that in chest pain was observed more frequently in the male group than in the female group (23.4% vs 12.5%). The same was true for headache, but in this case it was more common in women than in men (23.6% vs 14.9%). The obtained results are presented in Table 3.

Symptoms associated with HA were found in 245 patients, i.e. 81.1% of those examined. In contrast, 18.9% of patients reported no symptoms other than high BP. The patients most frequently reported one symptom associated with HA, and this was a group of 120 individuals (39.7%). A total of 29.5% (n=89) of the patients reported two symptoms and 10.9% (n=33) reported three. Approximately 1% of patients reported four or more symptoms associated with HA. The obtained results are presented in Table 4.

It was observed that the mean systolic and diastolic BPs accompanied by headache were 192 mmHg and 103 mmHg, respectively. For dizziness, the values were almost identical: 191 mmHg for systolic and 101 mmHg for diastolic BP.

Discussion

Hypertension is one of the most common chronic diseases and one of the most important cardiovascular risk factors not only in Poland, but also in Europe and the USA. In recent years, increasing focus has been given in population-based studies to the assessment of the prevalence of HA in men and women. The research has yielded disputed results regarding sex-specific differences in HA prevalence. However, most studies have confirmed a higher prevalence of HA in older groups in both sexes. The results by Mroczek et al. [5] indicated that 56.3% of women may suffer from HA, while for men the rate is slightly lower at 47.2%. The studies by Januszewicz et al. [6] and Podolec et al. [7] showed a higher prevalence of HA in women. In contrast, Knieć and Kujawska-Luczak [8] cited the results of the WOBASZ study, in which the prevalence of HA was higher in men (42.1%) than in women (32.9%). The authors' own study found that among the 302 cases analysed, HA was present in 68.9% (n=208) of the women.

The prevalence of HA increases with age. Demographic reports indicate the feminisation of old age, and epidemiological projections predict an increase in this phenomenon in the coming years. Currently, life expectancy in Poland is higher in women than in men [1]. In the research carried out, the average age of women was 72 years, i.e. eight years higher than the average age of men. Mass et al. [9] pointed out that women develop HA more rapidly with age, which is related to hormonal changes in the female body. Similar results were obtained in other epidemiological studies [11, 12]. The data confirms that HA in post-menopausal women is a common and important clinical problem. Men, on the other hand, develop hypertension at a younger age. Seo et al. [10] suggested that HA was more common in men than in women, but as the age increased, the absolute number of women with high BP was about twice the number of men in the Korean population studied. A comparison of BP values by sex showed that older women had a higher mean systolic pressure (190.45 mmHg) than the male subjects (185.65 mmHg). Higher systolic BP in older women was also demonstrated in the study by Burt et al. [11] and Staessen et al. [12]. In light of the above, the prevalence of HA among women over 60-65 will have important implications in terms of increased cardiovascular morbidity.

HA may not present any symptoms for many years. If they do occur, they are uncharacteristic. The most common ones include headaches, malaise, dizziness, insomnia, fatigue, excessive excitability, and palpitations. In the conducted study, symptoms associated with HA were found in 81.1% of patients. The most frequently mentioned complaints, besides malaise, were headache and dizziness. In the investigation by Bramlage et al. [13], who analysed symptoms associated with HA in hospitalised patients, nearly 69% of the respondents reported the following symptoms associated with HA (in the order of frequency): dyspnoea, dizziness, headache, palpitations. Lopez et al. [14] analysed a group of 493 people, of whom 52.1% experienced dizziness and 62.5% had HA. They demonstrated that HA was significantly associated with dizziness and occurred far more frequently in women. Headache associated with HA was investigated by Klocek et al. [15]. The results revealed that headaches were found more often in women and patients with elevated diastolic BP. Similar results were found in the authors' own study, where headache was the most common symptom in women (23.6%) as opposed to men (14.9%). The study by Salkić et al. [16] showed a higher prevalence of HA in older women and symptoms associated with high BP. Of these symptoms, the most common were headache (in 75% of the patients) and dizziness (in 44.4% of the patients).

The above findings confirm the need for further research into the significance of sex in the development of cardiovascular risk factors, especially hypertension.

Conclusions

1. During the EMS interventions, hypertension was most commonly found among older women. The women had higher systolic BP than the men.

2. The symptoms accompanying hypertension were reported by the vast majority of the patients analysed. Headaches were one of the most frequently reported symptoms and were far more common in women than in men.

3. Appropriate prevention and treatment of hypertension can have a significant impact on reducing cardiovascular morbidity and mortality, as well as reducing EMS interventions.

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CASE STUDY

DISLOCATION OF THE KNEE JOINT WITH CONCOMITANT FRACTURE OF THE PROXIMAL TIBIA

Zwichnięcie stawu kolanowego ze współistniejącym złamaniem bliższego końca kości piszczelowej

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Abstract: The paper presents an alternative surgical treatment for knee dislocation with coexisting proximal tibial fracture. The case presentation includes analysis of indications for surgical treatment, a detailed description of the surgical method and conclusions.
Key words: high-energy injuries, dislocations of the knee, fractures of the proximal tibia.

Streszczenie: W poniższej publikacji przedstawiono alternatywną metodę leczenia operacyjnego zwichnięcia stawu kolanowego ze współistniejącym złamaniem bliższego końca kości piszczelowej. Prezentacja przypadku obejmuje omówienie wskazań do leczenia operacyjnego, szczegółowy opis techniki operacyjnej oraz wnioski.
Słowa kluczowe: urazy wysokoenergetyczne, zwichnięcia stawu kolanowego, złamania bliższego końca kości piszczelowej.

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Introduction

The incidence of high-energy trauma has increased significantly in recent years. This is due to the significant improvement in the forms of transport reaching ever-increasing speeds and the growing popularity of extreme sports. Thus the associated costs of treatment and subsequent improvement have also increased. For this reason, comminuted proximal tibial fractures with concomitant dislocation of the knee joint present an increasing challenge to both orthopaedic and rehabilitation specialists. Such complex musculoskeletal injuries require a great deal of experience on the part of the operator. Once a knee dislocation has been diagnosed, a CT scan with vascular assessment (CT angiography) should be performed immediately after dislocation reduction, followed by a magnetic resonance imaging (MRI) scan to assess the extent of soft tissue damage. Vascular damage may result in acute lower limb ischaemia, which requires urgent vascular intervention with a risk of failure [1]. An additional factor that can affect the success or timing of treatment is the extensive soft tissue trauma that usually occurs with high-energy injuries. Assessment of the normal function of the common peroneal nerve is often limited immediately after injury due to severe pain or sedation of the patient [2]. Until surgery, the limb is immobilised in a plaster splint or with external fixation equipment. When deciding whether to use external fixation, one should bear in mind the subsequent surgical access. The added value provided by an external fixator is that it facilitates the monitoring of the pressure inside the fascial compartments and the possible use of VAC therapy.

The Schenck classification is the basic anatomical classification for assessing multi-ligament knee injuries after dislocation [3]. It describes the following injuries:

- **I** Injury to anterior cruciate ligament (ACL) and medial collateral ligament (MCL) or lateral collateral ligament (LCL)
- **II** Injury to ACL and posterior cruciate ligament (PCL)
- **IIIM** Injury to ACL+PCL+MCL
- **IIIL** Injury to ACL+ PCL+LCL+ posterior-lateral corner
- **IV** Injury to ACL+PCL+MCL+LCL+PLC
- **V** Dislocation + fracture
- **C** Arterial injury
- **N** Neural injury

Case study

A 44-year-old patient was transported to the Emergency Department in April 2020 after falling from a height of 1.5 m, which resulted in an injury to his right lower limb. A posterolateral dislocation of the knee joint was diagnosed after a physical examination. The dislocation was repositioned immediately without diagnostic imaging. The patient was then quickly transported to the radiology

department for CT angiography. The images obtained showed dislocation reduction (Fig. 1) and a comminuted fracture of the posterior column of the proximal tibia, type V according to Schenck's classification, without damage to the popliteal artery. In view of the above, the lower limb was immobilised in a full-leg plaster splint, with simultaneous measurement of intra-compartment pressure. On the following day, a non-contrast MRI was performed to assess the extent of damage to the ligament-capsular apparatus.
The MRI showed a complete rupture of the medial collateral ligament at the distal attachment, a complete pericapsular injury and tear of the posterior horn of the medial meniscus (MM), comminuted stress fracture of the intercondylar eminence and posterior medial condyle of the tibia with multifragmented damage to the cartilage surface, avulsion damage to the posterior cruciate ligament, damage to the medial anterior cruciate ligament, tendon damage to the popliteus muscle and a tear to the posterior horn of the lateral meniscus (ML). The above examinations yielded a full diagnosis of the injuries, which enabled detailed planning of the surgical procedure.

Surgical technique

The surgical procedure required some modifications compared to the procedure for treatment of articular proximal tibial fractures described by Schatzker [4]. The posterior column of the tibia consisted of the posterior part of the lateral condyle, the posterior part of the medial condyle and the medial part of the medial condyle. It served for the attachment of the posterior horn of the medial meniscus, the distal attachment of the posterior cruciate ligament and the popliteus, which initiates flexion of the knee joint [5].

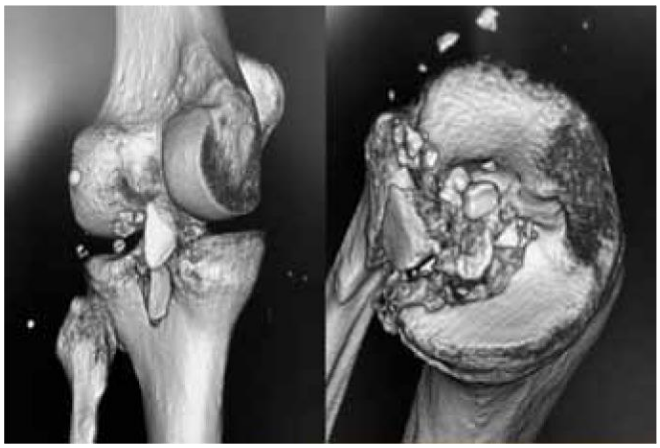

Fig. 1. CT angiography after the resetting of the dislocated knee (own material).

The patient was given general anaesthesia and placed in the prone position. An approximately 40 cm posterior-medial access site was planned. The skin incision was made between the medial head of the gastrocnemius muscle and the pes anserinus. To facilitate exposure of the fracture, the pes anserinus tendons, the tibial MCL attachment and the biceps femoris muscle were retracted laterally together with the neurovascular bundle. The remaining muscles from the posterior surface of the tibia were then mobilised, including the belly of the popliteus muscle. Finally, the joint capsule was cut open (Fig. 2). After gaining access to the articular surface, the repositioning of the fracture began. Due to the morphology of the ACL injury preventing its suturing, it was decided that the distal stump should be removed (possible deferred reconstruction in the future). The posterior MCL, medial meniscus and tibial PCL attachment were pulled back on threads to enlarge the access site. The articular surface of the medial condyle and the intercondylar eminence of the tibia were reconstructed under visual guidance. The fragments were temporarily stabilised with four Kirschner wires for the final insertion of cannulated screws, the main joining material. They were screwed into the cartilage under visual guidance (Fig. 3).

The bone loss was replaced with an allogeneic graft. Using a JuggerKnot anchor, the posterior root of the lateral meniscus was sutured to the attachment site. Another anchor was used to attach the remaining tendon fragment of the popliteus muscle to the tibia. The damaged posterior horn of the medial meniscus was sutured with an absorbable suture. In addition, a non-anatomic Axsos plate supporting the posterior column was selected and modelled to protect the connection from unwanted displacement of the fragments. The deep MCL injury was then sutured up and the medial meniscus was sutured to the joint capsule. The deep MCL was reinforced with Fiber Tape attached under tension at the MCL attachment sites using a PushLock anchor, while the superficial MCL was sutured to the distal attachment site on the tibia using a JuggerKnot anchor. Normal MCL tension during extension and 30-degree flexion was confirmed.

Postoperative procedure

In the early postoperative period, the limb remained immobilised in a full-leg plaster splint until the skin sutures were removed. Then, at 2 weeks, passive exercises using a CPM device were implemented under the close supervision of a physiotherapist. A gradual increase in the weight bearing on the limb began 6 weeks after surgery. Postoperative follow-ups took place at 6, 12, 18 weeks, with follow-up X-rays (Fig. 4 a, 4 b). Bone union was confirmed at 18 weeks after the surgery, full weight-bearing of the limb was allowed and a return to physical activity, initially on a limited basis, was permitted.

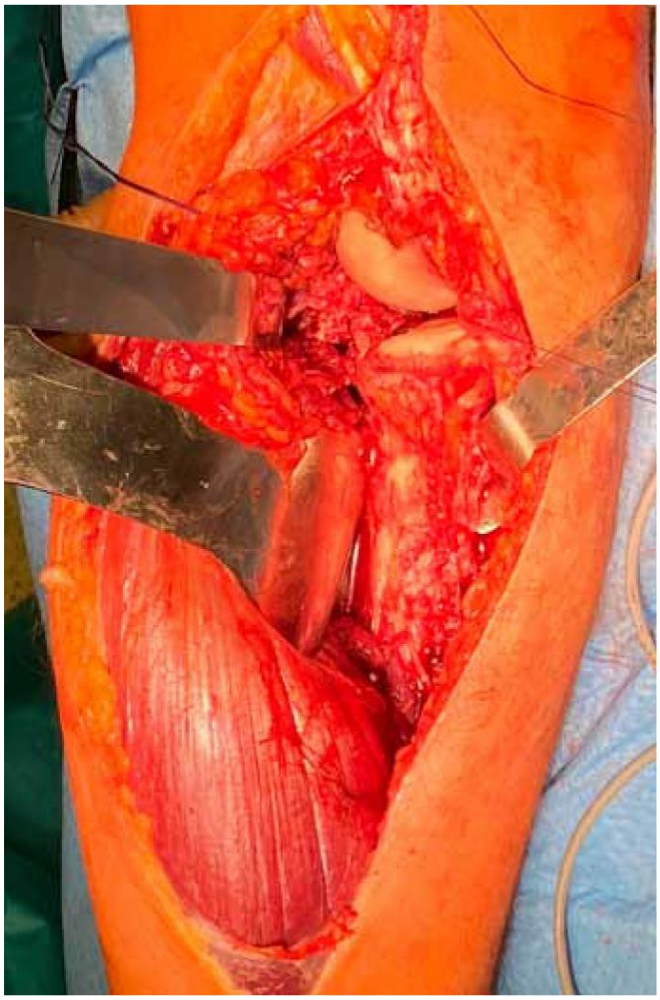

Figure 2. Access site with revealed fracture of the proximal tibia (own material).

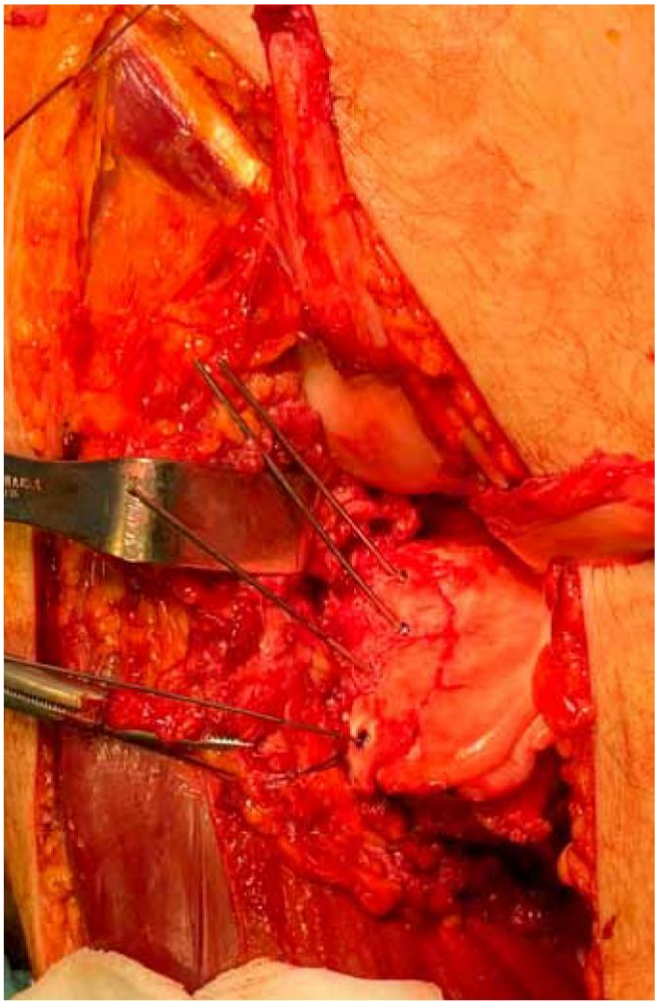

Figure 3. Proximal tibial fracture stabilised with cannulated screws (own material).

The orthopaedic treatment was discontinued 6 months after the surgery. Full extension and flexion of the knee joint was achieved, with no pain during active-passive exercises or gait (Fig. 5 a, 5 b).

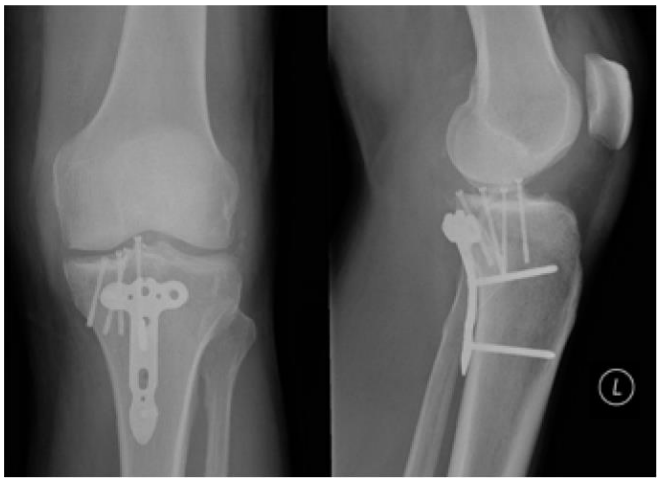

Figure 4. a, b. Postoperative X-ray in a) anteroposterior, b) lateral projection (own material).

Discussion

Dislocations of the knee joint with a concomitant proximal tibial fracture account for 0.02–0.2% of orthopaedic injuries [6]. They are significantly more common in men (M:F = 4:1). With a risk of vascular complications of 18–24%, it represent one of the most serious injuries to the knee joint. Considering their rarity, such knee joint injuries pose a major challenge to the operator. Incorrect treatment results in rapid limb dysfunction. It is a multi-tissue injury to the musculoskeletal system, requiring proper restoration of both cartilage and bone tissue and the ligament-bone apparatus. It is important to remember that, despite achieving a good radiological result, properly managed rehabilitation has a significant impact on the final outcome of treatment. The patient's determination and desire to regain as much as possible of their pre-injury health is also important.

Conclusion

Dislocations of the knee joint with a posterior column fracture of the proximal tibia are severe, complex musculoskeletal injuries in which the outcome of treatment

Figure 5. a, b. Functional outcome after orthopaedic treatment a) flexion, b) extension of the knee joint (own material).

is difficult to predict. It requires both an experienced surgical team and properly managed rehabilitation. Such surgeries should be performed in multi-specialist centres staffed with vascular surgeons and providing the necessary imaging equipment. In addition, a good radiological outcome of the surgical treatment performed does not guarantee a good functional outcome due to the aforementioned complexity of the injury. Returning to professional or sporting activity requires a great deal of determination on the part of the patient and cooperation with the doctor and rehabilitator.

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SURGICAL TREATMENT OF TRAUMATIC LENS SUBLUXATION

Leczenie chirurgiczne pourazowego podwichnięcia soczewki

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Abstract: Eye injuries account for 10–15% of all eye diseases. The Birmingham Eye Trauma Terminology is used to standardize them. Trauma can damage the cornea, sclera, iris, lens or even the entire eyeball. Moreover, trauma is the most common cause of lens subluxation, which requires surgical supply. In such a case, choosing an adequate, effective treatment method is necessary. In the Ophthalmology Department of the Military Institute of Medicine, the proprietary method used is the sutureless fixing of the capsular bag–intraocular lens complex using a capsule tension ring and iris retractors.
Key words: ocular trauma, lens subluxation, traumatic cataract, iris hooks, fixing of the capsular bag-intraocular lens complex.

Streszczenie: Urazy oczu stanowią 10–15% wszystkich schorzeń narządu wzroku. Do ich standaryzacji służy klasyfikacja The Birmingham Eye Trauma Terminology. Wskutek urazu może dojść do uszkodzenia rogówki, twardówki, tęczówki, soczewki lub nawet całej gałki ocznej. Jednocześnie uraz jest najczęstszą przyczyną podwichnięcia soczewki, które wymaga zaopatrzenia chirurgicznego. W takim przypadku konieczne jest wybranie odpowiedniej, skutecznej metody leczenia. W Klinice Okulistyki WIM – PIB stosowana jest autorska metoda bezszwowej fiksacji kompleksu torebka-soczewka wewnątrzgałkowa z zastosowaniem pierścienia napinającego torebkę oraz retraktorów tęczówkowych.
Słowa kluczowe: uraz gałki ocznej, podwichnięcie soczewki, zaćma pourazowa, retraktory tęczówkowe, fiksacja kompleksu torebka-soczewka wewnątrzgałkowa.

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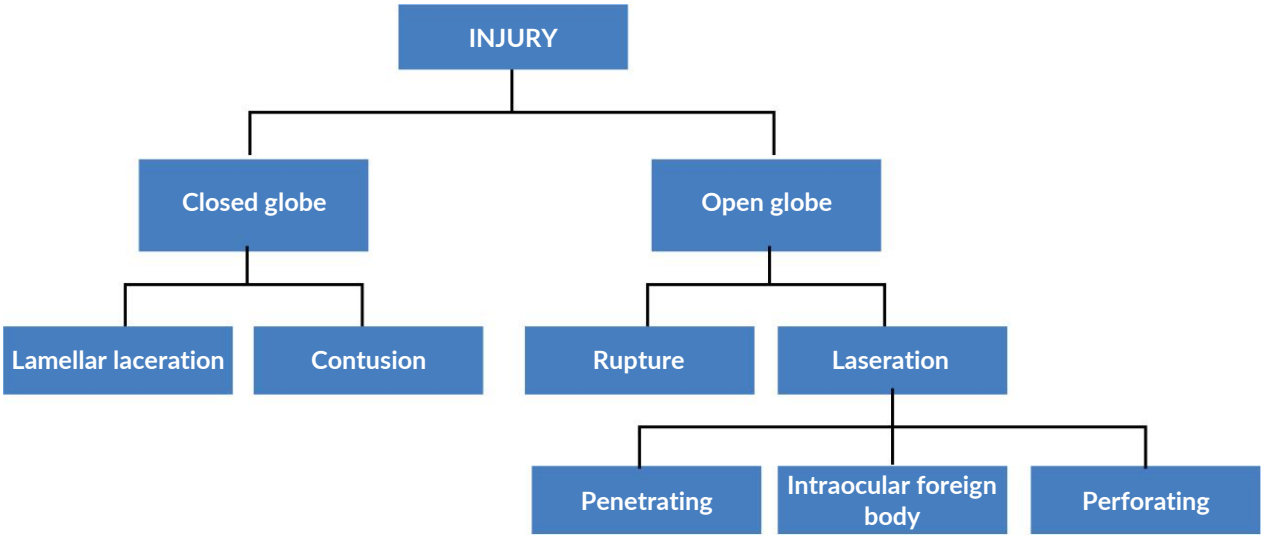
Introduction

Eye injuries can lead to the deterioration of visual acuity and, in extreme cases, even blindness. Visual impairment may adversely affect mental health and lower the quality of life [1-3]. For this reason, detailed diagnosis and appropriate treatment of ocular trauma is essential. The Birmingham Eye Trauma Terminology (BETT) is the most widely used classification of ocular trauma, which enables correct diagnosis and interpretation for scientific studies. In addition, it eliminates error and ambiguity in the nomenclature of ocular trauma [4, 5]. The BETT classification is shown in Table 1.

Epidemiology

Eye injuries account for 10-15% of all eye diseases [6]. However, statistics strongly depend on the study site, study group, sex and age of patients [7]. Ocular injuries most often affect men, who constitute about 60% of the cases [7] to as many as 81.5% of patients [8]. Traffic accidents are the most frequent cause of eye injuries among adults [9], accounting for 56.7% of cases, according to Park et al [8]. Other reports also indicate domestic accidents as a major cause of eye injuries [7]. Belmonte-Grau et al. report that open ocular injuries represent approximately 63% of cases, and among these, rupture is estimated at 39.13%, penetrating trauma at 14.13%, and intraocular foreign body at 8.7% [7]. Other data indicate that open globe trauma comprises 44% of eye injuries [9, 10]. In contrast, a study

Table 1. Birmingham Eye Trauma Terminology (BETT)



by Prat et al. provides an analysis of ocular trauma in armed conflict settings. It was conducted among 126 Israeli soldiers between 1998 and 2017. The most common types of injury found included lamellar lacerations (27%) and intraocular foreign bodies (21%). Trauma was most often caused by explosions (56%), shrapnel (29%), and gunshots (9%) [1].

When it comes to children, the causes of ocular trauma have a slightly different profile, especially as children are at much higher risk of eye injury than adults [11]. The incidence of ocular trauma in children is estimated at 8.9 per 100,000 patients in the United States [12], and 9–15 per 100,000 in France [2]. Eye injuries are more common in boys [2, 11, 12]. According to Boret et al, boys are 2.7 times more likely to suffer ocular trauma than girls [2]. Ocular injuries in children most commonly occur at home [2, 11] – Boret et al. estimate that this applies to 51% of patients [2], while Puodžiuviene et al. report 60.4% [11]. Finally, García Mancebo et al. suggest that eye injuries in the child population most commonly occur at home, at school or during sports [13].

Complications of ocular trauma

Any force acting directly on the eyeball may cause damage to the cornea, sclera, iris or lens [14], sometimes resulting in injury to the entire eyeball. Complications of such trauma include post-traumatic cataracts [14, 15], iris sphincter damage, haemorrhage, lens dislocation or subluxation [7]. Patients with open globe injuries may also develop infection inside the eye – endophthalmitis [15]. Andreoli et al. conclude that it is a rare complication of open globe injury, estimated at 0.9% of patients [16]. Possible complications of ocular trauma are shown in Table 2.

Trauma is the most common cause of lens displacement [17]. It can cause damage to the ciliary zonule, leading to lens subluxation or dislocation. Lens subluxation results from partial zonule damage. It is found when the lens is not displaced outside the posterior chamber. Lens dislocation, on the other hand, involves displacement of the lens into the vitreous or anterior chamber [18-20]. Symptoms of lens subluxation include visual impairment, refractive change towards hyperopia or myopia, astigmatism and diplopia [20].

Table 2. Possible complications of ocular trauma.

Complications of ocular trauma
Hyphema [2, 8, 11, 13]
Subconjunctival haemorrhage [2, 8, 9]
Hypopyon [2, 9]
Lens displacement [2, 7, 9] Subluxation Dislocation
Traumatic cataract [7, 8, 11, 14, 15]
RAPD* [2, 7, 9, 11]
Iris prolapse [9, 11]
Iridodialysis [2, 11]
Endophthalmitis [9, 15]
Retinal detachment [9, 11]
Vitreous haemorrhage [11, 13]

**RAPD – relative afferent pupillary defect*

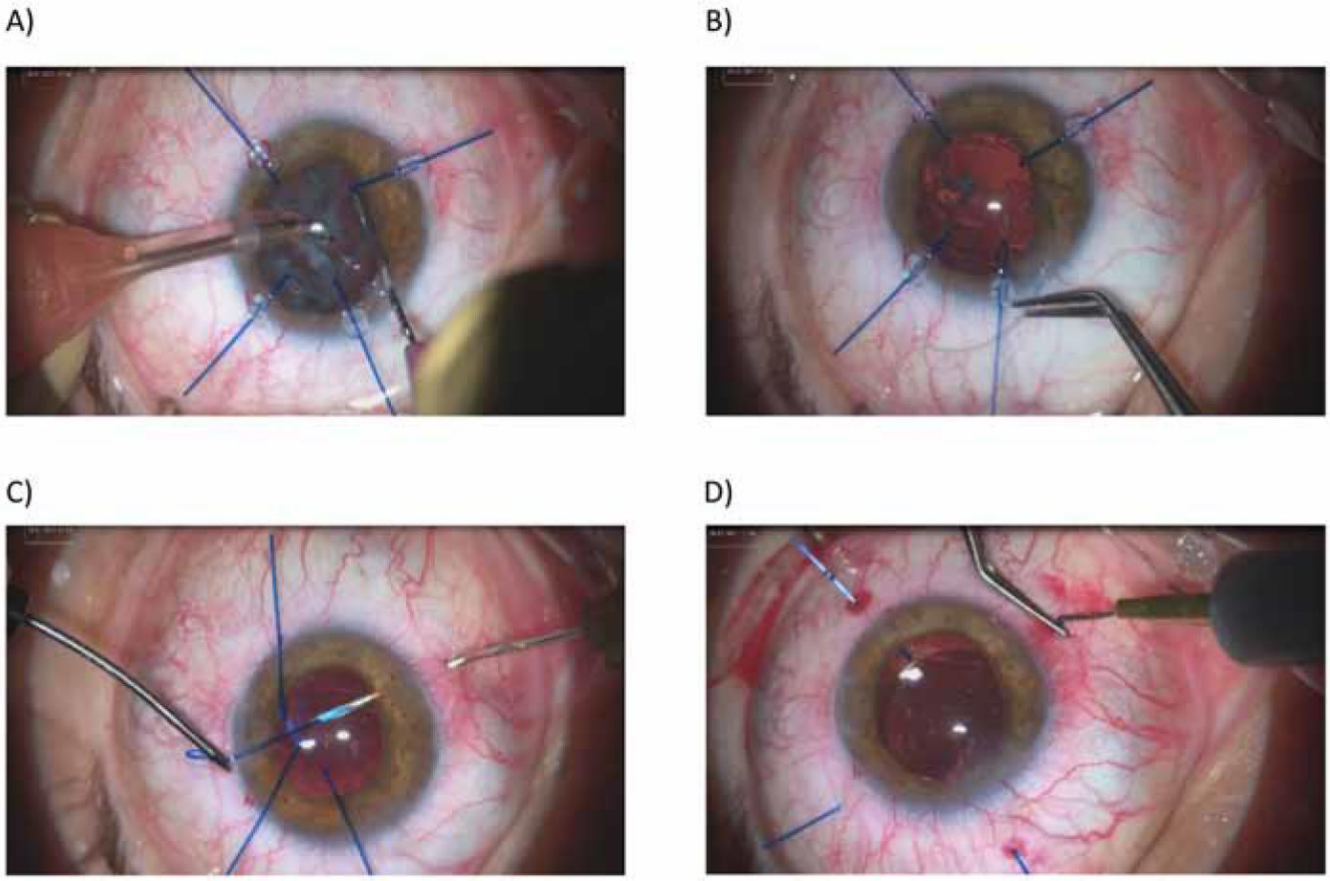


Figure 1. Consecutive stages of the sutureless fixation of the capsular bag-intraocular lens complex using a capsule tension ring and iris retractors.
A – Phacoemulsification of subluxated cataracts; B – Implantation of a capsule tension ring; C – Retraction through the sclera; D – Retractor tip cauterisation.

In cases of low to moderate zonule damage, the capsule can be preserved and the use of a capsule tension ring usually ensures the stability of the capsular-PCIOL complex. However, in injuries with significant damage to the zonule apparatus, this method may be insufficient. When this happens, it is difficult to ensure adequate centration and stabilisation of the PCIOL, which requires an accordingly adapted surgical technique. The Department of Ophthalmology of the Military Institute of Medicine, Clinical Hospital of the Ministry of National Defence – National Research Institute uses a surgical technique with a capsule tension ring and iris retractors to treat subluxated cataracts with extensive zonule dialysis to achieve permanent fixation of the capsule-PCIOL complex. To date, iris retractors have been used to temporarily stabilise the lens capsule during cataract surgery [21-23]. In the new method, the tips of the iris retractors are guided through the sclera and then cauterised, thus eliminating the need for sutures [24].

Case reports

The proprietary technique of sutureless fixation of the capsular bag-intraocular lens complex with a capsule tension ring and iris retractors was used by the Department of Ophthalmology, CSK MON WIM – National Research Institute in all the clinical cases described below. Figure 1 shows the individual stages of the described surgical method.

Clinical case 1

A 64-year-old woman presented to the Department of Ophthalmology of the Military Institute of Medicine – National Research Institute with a left eye injury caused by the blow from a fist. She was scheduled for surgery involving the removal of a subluxed native lens and implantation of a posterior chamber IOL (PCIOL). An ophthalmological examination revealed a visual acuity of 20/500 in the left eye. The intraocular pressure (IOP) was 15 mmHg. Phacoemulsification with implantation of a capsule ring and an artificial posterior chamber lens, suspension of the lens capsule on retractors and anterior vitrectomy in the left eye were performed. Four months after the procedure, visual acuity improved, with BCVA of 20/25, and normal IOP. No complications were reported either during or after the procedure. Figure 2 shows the left eye before surgery and Figure 3 shows the left eye after

surgery.

Figure 2. Left eye before the procedure.

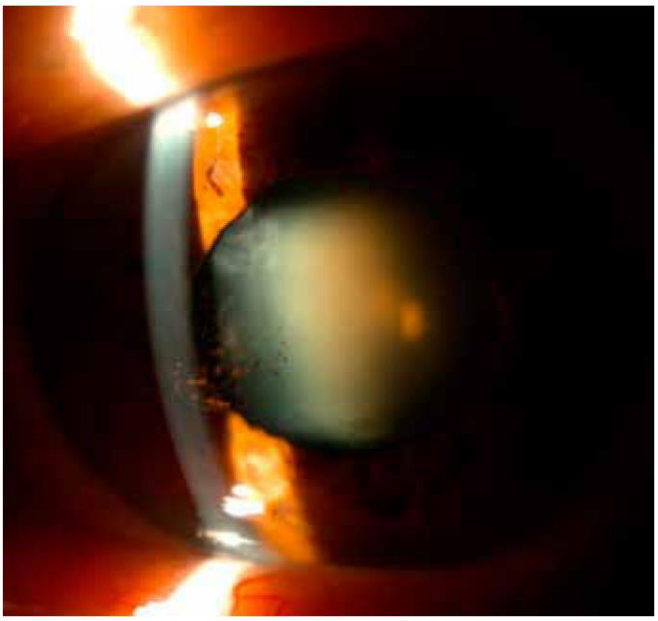
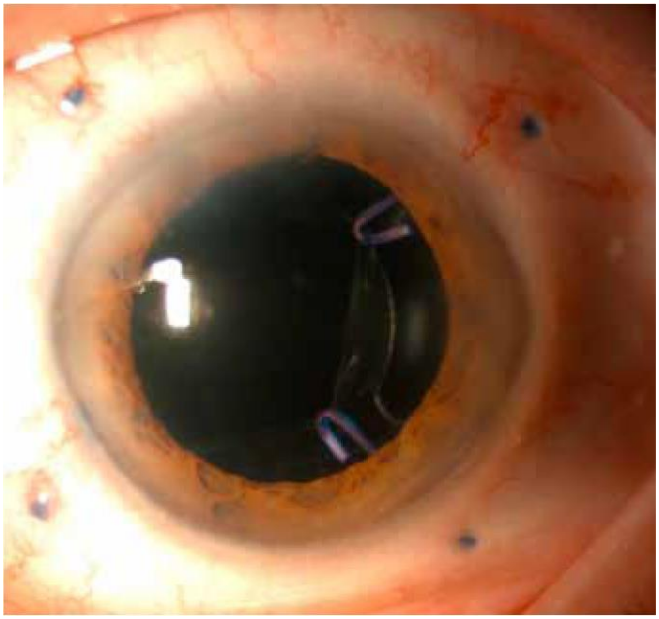


Figure 3. Left eye after the procedure.



Clinical case 2

A 70-year-old male patient with right ocular trauma (hit by a stone) was admitted to the department with a diagnosis of subluxated cataract of the right eye and secondary traumatic glaucoma. Preoperative examination identified a BCVA of 20/400 and an IOP of 40 mmHg. The operation was performed using the method described above and the following results were obtained: BCVA of 20/32 and IOP of 15 mmHg with two anti-glaucoma drugs. The procedure was carried out without complications (Figures 4 and 5).

Figure 4. Right eye before the procedure.

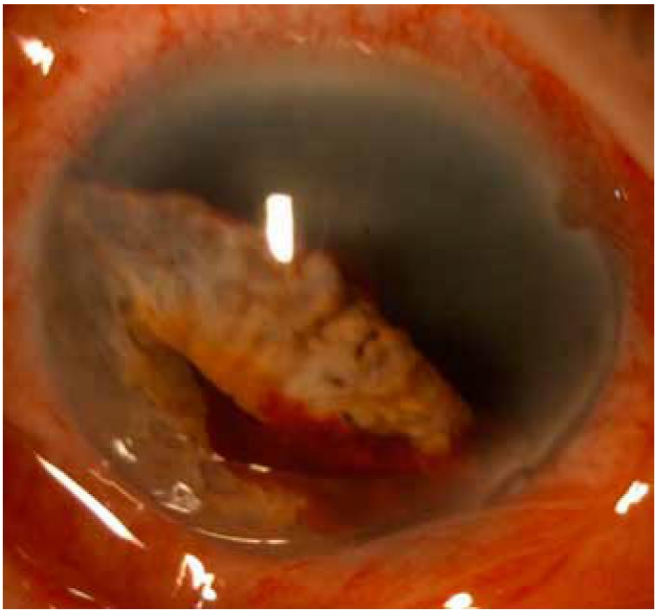
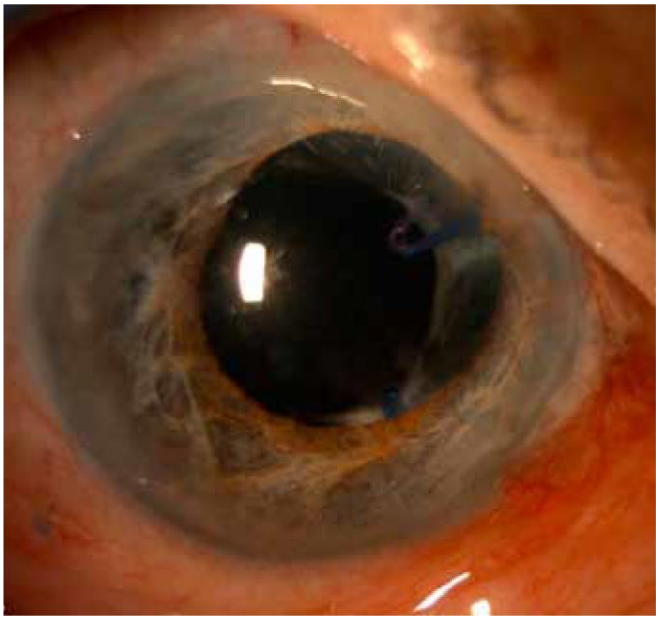


Figure 5. Right eye after the procedure.



Clinical case 3

A 41-year-old male patient was admitted to the Department for trauma management, including subluxated cataract removal and anterior segment plastic surgery, after suffering an injury to his left eye from being struck with a metal tool. Before the surgery, the BCVA was 20/50 and the IOP was 15 mmHg. The procedure was performed using the technique described above. After the surgery, the BCVA was 20/25 and the IOP was 11 mmHg. There were

no complications during the operation (Figures 6 and 7).

Figure 6. Left eye before the procedure.

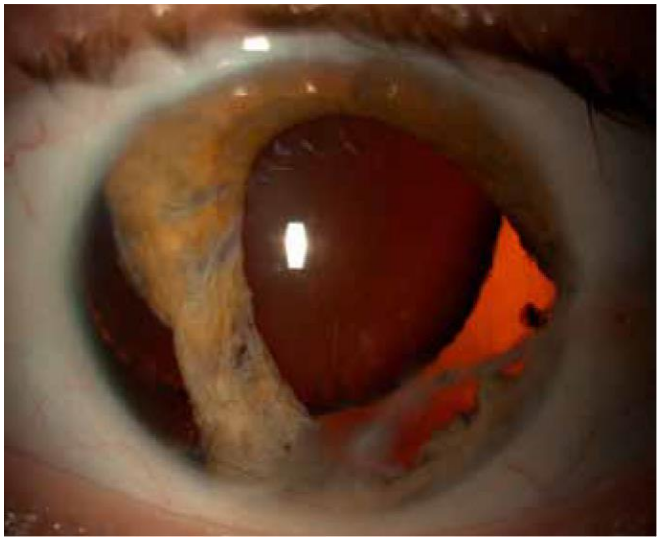
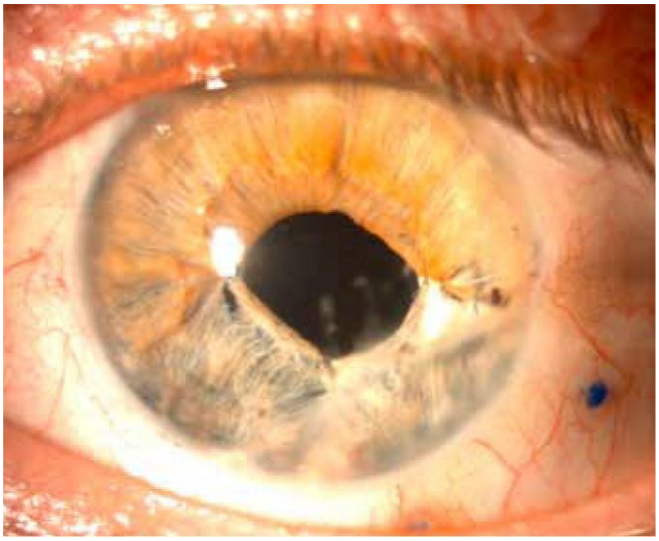


Figure 7. Left eye after the procedure.



Conclusion

Exposure to risk factors, incidence and mechanism of ocular trauma depend primarily on the population studied [7]. Damage to the organ of vision may cause many complications that require effective management. The surgical method and the time from injury to surgery should be selected on a case-by-case basis, depending on the local condition of the eyeball and the extent of the injury. Different treatment methods are used in clinical practice, depending on the experience and preference of the operator.

The proprietary technique used at the Department of Ophthalmology, CSK MON WIM is effective, minimally invasive and time-saving for the surgeon. The procedure was first presented and discussed at the 2018 international congress of the European Society of Cataract and Refractive Surgery (ESCRS). The surgical technique was also presented in the Video Journal of Cataract, Refractive and Glaucoma Surgery (VJCRGS) [25]. The operation is successfully used in patients with lens subluxation of various aetiologies, including congenital subluxation. This paper demonstrates the use of the technique in cases of eyeball trauma, where all the patients showed improved visual acuity and experienced no surgery-related complications.

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A SNAPSHOT FROM THE HISTORY OF WOJSKOWY INSTYTUT MEDYCZNY (MILITARY INSTITUTE OF MEDICINE): FROM THE MILITARY SURGICAL DEPARTMENT IN 1945 TO THE INSTITUTE OF SURGERY IN 1974

Kartka z historii Wojskowego Istytutu Medycznego. Od wojskowego oddziału chirurgicznego w 1945 r. do instytutu chirurgii w 1974 r.

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Abstract: The article presents a history of the development of military surgical departments in Warsaw: general surgery, orthopaedics, urology, neurosurgery and plastic surgery. It covers the years 1945–1974, from the date of establishing the first military surgical department at Koszykowa 78 until 1974, when the Surgery Institute of the Postgraduate Education Center of the Military Medical Academy (currently the Military Institute of Medicine – National Research Institute) in Warsaw was established, and presents the main directions of research and the most important scientific achievements of the clinics in this period. The achievements of the clinics are part of the 77-year history of the Military Institute of Medicine.

Key words: military hospitals – history, military medicine – history, 20th-century history of medicine.

Streszczenie: W artykule przedstawiono historię rozwoju wojskowych oddziałów chirurgicznych w Warszawie: chirurgii ogólnej, ortopedii, urologii, neurochirurgii i chirurgii plastycznej. Cezura czasowa obejmuje lata 1945-1974, tj. od utworzenia pierwszego wojskowego oddziału chirurgicznego przy ul. Koszykowej 78 do 1974 r., kiedy powstał Instytut Chirurgii Centrum Kształcenia Podyplomowego Wojskowej Akademii Medycznej (obecnie Wojskowy Instytut Medyczny – Państwowy Instytut Badawczy) i przedstawia główne kierunki badań w omawianym w okresie. Dokonania klinik wpisują się 77-letnią historię Wojskowego Instytutu Medycznego.

Słowa kluczowe: szpitale wojskowe – historia, medycyna wojskowa – historia, historia medycyny XX wieku.

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One of the first departments to start operating before the end of World War II was the Department of Surgery of the 1st District Hospital in Warsaw. It was established by the Order of the Supreme Command of the Polish Army No 23/Org. of 1 February 1945 on the formation of 6 military districts in the liberated areas [1, 2]. The hospital occupied the premises of the building at 78 Koszykowa Street. The Department of Surgery, entrusted to Col. Michał Dobulewicz, opened as early as 5 April 1945, and an important step towards securing the wounded and sick was made with the establishment of a Central Outpatient Clinic with specialist surgeries at the hospital on 7 April 1945. The surgical practice was run by Maj. Włodzimierz Sawicki MD [3, 4].

The first days after the war were extremely difficult for the health service in Poland. The end of the occupation and the beginning of the post-war reconstruction required immediate action, primarily due to the war damage and the lack of medical staff. The tasks ahead of the military health service were outlined by the then Head of the Department of Health Services, Brigadier General Michał Moguczy, in 1945: '[...] it is now our duty to remove the consequences of the war. This is because a large number of the most seriously injured remained in our hospitals. We are now faced with the problem of restitutory surgery, which we need to solve, the issue of treating the wounded with various types of neurasthenia and mental disorders, and managing exacerbations of chronic conditions which, in a state of excitement in the midst of combat operations, did

not make themselves known' [5].

Department of Surgery, Hospital of the Ministry of National Defence in Warsaw, 78 Koszykowa St.

The decision to establish a new hospital, intended for Polish Army officers and members of their families, was made back in 1945. The Command decided to move the 1st District Hospital to 27 Nowowiejska Street, and the Hospital of the Ministry of Defence was installed in Koszykowa Street.

The hospital was officially opened in November 1945. Marian Garlicki MD, PhD, later Brigadier General and professor, became head of the Department of Surgery and retained this position until 2 February 1946 (Fig. 1).

Figure 1. Prof. Marian Garlicki

In the first period, the department was staffed by three doctors: Col. Kazimierz Opacki PhD, who was the deputy director, neurosurgeon Maj. Artur Hausman PhD, and Maj. Stanisław Rusiniak, PhD. Garlicki's successor was the former head of the Department of Surgery at the 1st District Hospital in Warsaw – Col. Tadeusz Bętkowski, MD PhD. The department evolved into a 44-bed clinical ward with the following subdepartments: General Surgery, Trauma Surgery, headed by Col. Stanisław Rusiniak, and a subdepartment for patients with urological problems, managed by Capt. Kazimierz Szczepański, PhD [6] (Fig. 2).

The department's staff constantly struggled with difficulties in terms of the premises, a lack of appropriate equipment, and a shortage of professional physicians and nurses. At that time, the department had one operating theatre, where all surgical, urological, orthopaedic and gynaecological operations were performed. The department's team included Col. Tadeusz Bętkowski MD, PhD, Lt. Col. Jan Rusiniak MD, Maj. Karol Kunerth MD, Maj. Artur Hausman MD, PhD, Lt. Tadeusz Chojnacki MD, Lt. Władysław Gruchalski MD, Lt. Juliusz Słoński MD, Capt. Kazimierz Szczepański MD, PhD, Lt. Paweł Kubica MD, Lt. Józef Walendzik MD, and Lt. Edmund Warszawski MD. Halina Kazimierczak was appointed ward director while Róża Augenlicht was in charge of the operating theatre [7].

For the first few years, the daily activities performed by the

Figure 2. Col. Kazimierz Szczepański MD, PhD

surgeons at the Hospital of the Ministry of Defence were supported by eminent specialists and professors, such as: Bolesław Szarecki, Aleksander Szacki, Tadeusz Butkiewicz, Tadeusz Koszarowski, Ryszard Manteuffel, Witold Rudowski, Zdzisław Łapiński, and Jan Nielubowicz [8] (Fig. 3).

In its early days, the Department of Surgery was mainly focused on its role as a service and training department. Garlicki reported: '[The department] not only performed procedures on an ongoing basis but at the same time also worked on the recovery from acquired surgical diseases related to the period of war and occupation.' He called that time an 'organisational period', but at the same time pointed out: '[…] it was already at this time that material for scientific publications began to be collected, young doctors were trained and a scientific movement was launched at intra-departmental meetings and assemblies of the Warsaw Surgical Society' [9].

Following the continuous development of the facility, including scientific advances, the Hospital of the Ministry of Defence underwent an organisational change in February 1952, which also involved changing the name to the Central Hospital of the Ministry of Defence. The hospital's tasks were broadened to include scientific activities, and the functions of scientific heads were created. Tadeusz Bętkowski PhD, who had ended his career as a surgeon, took over as scientific supervisor of the surgical departments.

In 1952, construction on a new wing of the building began along Koszykowa Street towards Wilcza Street. The new section was larger than the pre-war building. The renovation of the old premises began the following year. The Department of Surgery received two large operating theatres, sterilisation rooms, an instrument room and two preparation rooms. The operating theatre received state-of-the-art anaesthetic equipment and, soon afterwards, an electrocardiogram and electrocardioscope.

Figure 3. Tadeusz Butkiewicz during surgery

The number of beds in the orthopaedic subdepartment was also increased to 80 and it could admit a larger number of adult and paediatric patients. The on-call regime was also changed – doctors were no longer on call as general practitioners of the hospital, and only performed their duties in the surgical ward [6–9].

Intubation anaesthesia with pentothal, nitrous oxide and antispasmodics (curare, flaxedil) started to be used during surgical procedures. As a rule of thumb, oxygen was administered concurrently in ether anaesthesia and pendiamide was used when heavy bleeding was expected [10].

In 1956, Asst. Prof. Tadeusz Betkowski MD, PhD due to poor health, was made a consultant of the surgical office of the Central Medical Clinic at Nowowiejska St. Col. Władysław Zagórski PhD, was appointed head of the Department of Surgery, while also acting as the scientific head of the surgical departments. The medical team of the department in 1957 consisted of Col. Karol Kunerth, who was the deputy head of the department, Maj. Juliusz Słoński, Maj. Tadeusz Chojnacki, Capt. Władysław Gruchalski, Col. Jerzy Bokwa, Col. Wacław Torz, Col. Stefan Błachnio, Col., and Tadeusz Winiarski, anaesthesiologist. The urology subdepartment became known as the Clinical Department of Urology, managed invariably by Maj. Kazimierz Szczepański MD, PhD. Due to the lack of a qualified team, the department performed mainly a service role.

In February 1962, the Department of Surgery was renamed the Chair of Surgery with the 1st Department of Surgery of the 2nd Central Teaching Hospital of the Military Medical Academy. Col. Władysław Zagórski MD, PhD, who obtained his post-doctoral degree in June 1961, was appointed head of the department [7, 9].

From the very beginning of the hospital's establishment, the heads of the wards and department directors engaged in scientific work and teaching activities in addition to their therapeutic and service activities. Władysław Zagórski conducted experimental animal studies on the induction and treatment of acute pancreatic diseases and surgical indications in this condition, including the surgical treatment of gastric diseases. Together with the department team, he initiated the production of tissue adhesives and their clinical application [6-9]. In addition, there were experimental studies of open-heart surgery, research into the development of an in-house resuscitation technique for cardiac arrest, adhesion-related disorders, vascular suture and associated techniques and materials, and the proper selection of biologically active grafts [11]. Noteworthy is the close cooperation between the Department of Surgery and the Department of Internal Medicine. They worked together in the diagnosis and differentiation of diseases of the stomach, duodenum, biliary tract, and the pancreas and the surgical indications in these conditions [8]. During that period, 34 doctors obtained their doctoral degrees in surgical specialities, seven doctors became assistant professors, one assistant professor was appointed associate professor and one associate professor was given the title of full professor. In the 20 years of the departments' existence, 67 papers were published, 54 of which were published after the establishment of the 2nd Central Teaching Hospital of the Military Medical Academy [9] (Fig. 4).

In 1974, the Department was moved to the hospital buildings on Szaserów Street and incorporated into the structures of the newly founded Institute of Surgery at the Postgraduate Education Centre of the Military Medical Academy.

Figure 4. Personnel of the clinic

Department of Trauma Surgery and Orthopaedics

The replacement of the scientific head of the Department of Surgery in October 1958 by Col. Prof. Marian Garlicki MD, PhD had a significant impact on the future of the hospital's orthopaedic departments. In the summer of 1957, the professor was again called up for active military service from the reserves and on 1 August 1957 started working at the Central Hospital of the Ministry of Defence as Chief Surgeon of the Polish Army and head of the Department of Trauma Surgery [6].

In the same year, the Department of Trauma Surgery was transformed into an independent Second Surgical Department, whose head was Maj. Asst. Prof. Stefan Malawski MD, PhD (Fig. 5).

The next stage in the development of the surgical departments was linked to the establishment of the Military Medical Academy in Łódź in 1958 and the integration of the hospital into its structures. The Central Hospital of the Ministry of Defence was renamed 2nd Central Teaching Hospital of the Military Medical Academy. The basic duties of the hospital were extended to include teaching – postgraduate and specialised training of medical personnel began in the army, which also included the staff of the 2nd Central Teaching Hospital of the Military Medical Academy.

Figure 5. Lt. Stefan Malawski MD, PhD

Thanks to Prof. Garlicki's tremendous efforts, in 1958 the department was transformed into the Department of Orthopaedics and Trauma Surgery. Initially, it only had 40 orthopaedic and trauma beds for adults. After the department was moved to a new wing in Koszykowa Street, it gained an operating theatre, and the creation of a 30-bed sub-department of paediatric orthopaedics, managed by Col. Jerzy Szulc MD, PhD, and a sub-department of plastic surgery, headed by Col. Stanisław Falkowski, MD, PhD [12]. Specialist orthopaedic outpatient departments were arranged, i.e. an outpatient department for children with congenital anomalies of the hip and spine and other defects, a rehabilitation outpatient department for patients after surgery or trauma, with postural defects and children with paralysis as a result of polio, and a newborn hip dysplasia unit operating in close cooperation with the maternity clinic. The Department also supervised the 3rd Military Rehabilitation Centre in Lądek Zdrój. A specialist library with a photo lab was set up as part of the clinic. The Orthopaedic and Trauma Outpatient Clinic, established in the same year, provided services, drawing on the knowledge and experience of the department team [13] (Fig. 6).

Prof. Marian Garlicki balanced the duties of the clinic's director with those of the commander (rector) of the newly established Military Medical Academy, a position he assumed on 14 October 1958. He was supported by Col. Władysław Barcikowski MD, PhD who was appointed the clinic's head and deputy director [6].

The scientific and research activities of the Department between 1946 and 1966 focused on issues related to the

Figure 6. Medical staff of the clinic

treatment of congenital hip dislocations, degenerative and deformational changes of the hip joints, the pathomechanics and treatment of habitual shoulder dislocations, the effects of ionising radiation on bone tissue and wound healing in radiation sickness, the biology of bone unions, methods of surgical treatment of Dupuytren's disease and tendon reconstruction [14]. Experimental work was also carried out on osteoarticular tuberculosis, the stimulation and inhibition of epiphyseal cartilage growth and the biology of bone unions. The wide range of studies also included issues related to military service, i.e. sports injuries, shoulder dislocations, Achilles tendon ruptures, overload fractures. The department of paediatric orthopaedics was primarily concerned with the treatment of congenital malformations and the development of new therapeutic methods. There was a prelux clinic at the ward, which cared for children with congenital malformations of the musculoskeletal system. An important aspect of the clinic's activities was its educational work as part of specialized internships [9, 14].

Clinical Department of Burns and Plastic Surgery

On 5 December 1970, an independent 25-bed Clinical Department of Burns and Plastic Surgery of the Postgraduate Education Institute of the Military Medical Academy was established at Koszykowa Street, which had previously operated as a subdivision within the surgical departments and then the Department of Orthopaedics and Trauma Surgery. From 1964, the department was directed by Col. Stanisław Lisicki MD, PhD, who remained in this position until the department was moved to buildings located at 128 Szaserów Street, i.e. until 1974 (Fig. 7).

At the time of its establishment, the department was the only facility of this speciality in the Polish Army and was intended to be a training centre for future burn treatment staff in the army. The original staff of the newly created department included: Lt. Jerzy Chęciński MD, Lt. Witold Goller MD, Lt. Andrzej Zaleski MD, and Col. Zbigniew Solek MD.

In the early days of the department, research was started on prognostic factors in burns, burn shock, electric burns, and the use of immunosuppression in the treatment of burn injuries. A large part of the studies included issues covered in the doctrine of burn treatment and disaster medicine. In the field of plastic surgery, the research focused on skin grafts, burns and shin ulcers [15, 13].

In 1974, the department was moved to the hospital

Figure 7. Col. Stanisław Lisicki MD, PhD

complex at 128 Szaserów Street and incorporated into the structure of the Institute of Surgery at the Postgraduate Education Centre of the Military Medical Academy.

2nd Central Teaching Hospital of the Military Medical Academy, Warsaw, 128 Szaserów St.

The hospital at 102/108 (currently 128) Szaserów St. was opened on 12 October 1964. A significant proportion of the clinical departments previously located in Koszykowa Street was relocated here, allowing for the expansion of both the range of health services provided and the research and training activities of the 2nd Central Teaching Hospital of the Military Medical Academy. The incorporation of the 1st Military District Hospital, which had previously been located in Nowowiejska Street in Warsaw – a large centre with major scientific achievements – into the structures of the 2nd Central Teaching Hospital of the Military Medical Academy undoubtedly played an important role in the further development of the institution. The surgery departments were provided with a complex of operating theatres with adapted apparatus and surgical instruments that could take into account the specificities of each speciality, as well as a separate 'septic' operating theatre [16].

In an article published in "Lekarz Wojskowy" in 1966, Professor Garlicki wrote: 'The post-war period has seen tremendous advances in medical specialities worldwide. Summing up the 20-year output of our two hospitals, one may objectively state that we have been able to keep pace in the overall progress in these fields of medical art and have managed to secure highly qualified specialist assistance for our patients, as well as to arouse doctors' scientific and research interests. The latter increased immeasurably with the creation of the Military Medical Academy and the granting of "academic" rights to the Central Hospital of the Ministry of Defence. The noble competition motivated everyone to put more effort into their studies and degrees' [9].

In 1967, based on the 2nd Central Teaching Hospital of the Military Medical Academy, the Postgraduate Education Institute of the Military Medical Academy with the 2nd Central Teaching Hospital of the Military Medical Academy was founded by an order of the Minister of National Defence under the rights of the Faculty for Postgraduate Education with its headquarters in Warsaw.

The Institute included:

- 2nd Department of Surgery – director: Col. Asst. Prof. Franciszek Smolarek MD, PhD (Fig. 8);
- Academic and Clinical Department of Orthopaedics and Trauma Surgery – director: Col. Prof. Jerzy Szulc MD, PhD (Fig. 9);
- Clinical Department of Neurosurgery – director: Stanisław Rudnicki MD, PhD (Fig. 10);
- Clinical Department of Urology – director: Kazimierz Szczepański MD, PhD;
- Department of Neurology – director: Lt. Col. Asst. Prof. Teofan Domżał MD, PhD.

The Institute was granted the right to appoint its own Scientific Council, the first meeting of which was held on

Figure 8. Col. Prof. Franciszek Smolarek MD, PhD

Figure 9. Col. Prof. Jerzy Szulc MD, PhD

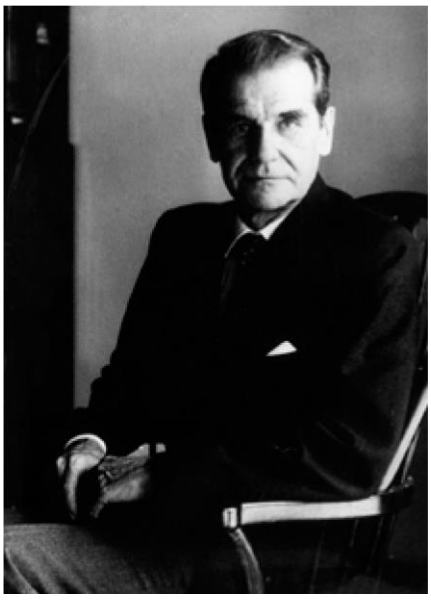

Figure 10. Col. Prof. Stanisław Rudnicki MD, PhD

20 November 1969. The Council consisted of 33 members, and the following were appointed from among the staff of the surgical departments: Col. Prof. Jerzy Szulc MD, PhD, Prof. Władysław Zagórski, Col. Asst. Prof. Franciszek Smolarek MD, PhD, and Maj. Edward Stanowski MD.

The establishment of the IKP WAM expanded the scope and range of the Institute's teaching and training activities, as it trained both military and civilian health professionals of the Polish Army from all over the country, as well as fellows of the Polish Academy of Sciences.

The training covered:
- two-year postgraduate rotation,
- three-month pre-examination courses for specialisation students,
- short thematic courses.

2nd Department of Surgery

The Department of Surgery of the 1st Military District Hospital, incorporated in 1964 into the 2nd Central Teaching Hospital of the Military Medical Academy in 1964, started its therapeutic activities as early as 9 April 1945, when it admitted its first patients. The working conditions in the premises at Nowowiejska Street were terrible. The building was very damaged – it had no doors, no windows, no furnaces, the plumbing was damaged, the roof was leaking, there was no electric light, while linen and the most necessary surgical instruments were missing. Nevertheless, thanks to the immense efforts of the staff, the department performed surgical procedures on a regular basis.

The activities of the department during the first decade were mainly service-based; it was only in the second half of the 1950s that research work began, undoubtedly prompted by the decision of the superiors in 1955 to provide health services to civilians as well. In 1957, Col. Franciszek Smolarek MD, PhD became the scientific head of the surgical departments. His scientific work involved the study of disorders of peripheral circulation in the limbs. He also devoted 30 years to another subject, which was the use of ganglioplegia to treat shock and to detect and stop bleeding, especially from parenchymal organs and the gastrointestinal tract. He was supported in his research by Jerzy Ancerowicz, Ryszard Ostaszewski, and Józef Adamczyk [4].

Clinical Department of General Surgery

In 1964, the Clinical Department of General Surgery of the 2nd Central Teaching Hospital of the Military Medical Academy was established based on the department. In September 1967, it was renamed the 2nd Department of Surgery with a Subdepartment of Vascular Surgery. The department was continuously directed by Prof. Franciszek Smolarek until 1983.

The clinic's research interests in the early years concerned peripheral vascular, thoracic and abdominal surgery, while investigations into the autonomic nervous system were also conducted. Experimental studies in the clinical use of tissue adhesives (cyanoacrylate and biological) and clinical studies on the pathophysiology of the peripheral circulation in chronic lower limb ischaemia continued, including: comprehensive evaluation of striated muscle samples, platelet adhesion disorders and changes in lipid metabolism [17].

Department of Orthopaedics and Trauma Surgery

The Department of Orthopaedics and Trauma Surgery, moved to Szaserów Street in September 1964, also inheriting the team of the Department of Trauma and Orthopaedic from the dissolved 1st Military District Hospital. The Academic Department of Trauma and Orthopaedic Surgery was established, which was headed (to 1966) by Brig. Gen. Prof. Marian Garlicki, who was then replaced by Col. Prof. Jerzy Szulc. In 1973, Prof. Donat Tylman MD, PhD took over the clinic (Fig. 11).

Fig. 11. Col. Prof. Donat Tylman MD, PhD

The department included:
- 1st Department of Trauma Surgery and Orthopaedics with the Subdepartment of Paediatric Orthopaedics,
- 2nd Department of Trauma Surgery and Orthopaedics with the Subdepartment of Plastic Surgery,
- 30-bed Recovery Unit, established in 1964, designed to facilitate and accelerate the return of soldiers to military service,
- In 1967, the Operating Theatre and the Department of Neurotraumatology were incorporated into the department.

The main lines of research included: osteo-articular tuberculosis, the biology of bone unions, surgical treatment of shin ulcers and burns, the remodelling and clinical usefulness of allogeneic frozen and radiation-sterilised bone grafts, research and work on external bone stabilisers, treatment of early childhood lateral curvature of the spine, using the 'RRC-2 extendable surgical retractor', correction and alignment of lower limbs, experimental studies and treatment of stress fractures of the femoral neck. In addition, the teams carried out mechanical studies on the measuring apparatus in collaboration with the Military University of Technology and the Warsaw University of

Technology [13, 14, 18].

Clinical Department of Urology

The Clinical Department of Urology relocated to new buildings in 1964, along with the Department of Urology of the 1st Military District Hospital, directed by Col. Jerzy Buliński MD, PhD [19], had 35 beds. Until 1974, Kazimierz Szczepański MD, PhD was the director of the department. The new facilities offered the department its own operating theatre, endoscopy room and X-ray room. The medical staff included 4 members: Col. Jerzy Buliński MD, PhD, Arnold Litwak, Andrzej Hałas, and Adam Alexandrowicz. The ward nurse was Irena Słomińska, while Barbara Kolasa was in charge of the operating theatre. The department's research interests revolved around urethral trauma and partial resection of the renal parenchyma and the use of ultrasound and microwave therapy in the treatment of plastic induration of the penis [9, 20].

Department of Neurosurgery

The Department of Neurosurgery was opened in 1965, initially as a 10-bed sub-department within the Department of Neurology, with Col. Stanisław Rudnicki MD, PhD as the director. The sub-department became the Clinical Department of Neurotraumatology in 1967. Col. Rudnicki, a future professor, held the position of director until 1992. The first team working at the department was rather small: Stanisław Rudnicki MD, PhD, Apolinary Kępski MD, PhD, two scrub nurses and several other nurses. By the 1970s, the department had already substantially increased the number of employees and developed its scientific activities. The basic and applied research conducted was related to the core areas of neurosurgery, such as the pathomechanism of spasticity, the pathophysiology of spinal cord injury, the pathophysiology of cerebral blood flow in vascular disease, the pathophysiology and treatment of cerebral oedema and other causes of intracranial hypertension, as well as the comprehensive diagnostic and therapeutic management of pituitary adenomas [21, 22].

Postgraduate Education Centre of the Military Medical Academy

Following yet another organisational change, the Postgraduate Education Institute of the Military Medical Academy became the Postgraduate Education Centre of the Military Medical Academy in 1974 and became the main facility providing education and postgraduate training for medical personnel of all professional groups in the military health service [23]. The centre's tasks in respect of specialist medical services did not change. It remained the army's leading consultation centre and the primary platform for the specialisation and scientific development of medical personnel. The centre's responsibilities also included scientific research with implementation within the scientific plan of the Ministry of Defence. The structure was modified – 4 institutes were created within the centre, including the Institute of Surgery, headed by Col. Prof. Tadeusz Orłowski MD, PhD (Fig. 12).

Fig. 12. Col. Prof. Tadeusz Orłowski MD, PhD

The Institute of Surgery consisted of seven departments:

- 1st Department of Surgery – Col. Prof. Władysław Zagórski MD, PhD,
- 2nd Department of Surgery – Col. Asst. Prof. Franciszek Smolarek MD, PhD,
- Department of Trauma Surgery and Orthopaedics – Asst. Prof. Donat Tylman MD, PhD,
- Department of Neurosurgery – Stanisław Rudnicki MD, PhD,
- Clinical Department of Burns and Plastic Surgery – acting Col. Zbigniew Solek MD,
- Clinical Department of Chronic Diseases (Recovery Unit), which remained in close cooperation with the Clinical Department of Burns and Plastic Surgery – Col. Stanisław Kowalski MD, PhD,
- Clinical Department of Urology – acting Col. Andrzej Hałas MD, PhD (Fig. 13).

Fig. 13. Col. Andrzej Hałas MD, PhD

The relocation of the departments from Koszykowa Street to Szaserów Street integrated inpatient treatment into a single organism, while polyclinic treatment was centralised at Koszykowa Street. This created a strong clinical centre and a comprehensive polyclinic with multi-profile specialist outpatient clinics. The new structure of the hospital, the expansion of the diagnostic and laboratory facilities, the highly specialised training, and, most importantly, the scientific development of the staff enabled multi-centre research. This included the development and implementation of 'First Aid Guidelines for Burns' (1975) in cooperation with the Military Technical Academy and the

preparation of the principles and a national prototype of a carbon dioxide (CO2) laser for removing necrotic tissue from burn wounds. The many years of research into the use of surgical adhesives for wound management and glue-collagen dressings, which began back in the 1960s, have found their way into clinical practice. The results of the research were popularised both by publication in scientific journals and by presentations at numerous national and international congresses and conferences. One way of disseminating surgical knowledge was through the highly popular scientific and educational film 'Kleje w chirurgii' (Adhesives in Surgery). The production took place at the Postgraduate Education Centre of the Military Medical Academy, with Col. Stefan Karliński, Dpharm, as the director and cinematographer. The film was presented in Padua at the International Festival of Scientific and Educational Films, where it won the Silver Bucranium in the Surgical Film category [24]. In 1976, at the international 6th Festival of Educational and Scientific and Technical Films in Katowice, the film won third prize in the Scientific and Research Film category [25].

The orthopaedic surgeons collaborated with industry to develop prototype hip prostheses, which were manufactured and donated to interested centres in the country, making hip alloplasty available [26].

The Staff Publication Bibliography of the Military Institute of Medicine lists 226 papers written between 1946 and 1974 by employees of the surgical departments [27].

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REPORT FROM THE 5TH SCIENTIFIC MEETING OF THE POLISH SOCIETY OF MEDICAL BIOLOGY: "BIOLOGY – MEDICINE – THERAPY"

Sprawozdanie z V Zjazdu Naukowego Polskiego Towarzystwa Biologii Medycznej „Biologia – Medycyna – Terapia"

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Abstract: The 5th Scientific Meeting of the Polish Society of Medical Biology: "Biology-Medicine-Therapy", was held on 15–17 September 2022 in Lublin. It was organised at the John Paul II Catholic Medical University. The Chairman of the Scientific Committee was Prof. Ryszard Maciejewski, while the role of Chairman of the Organising Committee was Katarzyna Czarnek, PhD. Topics included the latest research from the fields of biology, medicine, veterinary and pharmacy. Particular attention was paid to the problems of health threats. The presentation covered modernised methods of health monitoring and broadly defined human health protection.
Key words: medicine, pharmacology, Polish Society of Medical Biology, biology.

Streszczenie: V Zjazd Naukowy Polskiego Towarzystwa Biologii Medycznej „Biologia-Medycyna-Terapia" zorganizowany na terenie Katolickiego Uniwersytetu Medycznego Jana Pawła II w Lublinie odbył się w dniach 15–17 września 2022 r. Przewodniczącym Komitetu Naukowego tego spotkania był prof. Ryszard Maciejewski, zaś rolę Przewodniczącej Komitetu Organizacyjnego pełniła dr Katarzyna Czarnek. Tematyka zjazdu obejmowała zbiór najnowszych badań z dziedzin dotyczących nauk biologicznych, medycznych, weterynaryjnych oraz farmaceutycznych. Przedstawiono unowocześnione metody monitorowania stanu zdrowotnego oraz szeroko pojętej ochrony zdrowia człowieka.
Słowa kluczowe: medycyna, farmakologia, Polskie Towarzystwo Biologii Medycznej, biologia.

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The opening lecture was given by Prof. Grzegorz Telega from the Medical College of Wisconsin. His lecture was dedicated to genetic and metabolic liver diseases. In his opinion, liver transplantation as a form of gene therapy appears to be the most beneficial solution in a significant number of liver conditions in children.

Session I was devoted to 'Biological and Experimental Therapies'. Ground-breaking neurodegenerative disease research was presented by Prof. Grzegorz Węgrzyn (Faculty of Biology, Department of Molecular Biology – Gdańsk). In his lecture, 'Stymulacja autofagii jako potencjalna metoda leczenia choroby Huntingtona' (Stimulation of autophagy as a potential treatment for Huntington's disease), he presented results suggesting that increasing the efficiency of pathological protein degradation through the stimulation of lysosomal biogenesis with genistein (4',5,7-trihydroxyisoflavone) may be the most effective treatment for such diseases. It was also found that genistein induces autophagy and corrects the phenotype in a cellular model of Huntington's disease. The results of behavioural tests conducted on a mouse model of the disease showed that oral administration of genistein can reduce, or even rectify, many motor and cognitive defects in affected animals. Other speakers in the discussion included Prof. Jacek Malejczyk (honorary member of the Polish Society for Medical Biology) and Prof. Piotr Trzonkowski (Department of Medical Immunology – Gdańsk).

The session also discussed another groundbreaking study, which looked at regulatory T-cell-based therapies for autoimmune diseases such as type 1 diabetes and multiple sclerosis. Prof. Piotr Trzonkowski outlined the pathway of modern therapies from discovery to finished drug.

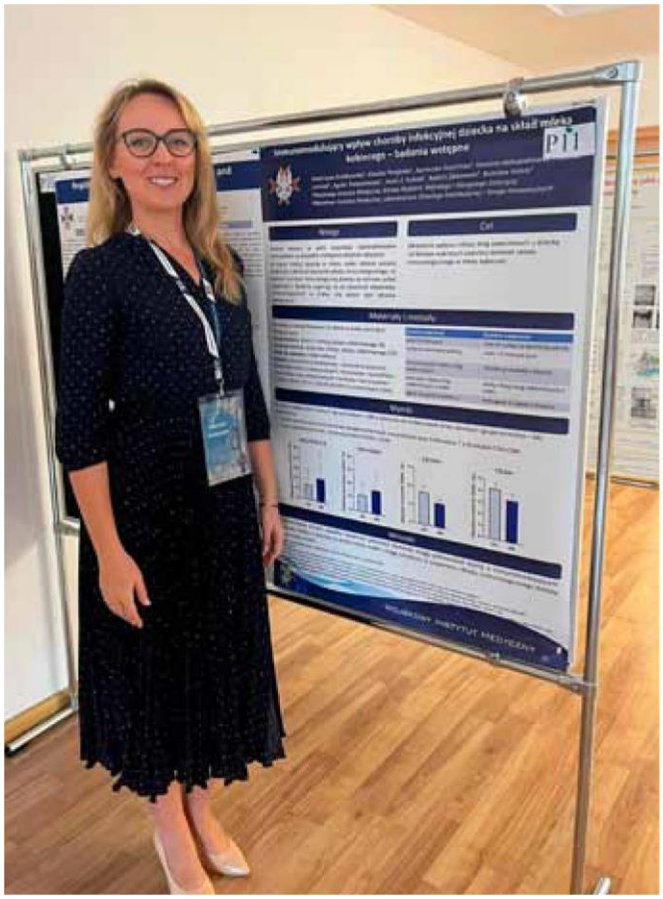
The problem of chronic (long-term) rejection, which affects 70% of all transplanted organs, was addressed by Prof.

Małgorzata Kloc (Weill Cornell Medical College – Houston). She used a mouse model to demonstrate that chronic rejection depends on macrophages that enter the organ in the first week after transplantation and induce vascular closure and deposition of collagen fibres, thus leading to fibrosis. This process relies on the actin cytoskeleton, which is regulated by RhoA ATPase and its effector, the ROCK1/2 kinase. Blocking ROCK activity, or genetic deletion of RhoA from macrophages, disrupts the actin cytoskeleton function, causes macrophage elongation (hummingbird phenotype) and prevents macrophages from entering the organ. Recent studies have shown that ROCK inhibitors which have been approved for clinical use, Fingolimod (for multiple sclerosis) and Rezurock (for graft-versus-host disease, GVHD) block chronic rejection in a rodent cardiac transplantation model. In addition, it was proved that the RhoA signalling pathway can also be regulated by converting a mechanical stimulus into electrochemical information (mechanotransduction) through the mechanoreceptors at the cell membrane, which respond to mechanical pressure on the membrane. Macrophages exposed to the mechanical force created by the magnetic field gradient have a dysfunctional actin cytoskeleton and assume the elongated hummingbird phenotype. Installing a device that generates a magnetic field gradient close to the graft may block the macrophages from entering and thus prevent chronic rejection.

Session II covered the topic of 'Full-Profile Oncology – Diagnosis and Treatment'. Prof. Elżbieta Starosławska (Hospital Specjalista Sp. z o.o. – Kutno), following the ideas of Prof. Tadeusz Koszarowski (founder of oncological surgery in Poland), reiterated the need for interdisciplinary oncology organised in a network of comprehensive centres encompassing all research and treatment, methodological, organisational and preventive methods used in cancer treatment. The meta-analysis conducted showed better therapeutic outcomes among patients treated in full-profile oncology centres than elsewhere.

Prof. Wiesław Wiktor Jędrzejczak (Department of Haematology, Oncology and Internal Diseases, Central Teaching Hospital of the Medical University of Warsaw) spoke about bone marrow transplantation as a treatment for blood diseases. The method is essentially based on the prior destruction of the existing haematopoietic system together with the disease and the subsequent generation of a healthy haematopoietic system from the transplanted stem cells. Either the patient's own healthy cells (autologous transplants) or cells obtained from another, specially selected person (allogeneic transplants) are used, depending on the needs. Despite some 40 million potential donors (including about 2 million in Poland), approximately 20% of patients cannot find a compatible donor. This problem has largely been solved by transplantation from a half-matched (haploidentical) donor.

An interesting lecture was presented by Tomasz Trombik (Experimental Medicine Center – Lublin) on the link between melanoma and the increase in cholesterol present



in its cells and its lateral organisation. It was shown that this process is modelled by the expression of ATP-binding cassette transporter A1 (ABCA1), which promotes the removal of cholesterol from the cell. Loss or inhibition of ABCA1 protein activity affects the extracellular matrix digestion and melanoma cell invasion capacity.

Session III focused on 'Biology and Medicine of Development'. Col. Marek Saracyn MD, PhD, Assoc. Prof. at WIM-PIB, in collaboration with Prof. Leonard Wartofsky's team from Georgetown University, Washington, DC, who for the first time in the literature presented a new mechanism related to the action of TSH. It was found that, through the specific receptors located in the renal blood vessels (and independently of thyroid hormones and relevant cardiovascular parameters, such as heart rate or blood pressure), TSH had a direct and independent effect on kidney blood supply and function.

The cellular and molecular mechanisms of action of bacterial lysates in allergic diseases were discussed by Kamil Janeczek MD, PhD (Department of Pediatric Pulmonary Diseases and Rheumatology – Lublin). A mixture of antigens extracted from inactivated bacteria, which are the most common aetiological agents of respiratory infections, has immunomodulatory properties and affects immunity through the production of specific antibodies. BLs display anti-inflammatory effects and restore the Th1/Th2 lymphocyte balance, the disruption of which causes allergic diseases. BLs affect dendritic cells to reduce Th2 cytokines (IL-4, IL-13) and increase Th1 cytokines (IFN-γ). This reduces the intensity of allergic inflammation and thus improves the clinical course of allergic diseases.

The session was moderated by the chairpersons, Prof. Barbara Wróblewska (Institute of Animal Reproduction and Food Research, Polish Academy of Sciences – Olsztyn), Prof. Bolesław Kalicki (Military Institute of Medicine – National Research Institute, Department of Paediatrics, Nephrology and Paediatric Allergology) and Col. Marek Saracyn MD, PhD (Military Institute of Medicine – National Research Institute, Department of Endocrinology and Isotope Therapy). After the session, due to the busy agenda and limited speaking time, the heated discussion on the research moved backstage.

During Session IV, covering 'Cell Biology', Prof. Jacek Kubiak (Centre National de la Recherche Scientifique and Universite Rennes – France) spoke about translationally-controlled tumour-associated protein (TCTP) in the context of cancer therapy. Many tumour types demonstrate overexpression of TCTP, often correlated with aggressiveness and with the stage of the disease. Suppression of TCTP protein expression is one of the main factors behind the reversal of the tumour phenotype in cancer cells. It was shown that a decrease in TCTP levels in ovarian cancer cells is accompanied by an increase in the expression of the p53 tumour suppressor protein. A distortion of the correlation in favour of TCTP is an important factor in amplifying the neoplastic phenotype of the cells.

Session V discussed the ever-present issue of coronaviruses, which are characterised by great variability. Prof. Andrzej Siwicki (Department of Microbiology and Clinical Immunology of the University of Warmia and Mazury – Olsztyn) explained that this is a resultant of two factors: extremely labile RNA and the lack of repair mechanisms for RNA-dependent RNA polymerase.

Another interesting study was presented by Robert Zdanowski PhD in biology (Military Institute of Medicine – National Research Institute, Laboratory of Molecular Oncology and Innovative Therapies). It examined the role of regulatory lymphocytes responsible for suppressing the immune response and protecting the body from autoimmune disease in a SARS CoV2 infection. He and his team proved that a reduction in the percentage of regulatory lymphocyte subpopulations combined with a strong increase in the pro-inflammatory response appears to be the main reason behind the severity of SARS CoV-2 infection.

Session VI (VARIA) featured a study by Katarzyna Królikowska MD, PhD (Military Institute of Medicine – National Research Institute, Department of Paediatrics, Nephrology and Paediatric Allergology) on the immunomodulatory effect of the child's infectious diseases on breast milk composition. The results helped to observe changes in the percentage of cell populations tested, which may confirm the theory that a child's infection has an immunomodulatory effect on the composition of breast milk, indicating that breast milk contributes to the child's immune system.
In her paper, Agnieszka Rustecka MD, PhD (Military Institute of Medicine – National Research Institute, Department of Paediatrics, Nephrology and Paediatric Allergology) demonstrated that cow's milk protein allergy is an important cause of food allergy among children, and that rapidly developing molecular diagnostics enables the determination of the clinical manifestation of the allergy, the development of a personalised allergy profile, and the specification of the severity of the allergic reaction correlated with the risk level of a potential anaphylactic reaction. The novelty of the method opens doors into the future of allergology.

A study on progranulin as a biomarker of asthma in children was outlined by Milena Pogonowska MD, PhD (Military Institute of Medicine – National Research Institute, Department of Paediatrics, Nephrology and Paediatric Allergology). It confirmed the usefulness of FeNO in the diagnosis of allergic asthma in the paediatric population and, at the same time, suggested that the role of progranulin and MMP-9 in the pathogenesis of asthma and their usefulness as biomarkers in children require further research.

Session VII concerned immunology and included a lecture by Prof. Teresa Jackowska (Department of Paediatrics, Medical Centre for Postgraduate Education, Department of Paediatrics at Bielany Hospital – Warsaw) on vaccinations

recommended for adults. The main points were that every adult should be vaccinated against seasonal flu and get Tdap vaccine every 10 years. HPV vaccine is recommended for those aged 19–26. Hepatitis B vaccine is suggested for patients not previously vaccinated. For seniors over 65 years of age, PCV 13, PCV 15, and PCV 20 vaccines are recommended. Adults (over 19 years of age) may require additional vaccines if they suffer from: asplenia, diabetes, heart disease, stroke, HIV infection, liver disease, lung disease (including asthma), kidney disease, impaired immunity (including pneumococcal conjugate vaccine and meningococcal B and ACWY vaccine). Pregnant women are advised to take Tdap vaccine (27–36 weeks pregnant) and the flu vaccine (October to May). Healthcare workers should be vaccinated against: hepatitis B, MMR (measles, mumps and rubella), chickenpox, and meningococcal disease.

Barbara Joanna Bałan, Assoc. Prof. at the Medical University of Warsaw (Department of Environmental Risk Prevention, Allergology and Immunology of the Medical University of Warsaw) discussed immunomodulation with medicinal plants and their products used in infections as an essential element in protecting human health. Immunotropic properties were found in: *echinacea purpurea*, tea tree essential oil, *aloe vera*, mangosteen, elderflower, verbena, and *gentianae radix*.

During Session VIII, centred on 'Regenerative Medicine and Biotechnology', Marta Fiołka PhD, Assoc. Prof at the Maria Curie-Skłodowska University analysed bioactive compounds obtained from earthworms for use in medicine. She demonstrated that earthworm extracts contain macromolecules offering antimicrobial, antifungal, antioxidant, anti-inflammatory and anticancer functions. *Lumbricus terrestris* extract has the ability to regenerate peripheral nerves after injury. Substances found in earthworm products accelerate wound healing and reduce myocardial ischaemia. Proteases derived from these invertebrates are known fibrinolytic and anti-cancer agents. They also enhance the effect of radiotherapy and chemotherapy in lung cancer treatment.

The 5th Scientific Meeting of the Polish Society of Medical Biology titled 'Biology-Medicine-Therapy' was undoubtedly a valuable source of information and contributed to the understanding of the mission that medical biology has in the modern world. It also revealed that further intensive research development in this area is necessary.

The Military Institute of Medicine, National Research Institute

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