REVIEW ARTICLE

PHARMACOLOGICAL TREATMENT OF SCARS AFTER GYNAECOLOGICAL AND OBSTETRIC SURGERIES

Farmakologia w terapii blizn po operacjach ginekologicznych i położniczych

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Abstract

Scarring after gynaecological (e.g., hysterectomy), urogynaecological (e.g., treatment of pelvic organ prolapse and/or incontinence) or obstetric (e.g., caesarean section) procedures is one of the most common reasons for reporting to a urogynaecological physiotherapist. The consequences of surgical treatment may include hypertrophic scarring or keloids; chronic pelvic pain; dyspareunia; infertility; non-specific gastrointestinal, urinary, reproductive complaints; musculoskeletal pain syndromes; abnormal posture and gait patterns. In order to counteract or reduce the consequences of postoperative adhesions, scar treatment should be implemented in a planned manner, using appropriate pharmacological agents as a base. The efficacy of many preparations for this purpose has not been proven or investigated. The article discusses active substances included in preparations for scar treatment, with detailed description of their characteristics, mechanism of action, pharmacological aspects and available scientific studies. We also propose a plan for scar treatment, taking into account the stages of wound healing, and pointing to the methods in which the use of pharmacological agents is justified.

Streszczenie

Jednym z najczęstszych powodów zgłaszania się pacjentek do fizjoterapeuty uroginekologicznego jest blizna po operacji ginekologicznej (np. usunięcia macicy), uroginekologicznej (np. leczenia zaburzenia statyki narządów miednicy mniejszej lub nietrzymania moczu) lub położniczej (np. cięcia cesarskiego). Konsekwencją przebytej operacji mogą być: blizna przerostowa lub bliznowiec, przewlekły ból miednicy, dyspareunia, niepłodność, nieswoiste dolegliwości układów pokarmowego, moczowego lub rozrodczego, zespoły bólowe narządu ruchu lub zaburzenie wzorca postawy ciała i chodu. Aby przeciwdziałać konsekwencjom zrostów pooperacyjnych lub je ograniczyć, należy w sposób planowany wdrożyć terapię blizny, najlepiej z wykorzystaniem odpowiednich środków farmakologicznych jako podłoża. W przypadku wielu z przeznaczonych do tego celu preparatów nie udowodniono ich skuteczności lub jej nie badano. W artykule omówiono substancje aktywne wchodzące w skład preparatów do leczenia blizn, wyszczególniając ich charakterystykę, mechanizm działania, aspekty farmakologiczne i dostępne badania naukowe na ich temat. Przedstawiono również autorski plan terapii blizny, uwzględniający etapy gojenia się rany, i wskazano metody, w których zasadne jest zastosowanie środków farmakologicznych.

Keywords: physiotherapy, gynaecology, obstetrics, pharmacology, scar treatment

Słowa kluczowe: fizjoterapia, ginekologia, położnictwo, farmakologia, terapia blizny

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Introduction

Scars following gynaecological or obstetric surgery are one of the most common reasons for patients presenting to a urogynaecological physiotherapist. Scar therapy can be supported with pharmacological agents used as a base. Unfortunately, many of the preparations intended for this purpose do not have the status of a medicinal

product or even a medical device. Their efficacy has never been proven or even investigated. This interdisciplinary paper will help physiotherapists select a proper preparation and estimate its actual efficacy in scar therapy, which makes the present paper pioneering in this respect.

Surgical treatment

Since hysterectomy, which is associated with the risk of pelvic organ prolapse (POP), is the most common gynaecological surgery, sparing procedures are recommended whenever possible (i.e. in patients with no risk of cancer) [1].

On the other hand, the goal of surgical treatment of pelvic floor disorders (POP and urinary incontinence, UI), which represent a significant social problem (according to various estimates, urinary incontinence affects 17–46% of women and up to 60% of menopausal women), is to restore normal anatomical relationships and improve the quality of life of patients in all aspects, i.e. eliminate pain, infectious, micturition and anorectal disorders, as well as sexual dysfunctions [2].

Finally, caesarean section (CC) is the most common obstetric surgery. The worldwide caesarean section rates are systematically growing, accounting for more than 80% in the private sector in some countries. The same trend may be seen in Poland, with CCs accounting for 47% of total births in 2022 (>50% in seven voivodeships).

Sequelae

Poor appearance of both the postoperative scar itself (hypertrophic scar, scarring) and the abdomen is most common complaint reported by patients following urogynaecological, gynaecological (abdominal access) and obstetric surgeries. The postoperative scar, even when properly formed, often adheres to the underlying tissues, which results in an overhang of skin and subcutaneous tissue [3].

However, adhesions, which affect between 46% and up to 100% of CC patients, are a significantly more serious consequence of surgery [4]. Postoperative adhesions may cause chronic pelvic pain (accounting for 10% of the reasons for gynaecologic appointments and affecting 6–50% of women after laparoscopic surgery), dyspareunia, infertility (accounting for infertility in 15–20% of patients), as well as non-specific gastrointestinal, urinary, reproductive and other symptoms [3, 5].

Musculoskeletal pain syndromes can develop as distant (both in terms of time and site) sequelae of postoperative adhesions resulting from restrictions within the healing tissues (i.e. reduced slide between tissue layers). They are caused by abnormal posture and gait patterns, altered tone and resting length of antagonistic muscle groups, and a change in the geometry and reduced elasticity of the fascia, which result from the presence of scarring (i.e. an area of inextensible tissues glued together). This can cause pain syndromes in the head, spine and pelvis [3].

Work with scars

In order to counteract the consequences of postoperative adhesions in this group of patients, or to reduce them as much as possible, a well-planned scar therapy should be implemented, preferably using pharmacological agents as a base to promote proper healing of the scar and improve its aesthetics (tab.).

Pharmacology in scar work

This part of the paper discusses the key active substances included in formulations for scar work, with a detailed description of active substance, its action, pharmacological aspects and available research assessing its efficacy.

Allantoin

Description: Allantoin belongs to the group of ureides (5-ureidohydantoin). It is a derivative of uric acid, a compound of plant origin, found in raw materials obtained from common comfrey (*Symphytum officinale*), its root in particular [6]. Preparations with medicinal product status are manufactured based on this substance.

Action: Allantoin is a commonly applied and widely described pharmacological and cosmetic agent. It is used to improve wound healing, stimulate cell mitosis and provide a keratolytic effect. It also promotes epithelial stimulation, has an anti-irritant and moisturising effect and accelerates granulation [6]. Its efficacy is particularly pronounced when used in combination with onion extracts.

Pharmacological aspects: Despite numerous citations, there are very few papers focusing on the actual mechanism of action of allantoin or showing the histological profile of wound healing.

Research: Araújo et al. [6] confirmed the efficacy of allantoin in wound healing in 2010. They also showed that the resulting tissue is better organised and has a structure more similar to healthy skin. Importantly, however, the authors pointed out that although 5% allantoin improves wound healing in treated patients compared to controls, the effect is not as strong as reported in the literature. Conti et al. [7] demonstrated that a monthly therapy with patches containing onion extract and allantoin reduced scars, increased their elasticity and improved pigmentation in women after CC. There are studies confirming the interesting properties of allantoin used for skin scaffolds, which have shown that it has antimicrobial and peripheral antinociceptive effects [8]. Allantoin-enriched pectin hydrogels show high potential for efficient use in wound healing [9].

Mountain arnica and meadow arnica

Description: The flowers of mountain arnica (*Arnica montana*) or meadow arnica (*Arnica chamissonis*), from which liquid water/alcohol extracts and ethanol tinctures are prepared, are used for medical purposes. They are used in a semi-solid form (5–50%), undiluted or diluted with water for compresses. Arnica flowers contain pseudoguaianolide sesquiterpene lactones, primarily represented by helenalin and dihydrohelenalin, as well as their esters, and these are considered the main active substances [10]. This raw material is used as the basis for formulations with medicinal product status.

Table. The author's original Scar Therapy Programme for patients after gynaecological and obstetric surgeries – physiotherapeutic methods

Phase	Physiotherapy methods
Inflammation (2–5 days postoperatively)	• manual lymphatic drainage (MDL) of the areas adjacent to the postoperative wound (abdomen and limbs) • lymphatic brush drainage of the areas adjacent to the postoperative wound (abdomen and limbs) using the ScarBrushing technique (ScarBru)[a] • self-lymph brush drainage of the areas adjacent to the postoperative wound (abdomen and limbs) – ScarBru[a] • wound closure strips
Proliferation and angiogenesis (up to 6–8 weeks postoperatively)	• *MDL of the areas adjacent to the postoperative wound (abdomen and limbs) and the wound area* • *lymphatic brush drainage of the areas adjacent to the postoperative wound (abdomen and limbs) and the wound area (ScarBru)* • *self-lymph brush drainage of the areas adjacent to the postoperative wound (abdomen and limbs) and the wound area – ScarBru* • *myofascial release of the abdomen and limbs, e.g. by Carole Manheim* • radiofrequency • low level laser therapy • medical taping / Kinesio taping
Remodelling (up to 6–24 months postoperatively)	• *continue the management used in the proliferation and angiogenesis phase (depending on the patient's condition)* • *direct manual scar treatment – gradual introduction of techniques* • *autotherapy – direct manual scar treatment – gradual introduction of techniques* • *gua sha* • *medical (vacuum) cupping* • *pinotherapy/pinopressure* • *instrument assisted soft tissue mobilization (IASTM)* • *iontophoresis* • high-intensity laser therapy (HILT) • dry needling • electroneedling • neuromodulation
Techniques with recommended use of pharmacological agents as a base for gynaecological and obstetric scar physiotherapy are given in italics. [a] by M. Chochowska.	

Action: Helenalin shows selective inhibitory effects against NF-κB factor activation, as well as against RelA binding to DNA, without affecting the activity of κB inhibitor kinases [10]. A modulatory effect on the NF-κB/IκB complex, preventing the release of IκB, has been postulated. This molecular mechanism of anti-inflammatory action is characteristic of sesquiterpene lactones (SLs) and differs significantly from that of the non-steroidal anti-inflammatory drugs (NSAIDs). NF-κB is a protein responsible for the transcription of genes encoding various inflammatory mediators [11].

Pharmacological aspects: SLs contained in mountain arnica flowers are slowly absorbed from the site of external (dermal) application. They penetrate the skin to a small extent and accumulate in the stratum corneum. Distribution and elimination following transdermal absorption is assumed to be analogous to intravenous (i.v.) and intraperitoneal (i.p.) administration. Although there are reports on the toxicity of helenalin, these refer to its oral use (in a mouse study, the LD_{50} values of helenalin were 43 mg/kg bw after i.p. administration and 85–150 mg/kg bw after i.v. administration) [12].

Research: There are too few studies on the mechanism of action and efficacy of arnica montana-based products. Olioso et al. [13] have presented new hypotheses from their polymerase chain reaction studies on the effect of this plant on human macrophages. Importantly, arnica montana ointments have been shown to be effective in the treatment of inflammatory processes and UVB-induced oxidative damage.

Allium cepa

Description: Onion bulbs (*Allium cepa*) are used in medicine. Sulfoxides are the main active compounds contained in onion [9]. The enzyme (alliinase) present in the common onion causes the formation of allicin as a product of alliin transformation. Raw material is used for preparations with drug status.

Action: Onion extract shows the therapeutic effect on human skin fibroblast cell line. It additionally prevents the formation of keloids and hypertrophic scars. Onion extract is used to improve the cosmetic appearance of postoperative scars, while onion ointments enhance the elasticity of burn scars [14]. Onion extracts have antimicrobial effects, inhibit platelet aggregation and reduce blood pressure [15]. Since studies on the efficacy of these actions are inconclusive (some indicate low efficacy), these extracts are mainly included in combined preparations.

Pharmacological aspects: The plant extract has effects on connective tissue metabolism, reduces granulation overgrowth, prevents hypertrophic scar formation and

enhances softening and relaxation of scar tissue. Since quercetin contained in an onion bulb shows poor transdermal absorption, this form of administration is not sufficiently effective.

Research: Prager and Gauglitz [16] reported that the use of occlusive patches containing onion extract and allantoin overnight effectively reduces acne scars. However, Jackson and Shelton [17] showed no improvement in local pruritus or scar erythema after application of onion extract gel.

Dexpanthenol

Description: Dexpanthenol belongs to the vitamin B group and is an analogue of pantothenic acid, a precursor of coenzyme A.

Action: Dexpanthenol facilitates wound healing, increases epidermal differentiation, strengthens the skin barrier and has a moisturising and anti-inflammatory effect. It is used for medicinal products and medical devices.

Pharmacological aspects: dexpanthenol is well absorbed into the skin, where it undergoes rapid conversion into pantothenic acid, a component of coenzyme A (essential for physiological epithelial function). Data on the expression of genes responsible for wound healing based on 3D skin models indicate that dexpanthenol effectively upregulates these genes (good correlation of *in vivo* model with dexpanthenol compared to 3D skin models) [18].

Research: Many studies indicate that dexpanthenol can effectively prevent skin irritation, enhance skin regeneration and stimulate wound healing [19].

Hyaluronic acid

Description: Hyaluronic acid (HA) is a polysaccharide with water-holding capacity. It is a component of connective tissue. HA consists of repeating disaccharides (D-glucuronic acid and N-acetylglucosamine). It was first isolated in the 1930s. HA is mainly used in medical devices and very few medicinal products.

Action: Hyaluronic acid is used as a dermal filler for correcting acne scars.

Pharmacological aspects: HA has the potential to normalise keloid fibroblast characteristic features such as hyperproliferation and growth factor production [20]. This way, fibrosis and keloid manifestation are reduced. High molecular weight hyaluronic acid has an anti-inflammatory effect, while low molecular weight molecules promote inflammation. Hyaluronic acid shows good skin penetration, which further increases when incorporated in formulations using ethosomes (phospholipid nanovesicles). After penetrating the outer layer, HA accumulates in the epidermis, which limits its systemic effects.

Research: Experimental studies on tympanic membrane perforations in rats treated with HA have shown that the perforations not only closed faster, but also left behind significantly less scaring compared to controls [21]. Additionally, the efficacy of combined treatment using 1,540-nm fractional erbium:glass laser and hyaluronic acid injections has been demonstrated [22].

Collagen

Description: Collagen is the most abundant protein in animals. It consists of a bundle of three left-handed polyproline II-like helices. Collagen accounts for one third of total human protein and is the most prevalent component of the extracellular matrix (ECM). It is mainly used in medical devices and dietary supplements.

Action: Natural collagen can form into structured, three-dimensional structures that are biocompatible, biodegradable and non-toxic, and is therefore used to support wound healing.

Pharmacological aspects: Pilot studies have shown that percutaneous collagen induction (microneedling) at a scar led to a significant increase in collagen content, elastin deposition and thickening of the spinous layer [23]. This mode of administration has the advantage of reaching areas inaccessible to ablative laser therapy. When ingested, collagen is broken down into amino acids, and therefore it is the body that decides on their assimilation and increased collagen production (it is beyond our influence in which tissue this process occurs most effectively). It seems very controversial that collagen, which is a relatively large protein, is able to penetrate intact skin. However, there are studies indicating that such penetration is possible with sufficiently high lipophilicity of fish-scale collagen peptides (FSCPs) (as the dominant factor in overcoming the barrier) [24]. The use of collagen preparations to treat wounds is a separate issue. Collagen gels, membranes, dressings, and injections ensure good collagen accumulation in damaged tissue. However, poor thermal and mechanical properties of collagen mean that it can be used in combination with other substances (e.g. alligans and chitosan) [25].

Research: Microneedle patches with collagen seem to be of great interest. A study on type I collagen patches showed that the microneedle system is effective in delivering collagen to the epidermis and dermis in humans [26].

Cocoa butter and shea butter

Description: Cocoa butter is a mixture of triglycerides of oleic, palmitic and stearic acids, virtually insoluble in water. This natural fat extracted from the seed kernels of the cocoa tree (*Theobroma cacao*) contains saturated and unsaturated fatty acids. It is also a source of copper, iron and magnesium, as well as polyphenols that neutralise free radicals [27].

Shea butter is an oil extracted from the seeds of the shea tree (*Vitellaria paradoxa*). It contains significant amounts of resins, as well as oleic and stearic acids, which are mainly used for cosmetics.

Action: Both substances provide the skin with adequate oiliness, elasticity and firmness, as well as work as an emollient. Cocoa butter additionally contains polyphe-

nols with antioxidant properties [27]. Shea butter also has antioxidant and anti-inflammatory properties and protects against UV radiation [28]. These butters are very popular ingredients of different formulations (mainly cosmetics), combined with other substances, e.g. in the form of creams. Products combining these two butters can also be found.

Pharmacological aspects: Studies confirm both the antioxidant and anti-inflammatory effects of shea butter. However, clear data to actually conclude that this substance helps in healing wounds are missing [28]. The same may be said about cocoa butter. Creams based on shea butter show better transdermal absorption compared to lanolin. As a result, higher levels of the active ingredient (if contained in the formulation) reach the site of action. Studies on the moisturising properties of cocoa butter indicate that its combined use with glycerine prolongs the moisturising effect of the composition [29].

Research: Moore et al. did not confirm that any topical agent (including cocoa butter and olive oil) could prevent or reduce stretch marks [30].

Olive oil

Description: The composition of olive oil is primarily triacylglycerols, the richest source of monounsaturated oleic acid. Sterols, tocopherols, phenolic compounds, antioxidants, squalene and squalane are also found in olive oil. The raw material is mainly used to produce cosmetics. **Action**: Due to its content of squalane, which prevents transepidermal water loss, olive oil helps reduce moisture loss from the skin. Additionally, the compounds it contains have proven antioxidant and anti-inflammatory effects and promote wound healing [28]. This provides slight lubrication of the outer layers of the epidermis and improved hydration of the deeper parts of the skin.

Pharmacological aspects: Polyphenols contained in the oil are mainly responsible for improving wound healing; however, too few studies have been conducted to discuss this issue comprehensively.

Studies: Taavoni et al. [31] have not confirmed that any topical agent (including cocoa butter and olive oil) prevents or reduces stretch marks; however, studies in mice have shown that olive oil improves wound healing by reducing inflammation in pressure sores [32].

Manuka honey

Description: Manuka honey is a natural bee product derived from the nectar of the flowers of the manuka shrub (*Leptospermum scoparium*). The plant is native to New Zealand and parts of Australia [33]. Manuka honey is mainly used for medical devices.

Action: The health-promoting effects of manuka honey, including its antimicrobial properties, are due to a different mechanism from that of other honeys. This is because manuka honey contains methylglyoxal, formed from the dihydroxyacetone present in the flower nectar. This action has been confirmed against both planktonic bacteria and biofilm strains of *S. aureus*, *P. aeruginosa*, and partially against *E. coli* and *P. mirabilis* [33].

Pharmacological aspects: Methylglyoxal modifies DNA, RNA and cell proteins to produce antimicrobial effects. However, there are no studies on such interaction with human cells. The antimicrobial effects are also due to high osmolarity. The natural high carbohydrate content of manuka honey, which means that diabetic patients should not use it without consulting their doctor (there are no such contraindications with manuka honey dressings), is a significant limitation. The honey has an immunostimulant, anti-inflammatory and antimicrobial effect on the wound, as well as it reduces scar formation [33]. It maintains proper level of moisture, thereby accelerating wound healing, while preventing bacterial growth. Its low pH acidifies the environment and deactivates proteinases that break down proteins responsible for the healing process [33].

Research: Seventeen randomised trials (1,965 participants) have reported the benefits of manuka honey used as a wound dressing [34]. Additionally, a study by Malhotra et al. indicated a possible subjective benefit of manuka honey in eyelid wound healing, even in the early postoperative period [35].

Insulin ointments

Description: Insulin is an anabolic peptide hormone secreted by the beta cells of the Islets of Langerhans and has many physiological functions in the human body. Although insulin ointments are a rare prescription drug, they can be encountered in practice. Insulin is mainly used for cosmetics and (prescription) drugs.

Action: In the context of wound treatment, insulin induces an early neutrophil response, increases macrophage count and IL-10 levels, facilitates phagocytosis, enhances local keratocyte migration, increases local collagen deposition and maturation, as well as boosts local angiogenesis. It also has antioxidant effects following topical application [36].

Pharmacological aspects: Insulin receptors (tyrosine kinase type), which occur in all cell types, are also found in keratocytes and fibroblasts. Topical application of insulin (ointment) on skin wounds enhances keratinocyte migration. Faster wound healing is due to upregulation of integrin α3β1 in keratocytes [36]. Systemic administration of insulin is associated with subsequent hypoglycaemia and hypokalaemia, and therefore topical forms are often used. However, due to the need for an additional carrier to stabilise the dose reaching the tissue in a given unit of time (better penetration and relatively constant rate), this form is still imperfect. Consequently, insulin is generally used in the form of ointment and can also be administered on stable carriers, such as hydrogels [36].

Research: Lima et al. [37] showed improved wound healing after topical application of insulin creams in their animal and human diabetic studies. Similar findings were reported by Vatankhah et al. [38], with the reservation that further research is needed.

Jojoba oil

Description: Jojoba oil is a type of liquid wax obtained from the seeds of *Simmondsia chinensis (jojoba)* plant. Squalene, cetyl palmitate, wax esters, hydrocarbons and phytosterols are the main active ingredients. This raw material is mainly used for cosmetics.

Action: Jojoba oil has a wide array of actions to promote wound healing, including anti-inflammatory, antimicrobial, moisturising, antioxidant and regenerative effects on skin tissue [28].

Pharmacological aspects: Jojoba oil shows good permeability, including absorption at the wound site. Studies on active substances confirmed better absorption of jojoba oil-based microemulsion of diclofenac compared to classical commercially available preparations [39]. Jojoba oil is included in emollient formulations.

Research: Preliminary studies have shown the efficacy of jojoba oil facial mask in improving damaged skin, also in patients with mild acne vulgaris [40].

Silicones

Description: Silicones are siloxane polymers with oxygen-silicon bonds. Organic groups are additionally attached to the silicon atoms. These are anhydrous forms that mix well with ethanol or vegetable oils. These substances are mainly used for medical devices.

Action: The mechanism of action of silicone therapy for scars has not yet been clearly explained. However, it is most likely that by occluding the scar site and hydrating the wound bed, these preparations suppress and normalise cell activity within the scar, as well as improve its hydration and elasticity [41].

Pharmacological aspects: The use of silicone gels during the initial period of wound healing (1–2 weeks) is not justified as collagen plays a major role at this stage. However, after this period, the new and immature epidermal layer causes abnormal water loss from the site of the developing scar. This activates the keratocyte, cytokine and fibroblast pathways, resulting in excessive collagen synthesis and release. As a result, unsightly, irregular scars may appear. Silicones applied to the scar site promote proper hydration and probably inhibit the fibroblast pathway and collagen formation [41]. Silicones are very well tolerated by the human skin. The occlusive film layer adapts to the shape of the wound.

Research: Silicones are mainly available in the form of gels and creams. The former contain significantly higher amounts of silicones and are more widely used. Creams are mainly intended for mild acne scars. Silicone elastomers are increasingly popular means of silicone application. These are used in dressings, often in the form of patches (due to their adhesive properties). The efficacy of silicone dressings in the prevention of hypertrophic scars is approximately 68% [42]. There are studies showing that some silicone products may cause skin irritation in hot climates [43]. Silicone gels show better healing effects when combined with vitamin E than when used alone [44].

Vitamin E

Description: Vitamin E is the collective name of a group of compounds including tocopherols and tocotrienols. It is synthesised by plants and therefore must be supplied with food. Vitamin E is found in large quantities in nuts, spinach and whole grain products. Vitamin E-based preparations usually come in the form of a dietary supplement. For topical use, the vitamin is usually combined with other substances (often with vitamin A), and the preparation can take the form of a cosmetic, medical device or even a medicinal product.

Action: Vitamin E has antioxidant effects, prevents lipid peroxidation, nourishes the skin, enhances elasticity and reduces skin inflammation and swelling [45].

Pharmacological aspects: Vitamin E can penetrate the epidermis well, improves hydration and, with its additional anti-inflammatory effects, it improves wound healing and reduces scarring. Its potent antioxidant effect is due to its strong anchorage in the skin structures (lipophilic chain). Vitamin E is most often found in preparations in the form of acetate, which is light-resistant and inhibits UVB radiation [45].

Research: Despite decades of research, complete evidence to support the efficacy of vitamin E in specific skin diseases is missing. From a pharmaceutical point of view, there are no purely therapeutic applications, but there are many reports on good cosmetic effects, including improved efficacy of silicone gels in combination with vitamin E [44]. Preparations for external use are on the borderline between medicinal products and cosmetics, and are commonly referred to as 'cosmeceuticals' due to their UVB-protective, antioxidant and moisturising effects.

Conclusions

Physiotherapist is an independent medical profession whose duty is to plan and deliver treatment according to evidence-based medicine. This should also be borne in mind when treating scars with specific pharmacological agents containing different active substances. Knowledge of their mechanism of action, status (medicinal product, medical device or cosmetic) and, finally, their pharmacokinetics and pharmacodynamics cannot be overestimated in terms of the expected outcomes and satisfaction of patients after urogynaecological surgeries.

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