LAPAROSCOPIC APPENDECTOMY AS AN ALTERNATIVE TO OPEN APPENDECTOMY – A SINGLE-CENTER EXPERIENCE

Appendektomia laparoskopowa jako alternatywa dla metody klasycznej – doświadczenia własne

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Abstract

Introduction and objective: Acute appendicitis is one of the most common acute emergencies in general surgery. Laparoscopic procedures in acute abdominal diseases require particular skills and experience from the surgeon, because the anatomical conditions and the image of the abdominal cavity are usually altered, with swollen and brittle tissues, by ongoing acute inflammation. Appendectomy can be performed using both open and laparoscopic methods. In the era of minimally invasive procedures, appendectomy is most often performed using the latter approach. The aim of the study was to assess the impact of the type of surgical approach (open or laparoscopic appendectomy) on the length of hospital stay, patients' recovery and postoperative complications. **Materials and methods:** The analysis included patients operated on in the Department of Thoracic, General and Oncological Surgery between 2020 and 2023 due to acute appendicitis. The patients underwent emergency surgery using open or laparoscopic methods. All patients were qualified for a follow-up appointment at the hospital surgical clinic (appointments took place on day 10 after the primary surgery or relaparotomy). **Results:** The study group was divided based on age, gender and the type of surgical procedure performed (open versus laparoscopic). The severity of pain on days 1 and 10 postoperatively, the occurrence of postoperative complications, and the duration of hospital stay were also assessed. **Conclusions:** It was concluded based on the results obtained that compared to open appendectomy, laparoscopic procedure was associated with lower rates of postoperative complications, reduced pain and shorter hospital stay.

Streszczenie

Wprowadzenie i cel: Ostre zapalenie wyrostka robaczkowego jest jednym z najczęstszych ostrych stanów w chirurgii ogólnej. Laparoskopowe zabiegi w ostrych schorzeniach jamy brzusznej wymagają szczególnych umiejętności i doświadczenia operatora, ponieważ zwykle warunki anatomiczne oraz obraz jamy brzusznej są zmienione przez toczący się ostry stan zapalny, a tkanki są obrzęknięte i kruche. Appendektomię możemy wykonać metodą klasyczną lub laparoskopową. W dobie przewagi zabiegów małoinwazyjnych również usunięcie wyrostka robaczkowego najczęściej wykonuje się tą metodą. Celem pracy była ocena wpływu rodzaju zabiegu (appendektomii klasycznej lub laparoskopowej) na czas hospitalizacji, okres rekonwalescencji i występowanie powikłań pooperacyjnych. **Materiał i metody:** Analizie poddano pacjentów operowanych w Klinice Chirurgii Klatki Piersiowej, Chirurgii Ogólnej i Onkologicznej w latach 2020–2023 z powodu ostrego zapalenia wyrostka robaczkowego. Badani byli operowania w trybie ostrym i wykonywano u nich appendektomię klasyczną lub laparoskopową. Wszystkich badanych zakwalifikowano do kontroli w przyszpitalnej poradni chirurgicznej (wizyty odbywały się w 10. dobie od pierwotnego zabiegu operacyjnego lub relaparotomii). **Wyniki:** W badanej grupie, którą podzielono ze względu na wiek, płeć i rodzaj wykonanego zabiegu operacyjnego (klasyczny, laparoskopowy), oceniano nasilenie dolegliwości bólowych w pierwszej i 10. dobie po zabiegu operacyjnym, występowanie powikłań pooperacyjnych oraz czas hospitalizacji. **Wnioski:** Na podstawie uzyskanych wyników wysunięto wniosek, że appendektomia laparoskopowa w porównaniu z klasyczną jest metodą pozwalającą na ograniczenie liczby powikłań pooperacyjnych, zmniejszenie dolegliwościach bólowych u pacjentów oraz skrócenie czasu hospitalizacji.

Keywords: laparoscopic appendectomy; postoperative complications; pain; acute appendicitis; open appendectomy

Słowa kluczowe: appendektomia laparoskopowa; powikłania pooperacyjne; dolegliwości bólowe; ostre zapalenie wyrostka robaczkowego; appendektomia klasyczna

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Introduction

Acute appendicitis (AA) is one of the most common acute emergencies in general surgery. The incidence of AA ranges from 76 to 227 per 100,000 population per year in developed countries. Appendectomies account for about 5% of all interventions in general surgical settings [1–3]. The vast majority of patients are children and young adults, predominantly males. Women >40 years of age are significantly more likely to develop AA. Acute appendicitis is very rare in children under 5 years of age, neonates in particular. This is most likely due to their wide appendix, reducing the risk of its proximal obstruction. AA is more common in European countries than in Africa and Asia. This is probably related to a diet high in carbohydrates and low in fibre, as well as genetic factors [1–4].

Appendectomy is performed using either the open or laparoscopic approach. In the era of minimally invasive procedures, the latter method is more popular. The first fully laparoscopic appendectomy was performed in 1980 by gynaecologist Kurt Semm [2, 5, 6]. However, this technique did not gain wide acceptance for many years. It had its heyday at the beginning of the 21st century, when surgeons began to acquire technical skills essential for performing this type of procedure. Laparoscopic procedures are gaining wider application not only in elective surgery, but also in the diagnosis and treatment of acute abdominal conditions. They require particular skills and experience from surgeons, as the anatomical conditions and the image of the abdominal cavity are usually altered, with swollen and brittle tissues, by ongoing acute inflammation. Nevertheless, encouraged by the benefits of minimally invasive methods, surgeons are increasingly more likely to choose these approaches also for appendectomy [2, 5–9].

Objective

The aim of the study was to assess the impact of surgical approach (open vs. laparoscopic appendectomy) on the length of hospital stay, recovery and postoperative complications. Other non-modifiable factors (age, gender) were also considered.

Materials and methods

Patients operated on at the Department of Thoracic, General and Oncological Surgery in the years 2020–2023 due to acute appendicitis were included in the analysis. The patients underwent emergency surgery using either open or laparoscopic approach.

The open procedure was performed with an oblique, about 5 cm incision at McBurney's point. The entire abdominal cavity was inspected for pathology. The mesentery of the appendix was divided and single ligatures were placed. The appendix was ligated at the base and removed. A purse-string suture was placed on the caecum, followed by a securing z-suture. A small bowel segment of about 50 cm was inspected for Meckel's diverticulum. A layer-by-layer reconstruction of the integuments was performed, and single stitches were placed on the subcutaneous tissue and skin.

Laparoscopic procedures started with direct umbilical trocar insertion and creation of a pneumoperitoneum of up to 12 mm Hg. This was followed by insertion of the remaining trocars in the lower abdomen, slightly to the left, and in the right mid-abdomen. The entire abdominal cavity was inspected for pathology. After locating the appendix, the mesentery of the appendix was divided and removed after clipping. Then the appendix was dissected, secured with Hem-o-lock clips and removed. The peritoneal cavity was rinsed with physiological saline solution and classical layer-by-layer suturing of the integuments was performed.

All patients were qualified for a follow-up at the hospital surgical clinic (visits took place on day 10 after the primary procedure or relaparotomy). The study group consisted of patients who underwent a follow-up at the hospital's general surgery clinic after appendectomy. A total of 328 patients (176 women and 152 men) reported for their visit. All patients received perioperative infection prophylaxis (cephalosporin at a single preoperative dose of 1.0 g).

Available medical records from the patients' hospital stay and from the hospital general surgery clinic were retrospectively assessed.

The severity of pain was assessed using a visual analogue scale (VAS) on days 1 and 10 postoperatively. Patients used a dedicated ruler-like tool to rate their pain, where a score of 0 meant 'no pain', and 10 meant 'the worst pain imaginable'.

Statistical analysis was performed using Statistica 13. The Shapiro–Wilk test, Student's T-test, Friedman's ANOVA, and Kruskal-Wallis tests were used for calculations. A p-value <0.05 was considered statistically significant across all analyses.

Results

The study group was assessed for the severity of pain on postoperative days 1 and 10, postoperative complications and length of hospital stay depending on age, gender and type of procedure performed (open vs. laparo-

scopic appendectomy). Early treatment outcomes (up to 10 days postoperatively) were evaluated. We did not assess the length of patients' incapacity for work, but only their subjective rating of pain.

Characteristics of the study group – gender, age and surgical approach

The study group included 176 women (54%) and 152 men (46%). The mean age was 44 years, with 70 patients aged ≥60 years (21%).

The mean age of patients undergoing laparoscopic and open surgery was 36 and 58 years, respectively.

The open approach was used in 92 patients (28%; women: 51%, men: 49%), and the laparoscopic method was used in 236 patients (72%; women: 52%, men: 48%). Among those ≥60 years old, the majority (63%) were treated with the open technique, whereas the laparoscopic approach was more common (81%) in the group of patients under 60 years of age. Patients in the laparoscopic group were statistically significantly younger (p = 0.001479). No statistically significant relationship was found between gender and surgical approach (p = 0.83174). The relationship between the age of patients and surgical technique used is shown in figure 1.

Characteristics of the study group – postoperative complications

There were no cases of mortality in the study group. Postoperative complications occurred in 21 patients (6.4%), including 4.6% in the laparoscopic group and 11% in the open approach group.

Impaired postoperative wound healing was found in 11 patients (3.4%), a wound haematoma requiring drainage was observed in 2 patients (0.6%), and reoperation due to interloop abscesses was needed in 8 patients (2.4%). Statistically significantly lower rates of complications were found in the laparoscopic group (p = 0.002179). No statistically significant differences were observed for the type of complications depending on surgical approach (p = 0.76714). The relationship between postoperative complications and surgical technique is presented in figure 2.

Characteristics of the study group – pain

Pain was assessed both during hospital stay and at follow-up visits in the hospital's general surgery clinic.

The laparoscopic group rated their pain on postoperative day 1 as mild (VAS 1–3) (n = 101, 43%) or moderate (VAS 4–6) (n = 135, 57%). None of the patients reported severe pain (VAS >7). At 10 days postoperatively, 90 patients (38%) reported no pain, 145 patients reported mild pain (61%), and one person reported moderate pain (1%).

The open approach group rated their pain on postoperative day 1 as mild (VAS 1–3) (n = 11, 11%), moderate (VAS 4–6) (n = 80, 87%), and severe (VAS >7) (n = 1, 2%). At 10 days postoperatively, 11 patients (12%) reported no pain, 78 patients reported mild pain (84%) and three patients experienced moderate pain (4%). A statistically significantly higher proportion of laparoscopically treated patients experienced no pain or their pain resolved on day 10 postoperatively (p = 0.00038).

The severity of pain was significantly higher on the first postoperative day in the open approach group (p = 0.00245). The relationship between surgical technique and the severity of pain on postoperative days 1 and 10 is presented in table 1.

Characteristics of the study group – length of hospital stay

The average length of hospital stay in the study group was 2.5 days (an average of 3.5 days in the open approach group and 2 days in the laparoscopic group). The average length of hospital stay was 4 and 2 days among patients ≥60 years and <60 years of age.

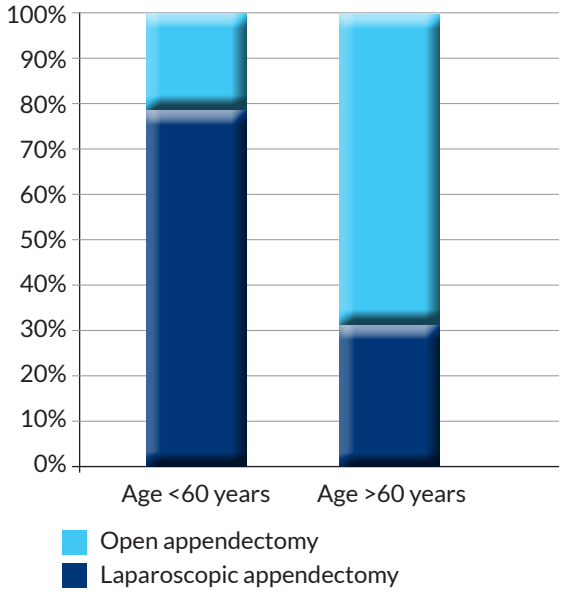

Figure 1. The relationship between age and surgical approach

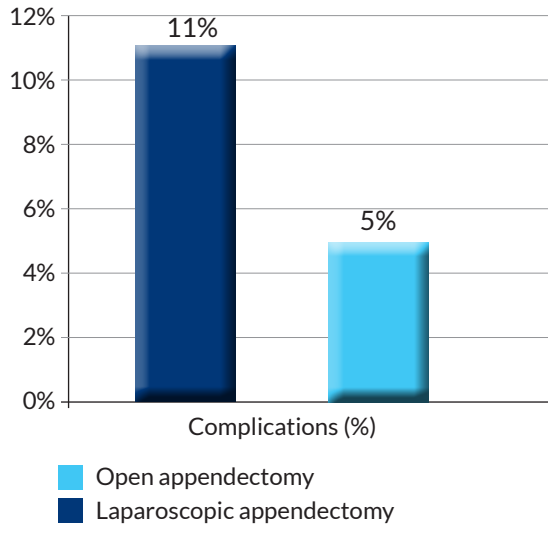

Figure 2. The relationship between postoperative complications and surgical approach

Statistical analysis showed a statistically significantly shorter hospitalisation among patients <60 years of age (p = 0.000147).

A statistically significant difference in the length of hospital stay was also observed depending on surgical approach (p = 0.00387). The relationship between length of hospitalisation and surgical approach is shown in figure 3.

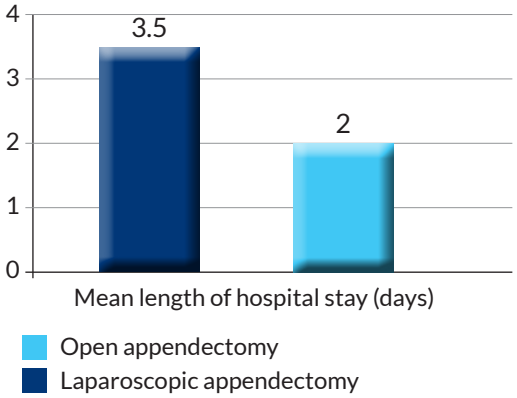

Figure 3. The relationship between the length of hospital stay and surgical approach

Discussion

Acute appendicitis affects about 7% of the population. It is most often managed in the emergency surgical setting [3, 10]. Laparoscopic approach is the preferred option in these patients. This is due to the multiple benefits of minimally invasive surgery compared to open techniques. We assessed whether there is a relationship between the surgical method used (open vs. laparoscopic appendectomy) and the length of hospital stay, postoperative complications and the severity of postoperative pain.

The study showed that the majority of patients ≥60 years of age underwent an open procedure, whereas the laparoscopic approach was a more common option in the younger group. This is mostly due to the fact that older patients are likely to present with atypical symptoms, which may be associated with delayed diagnosis and disease progression. Almost half of the patients were under 40 years of age (49.4%), with only 15% of patients aged ≥65 years. Similar conclusions have been reported in the literature. As pointed out by Coher-Arazi, multimorbidity and polypharmacy may lead to a delayed diagnosis in older patients, which is associated with atypical presentation of clinical symptoms of AA [2]. Strzałka [9] also reached similar conclusions, indicating a statistically significantly lower age of laparoscopically treated patients. He also noted that women were more likely to undergo minimally invasive surgery.

We found no statistically significant relationship between gender and surgical approach (p = 0.83174).

There were no cases of mortality in the study group. Postoperative complications occurred in 21 patients (6.4%) and included impaired healing of the postoperative wound, wound haematoma requiring drainage and interloop abscesses requiring reoperation.

Statistical analysis showed statistically significantly lower rates of complications in the laparoscopic group, with no relationship between the type of complication and surgical approach.

Lower rates of postoperative complications after laparoscopic appendectomy compared to open surgery have also been described in the literature. Additionally, some authors indicate an increased rate of intra-abdominal abscesses after laparoscopic surgery [11–14]. However, no such statistically significant correlations were observed in our study.

The length of hospital stay was another aspect taken into account in our research. Statistical analysis showed a significantly shorter hospital stay in both patients under 60 years of age and those who underwent laparoscopic appendectomy.

Other authors have also reported that longer hospital stay in patients over 60 years of age is related to their general health, comorbidities and impaired healing of postoperative wounds. Some authors have noted a correlation between the age of patients and the rate of complications, and thus the length of hospital stay [5, 7, 15–17]. No such statistically significant differences were observed in our study.

We used the VAS scale for pain measurement. Patients were asked to rate the intensity of pain on postoperative days 1 and 10. A significantly higher severity of postoperative pain was observed on the first day after open appendectomy. By contrast, there was a statistically significantly higher percentage of laparoscopically-treated patients reporting no pain or whose pain decreased on day 10 postoperatively.

Other authors have also emphasised less pain after laparoscopic appendectomy and a faster return to daily activity and work. Considering the costs of prolonged employee absence and the potential costs of rehabilitation or the use of analgesics, this seems invaluable [4–6, 10, 13].

Conclusions

The following conclusion was drawn based on the obtained results: compared to open appendectomy, lapa-

Table 1. The relationship between age and surgical approach

	Pain on day 1				Pain on day 10			
	No	Mild	Moderate	Severe	No	Mild	Moderate	Severe
Open appendectomy	0	11	80	1	11	78	3	0
Laparoscopic appendectomy	0	101	135	0	90	145	1	0

roscopy decreases the rates of postoperative complications, as well as is associated with less pain and a shorter hospital stay.

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