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Does non-operative treatment of appendicitis can replace surgery? - literature overview

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Abstact

Introduction and purpose

Acute appendicitis, a common surgical abdominal ailment, mostly affects individuals in their second or third decade of life, with an annual incidence of about 100 cases per 100,000 persons. This literature review aims to synthesize evidence from diverse sources, summarizing optimal practices for clinical implementation. Surgical intervention, achieving almost 100% cure rates, remains the gold standard, emphasizing challenges in patient qualification for non-surgical approachesNon-operative treatment, considered safe for uncomplicated cases, involves antibiotic therapy, with concerns about antibiotic resistance. Summarizing the current understanding of antibiotic therapy of appendicitis seeks to enhance its effective use, decrease adverse incidents in patients, and contribute to the overall safety of both patients and healthcare providers.

Material and methods

The following review of studies was based on articles obtained from the PubMed and Google Scholar databases. Key search terms included acute appendicitis, acute appendicitis conservative treatment, appendectomy, surgical abdominal diaseases, antibiothic therapy.

Conclusions

The literature review highlights the existing challenges in the management of acute appendicitis, acknowledging the efficacy of both methods. While surgical intervention with high cure rates, the increasing popularity of non-operative therapy encourages optimism for comprehensive research in the future. The need for large, randomized studies comparing long-term clinical effectiveness is emphasized, aiming to inform decision-making and optimize patient outcomes.

Introduction

Acute appendicitis is one of the most popular surgical abdominal diseases, which most often occurs in the second or third decade of life. Every year incidence nearby 100 new cases per 100 000 person. Studies outcome that lifetime appendectomy risk refers 12% for males and 23% for females [1,2,3]. Acute appendicitis is also the most common non obstetric surgical problem that occurs during pregnancy, and its incidence varies widely, with rates ranging from 1.8 to 41 per 10,000 pregnancies.[4] The gold standard in acute appendicitis is classical surgery or laparoscopy. One of the main problems of this treatment is the fact that they require general anesthesia. Another one are hemorrhage, surgical site infection, injury to surrounding structures, ileus, adhesive small bowel obstruction, the potential need for reoperation. However, even with the great development of examination methods, a normal appendix can be found during surgery [5,6]. On the other side, there is a long story of non-operative therapy of acute appendicitis, which started in 1959, when Coldrey was the first to mention the successful treatment of appendicitis using the conservative approach. Despite the growing popularity of this treatment, there is still insufficient evidence to establish antibiotic therapy as a basic solution for acute appendicitis.[7] The main purpose of this literature review is to collect and compare evidence regarding both methods from many available sources and try to summarise and highlight the best to implement in clinical practice.

Pathophysiology

The basic fact is that acute appendicitis is usually caused by a bacterial infection that leads to luminal obstruction and increasing intraluminal presure. Inflammation is associated with aerobic and anaerobic bacteria, most often E. coli and Bacteroides spp. Moreover, it is believed that the reduction of the appendix lumen may also be related to an appendicolith, fibrous band, lymphoid hyperplasia, or even a caecal carcinoma. Appendicitis has been also considered an extremely rare complication of colonoscopy since it was first described by Houghton and Ashton in 1988. Its incidence is estimated to be approximately 0.038%. Blunt abdominal trauma with damage to blood vessels was also indicated as a probable cause. Interestingly, a recent study shows that appendicitis can occur even without increasing intraluminal pressure. Some authors suggest that it could be caused by direct damage to the appendix mucosa by bacteria. Based on macroscopic and microscopic appearances, acute appendicitis is divided into simple and complex. Simple appendicitis is associated with phlegmonous, non-perforated appendicitis. Complex appendicitis commonly leads to a gangrenous or perforated appendix with or without abscess formation. Differences

in the frequency of occurrence in different ethnicities, geographical regions, and familial tendencies have been noticed, which may suggest a genetic predisposition, but so far no single gene has been found. It was noticed that the risk of developing acute appendicitis for the family in which the disease occurred is three times higher.The influence of diet and environmental factors has also not been determined.[2,7,8]

Symptoms

A patient with suspected acute appendicitis should be carefully examined, starting with a thorough medical history, in particular the diseases and medications taken. Then you should focus on the main symptoms. They usually concern abdominal pain. The duration, location, and nature of the pain should be determined. Pain typically originates around the navel in 60% of patients. [9] The classic symptom is pain in the lower right quadrant, which may initially be located in the upper abdomen, followed by nausea, vomiting, and loss of appetite. The absence of vomiting, nausea, abdominal pain, and leukocytosis allows us to exclude appendicitis in children with 98% reliability. [1] The location of the appendix is different in each patient (e.g. pelvic, retrocecal), which should be remembered when diagnosing abdominal diseases.[9] Diagnosis of the disease in pregnant women may be difficult because the pain is located higher, more often in the subcostal area. The reason for this is the displacement of the appendix by the enlarged uterus.[1] Painkillers rarely mask the symptoms of appendicitis to a significant extent, so early analgesia is recommended. There is no increase in missed appendicitis or in negative appendectomies after analgesia. Adequate pain control for patients with suspected appendicitis is imperative. [10] Local guarding during the examination indicates a greater likelihood of irritation of the parietal peritoneum. Diffuse guarding is more often associated with complex appendicitis.[1]

Diagnostics

The clinical picture of appendicitis is usually consistent and does not require imaging tests. Despite this, it is also worth performing laboratory tests and urine tests. In women of reproductive age, it is recommended to perform a pregnancy test and, in unclear cases, a gynecological examination. Patients with appendicitis are characterized by elevated WBC levels. As the WBC level increases, the chance of gangrenous appendix or perforation increases. [9] The level of CRP protein is also increased, and leukocytosis/neutrophilia occurs, but these are not specific symptoms. Procalcitonin has no role in routine testing. Digital rectal examination also does not have a high diagnostic value. Several scales help assess

the possibility of acute appendicitis, e.g. the Alvarado scale. Recent clinical trials have not proven its effectiveness, which is why it is mainly used as an aid in qualifying for imaging tests. Various imaging tests are available to help make the diagnosis in ambiguous cases. In the diagnostic process, you can use - ultrasound, CT, and MRI. Depending on the sources, CT or ultrasound is indicated as the main one. USG reaches a sensitivity of 71-94%, and specificity of 81-98%, which in adults does not allow the exclusion of the disease. Ultrasonography works better in children because sensitivity and specificity reach higher values: sensitivity 96% [83–99%], specificity 100% [87–100%].[1] Due to the lack of ionizing radiation, ultrasound remains valuable as the initial imaging modality of choice in children, young adults and pregnant women. [11] The disadvantage of ultrasound is that the test result depends on the doctor's experience. Tomography is characterizedby a sensitivity of 76–100% and, a specificity of 83–100%.[1] Features indicating appendicitis in CT examination include appendiceal diameter greater than 6 mm and wall thickness greater than 2 mm, fecalith, and/or periappendiceal inflammation.[9] Moreover, during this examination, it is possible to obtain the exact location of the appendix, assess whetherit is inflammatory, and help verify other potential causes of the ailment. This is mainly important in patients over 65 years of age, who usually require a broader differential diagnosis due to comorbidities. The second group of patients for whom CT is recommended are obese people (BMI >30 kg/m2) due to technical difficulties when performing ultrasound examinations. MRI also achieves high values of sensitivity (97%) and specificity (95%).[1] MRI is a test dedicated to pregnant women and children whose ultrasound results are ambiguous.[12] The use of MRI avoids exposure to ionizing radiation. The disadvantage of this solution is the fact that most children under 5 years of age must undergo sedation or general anesthesia.[1] The second disadvantage of MRI is its small emergency availability. In addition, MR imaging costs more than other cross-sectional imaging modalities. Analysis showed the technical cost per examination for a US, CT, and MR at a tertiary care academic center was $50.28, $112.32, and $266.96, respectively.[13]

If a patient has all the symptoms of appendicitis, surgery is often performed without imaging tests. Unfortunately, in 15-30% of patients during surgery, it turns out that the appendixis not inflamed.[9]

Non-operative treatment

It is generally believed that non-operative treatment is safe for patients with uncomplicated appendicitis.[2] Antibiotic therapy is also effective as an initial treatment in some cases

of complicated appendicitis, along with puncture or drainage of large abscesses.[14] Non-surgical treatment of the appendix allows you to avoid complications specific to surgery, such as wound infections, intestinal adhesions, or incisional hernias.[15] But also complications related to general anesthesia, which is particularly important in patients with high surgical risk. Conservative treatment of appendicitis involves antibiotic therapy.The most frequently administered drugs are cephalosporin combined with nitroimidazole (usually metronidazole). Next in order are penicillin with a beta-lactamase inhibitor and quinolones.Therapy usually involves intravenous administration for the first three days, followed by oral administration for 5-7 days. The duration of treatment has not been clearly defined and is determined individually for each patient based on the clinical course and the normalization of inflammatory parameters.[1] During antibiotic therapy, early initiation of treatment plays an important role. Treatment achieves the best results if it is started within 12 hours of the onset of symptoms, and optimally within 6 hours. Observations have shown a positive effect of combining antibiotics with antihistamines and spasmolytics.[16] Unfortunately, the problem associated with non-surgical treatment of appendicitis is also the increase in global antibiotic resistance.

The use of broad-spectrum antibiotics without cnuulture and sensitivity results may lead to the development of multidrug-resistant bacterial strains, which pose a serious threat to medicine in the coming decades.[7]

Surgery

Surgery remains the gold standard in the treatment of acute appendicitis. Open surgery with a McBurney incision was the main treatment modality until 1980 when laparoscopy became available. Interestingly, the literature describes cases of appendix removal using an endoscopic approach - transvaginal, peroral transgastric, and per rectal.[17] Both classical and laparoscopic surgery carry a very low surgical risk, and morbidity and mortality are mainly related to the advancement of appendicitis.[1] Appendix removal surgery can be performed on pregnant women. It has been reported that the safest time to operate in a pregnant woman is in the second trimester.[18] Surgical treatment can cure almost 100% of patients with acute appendicitis.[7] The main goal of surgical treatment is to eliminate the focus of inflammation and reduce contamination of the peritoneal cavity. Classic surgery is associated with a lower incidence of abscesses, a slightly shorter duration, and lower costs. In turn, in the case of laparoscopy, it has been shown that the probability of infection of postoperative wounds is reduced by at least half and the percentage of fewer short- and long-

term adhesive bowel obstructions has decreased.[12] The main factor reducing the number of infectious complications of laparoscopy is reducing wound contamination through the use of laparoscopic ports and specimen retrieval bags.[19] Patients undergoing laparoscopy usually feel less pain and require less analgesia, and their intestines recover much faster.[2] In addition, laparoscopy is a very good diagnostic method, especially in patients whose histological examination of the appendix turned out to be negative. In some cases, excision and histopathological examination of samples allows one to obtain a diagnosis, because many pathologies can imitate appendicitis. Moreover, in 18–29% of cases despite a macroscopically normal appendix, histopathological examination point out diseases such as endometriosis (0.0–0.9%), neoplasia (0.23–1.2%), or obstruction by an appendicolith (2.7–6.0%) or parasites (1.2–2.5%).[1]

In uncomplicated acute appendicitis, antibiotics are used prophylactically for 24 hours or less and reduce the rates of infectious postoperative complications. Intraoperatively diagnosed complex appendicitis requires antibiotic therapy for at least 3-5 days.[12,20]

Comparision

Comparing both treatment methods requires looking at several aspects that are of importance in clinical practice. Let's start with the cure rate, which in patients treated surgically is almost 100%. The situation is slightly worse in patients treated conservatively, and the risk of recurrence is also higher.[7] Studies have also shown that for patients with acute appendicitis with fecaliths or perforated appendicitis surgical treatment is more effective.[6,21] However, it should be mentioned that the results of conservative treatment published recently are noticeably better than in articles published 5-10 years ago.[22] If non-operative therapy fails, primary uncomplicated appendicitis is likely to develop into a complicated form and appendix perforation with peritonitis or perityphlitic abscess and possibly sepsis may occur, requiring secondary, often more invasive surgery.[15] On the other hand, surgical treatment also carries the risk of complications such as intestinal adhesions, hemorrhage, infection, and wound dehiscence.[16] The result of the operation may also depend on the individual skills of the operator, in particular when it concerns complicated appendicitis with an appendiceal mass or phlegmon or adhesions.[23] It is presumed that the advancement of the underlying disease in patients has a greater impact on the number and type of complications than the type of therapy used. Another issue is the possibility of making a histopathological diagnosis, which makes it possible to visualize unexpected tumors and other pathologies that are not possible in conservative treatment. However, in the case of removing

a histopathologically correct appendix, the thought comes to mind that unnecessary amputation could have been avoided with conservative therapy.[7] It is worth looking at the pain aspect of appendicitis. In people treated with antibiotics, the pain usually becomes visceral and its intensity decreases more slowly. The observations carried out indicate that in patients undergoing appendectomy, the pain is usually shorter (6 vs. 9 days), reaches a higher intensity in the perioperative period, and mainly affects the wound.[24] Vons et al did not report any significant differencesin pain score between appendicectomy and antibiotic treatment. [25] A huge advantage of conservative treatment is the ability to treat patients whose comorbidities disqualify them from safe anesthesia for surgery.[1] Antibiotic treatment is usually associated with a potentially shorter hospital stay and a presumed faster return to work.[15] However, in cases of uncomplicated acute appendicitis, surgery seems to be a faster path to recovery.[7] Other studies have shown that conservative treatment usually involves a longer hospital stay (the difference is usually 1 day) and requires longer patient observation.[6,21,26,27]

The disadvantages of appendectomy also include the high cost of the procedure, especially laparoscopic surgery.[15,27] The study revealed that the higher cost of the surgical procedure combined with a shorter length of stay did not differ significantly from the cost of stay of a patient treated conservatively.[21,27] In the analyzes performed, it is believed that the differences in length of stay, total cost and health-related quality of life are statistically insignificant. [6,28] Kirby et al claims that on a background of increasing antibiotic resistance, appendectomy remains the most appropriate treatment of choice for patients with appendicitis. [29].

Conclusion

Currently, there is a lack of detailed research, so antibiotic therapy cannot be established as the leading method of treating appendicitis. However, this literature review shows that nonoperative treatment of acute non-perforated appendicitis in children is safe and effective and may be used in some cases. The primary challenge lies in appropriately qualifying patients for non-surgical treatment. To resolve this issue, more studies are needed, preferably large, randomized ones, comparing the long-term clinical effectiveness of conservative treatment with appendectomy. The growing popularity of this therapy gives hope that such studies will be conducted in the future.

Author's contribution

Conceptualization, Dawid Mika, Bartosz Mazur, Maciej Lambach; methodology, Mateusz Pawlicki; software, Kamila Turek; check, Anna Greguła, Aleksandra Kłos and Karol Stachyrak; formal analysis, Aleksandra Mazurek and Wiktoria Wilanowska; investigation, Dawid Mika and Wiktoria Wilanowska; resources, Bartosz Mazur; data curation, Wiktoria Wilanowska; writing - rough preparation, Maciej Lambach; writing - review and editing, Mateusz Pawlicki, Kamila Turek; visualization, Anna Greguła, Aleksandra Kłos; supervision, Dawid Mika; project administration, Dawid Mika, Aleksandra Mazurek; receiving funding, Karol Stachyrak

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