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Chapter 11

Laparoscopic Appendectomy for Acute Uncomplicated Appendicitis: An Update

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Abstract

Acute appendicitis is one of the most common surgical emergencies worldwide, with laparoscopic appendectomy increasingly regarded as the gold standard treatment. Since its introduction in the late 20^{th} century, laparoscopic surgery has transformed the management of appendicitis by offering reduced postoperative pain, shorter hospital stays, earlier return to normal activities, and improved cosmetic outcomes. This chapter examines the current evidence regarding the role of laparoscopic appendectomy in the surgical management of acute appendicitis in adults, children, and the elderly. Evidence suggests that laparoscopic appendectomy is superior in many clinical scenarios, although surgeon expertise and institutional resources remain critical determinants of outcomes.

Keywords: Acute appendicitis, Uncomplicated appendicitis, Adult, Children, Laparoscopy, Laparoscopic appendectomy, Open Appendectomy, and Complications.

1. Introduction

Acute appendicitis is the most common acute abdominal condition that accounts for admission to the general surgical ward, and it has a lifetime risk of 7% -8%. It is most seen in the second and third decades of life and has a slightly higher incidence in male patients. It has an incidence of 90-100 cases per 100,000 population in most Western countries (Bhangu, 2015). The clinical presentation of acute appendicitis is that of central abdominal pain that radiates to the right iliac fossa, and it is associated with nausea and vomiting. In some cases, it may present with symptoms like diarrhea or dysuria. Examination of the abdomen will reveal guarding and rigidity over the right iliac fossa (Echevarria, 2023). The diagnosis of acute appendicitis is confirmed by clinical examination and inflammatory markers like leukocytosis and C.Reactive Protein (CRP), with imaging modalities like ultrasound and computerized tomography reserved for cases when the diagnosis is in doubt. The management of acute appendicitis involves performing an appendectomy, which can be performed as an open or laparoscopic method (Becker, 2018; Mora, 2026).

The World Society of Emergency Surgeons (WSES) in their 2020 guidelines for the management of acute appendicitis, have recommended laparoscopic appendectomy as the preferred approach for the surgical management of acute appendicitis in adults and children, if the expertise and laparoscopic equipment are available (Di Saverio, 2020). The Society of Gastrointestinal and Endoscopic Surgeons (SAGES) has recommended laparoscopic appendectomy for the surgical management of acute uncomplicated appendicitis and as an alternative to open appendectomy (Korndorffer Jr, 2010). The Swedish National Guidelines for the diagnosis and management of acute appendicitis in adults and children have recommended laparoscopic appendectomy for the management of acute appendicitis in adults and children, and the three-port technique is recommended for the surgical treatment of acute appendicitis (Salö, 2025).

In this chapter, we examine the roles of laparoscopic appendectomy in the management of acute appendicitis in adults and children. We will compare laparoscopic appendectomy with open appendectomy. A comprehensive literature review was conducted utilizing PUBMED, the Cochrane Database of Systematic Reviews, Google Scholar, and Semantic Scholar. The search focused on randomized controlled trials, non-randomized trials, observational and cohort studies, clinical reviews, systematic reviews, and meta-analyses published from 1990 to 2026. The keywords employed in the search included: “Acute appendicitis,” “Uncomplicated appendicitis,” “laparoscopy,” “children,”

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"adults," "laparoscopic appendectomy," "open appendectomy," and "complications." All articles were in English and were assessed through manual cross-referencing of the literature. Commentaries, case reports, and editorials were excluded from this review. The study included only adult and pediatric patients with acute appendicitis.

2. Discussion

2.1. Laparoscopic appendectomy for acute uncomplicated appendicitis in adults

Laparoscopic appendectomy was introduced in the 1980s, and it has gained wide acceptance with its reduced postoperative nausea and vomiting, reduced analgesia usage, faster recovery, and reduced length of stay in the hospital. The standard three-port technique is commonly used with a sub- umbilical, suprapubic, and left lateral port sites. The appendicular stump is closed with a pre-tied suture, or hem-o-lock, or via staplers (Gorter, 2014). Several reviews have compared laparoscopic appendectomy with open appendectomy for acute, uncomplicated appendicitis, and laparoscopic appendectomy was associated with a reduced risk of surgical site infection, but it was associated with a higher intra-abdominal abscess risk. The primary advantage of laparoscopic appendectomy is the ability to identify other pathologies in the abdomen and reduce the negative appendectomy rate (Fingerhut, 1999; Eypasch, 2002; Moazzez, 2011).

A nationwide cohort study on adult patients undergoing surgery for acute appendicitis was conducted by Kleif et al. A total of 58,093 patients underwent appendectomy from 2000 to 2015. The laparoscopic appendectomy rate increased from 7.4% in 2000 to 93% in 2015, and there was a reduction in the postoperative morbidity and length of hospital stay (Kleif, 2021). A retrospective study comparing laparoscopic versus open appendectomy was conducted by Bulut et al. A total of 627 patients were included in this study, with 298 undergoing laparoscopic appendectomy and 329 undergoing open appendectomies. This study showed that laparoscopic appendectomy was safe, effective, and was able to assess other intra-abdominal pathologies (Bulut, 2025). Further studies by Destek et al, Heise et al., and Basukala et al., which compared laparoscopic appendectomy and open appendectomy for acute appendicitis, also concluded that laparoscopic appendectomy was safe and associated with better outcomes (Destek, 2023; Basukala, 2023; Heise, 2021).

A meta-analysis on laparoscopic and open appendectomy for suspected appendicitis was conducted by Temple et al. A total of 8 studies were included, 1383 patients with 730 undergoing laparoscopic appendectomy and 653 undergoing open appendectomy. Laparoscopic appendectomy was associated with a reduced wound infection rate (OR 0.40, 95%CI, 0.24-0.69), no significant differences with intra-abdominal abscess rate (OR 1.94, 95%CI, 0.68-5.58), and an earlier return to normal activity (WMD-5.79 days, 95%CI, 7.38-4.21 days) (Temple, 1999). A meta-analysis comparing laparoscopic versus open appendectomy for acute appendicitis was conducted by Bennett et al. A total of 34 studies with 4414 patients were included in this study, with 2064 patients undergoing laparoscopic appendectomy and 2350 undergoing open appendectomy. Another meta-analysis comparing laparoscopic vs open appendectomy for acute appendicitis was conducted by Bo Wei et al. A total of 25 studies with 4694 patients, with 2220 undergoing laparoscopic appendectomies and 2474 undergoing open appendectomies, were included in this study. Laparoscopic appendectomy was associated with lower postoperative complications (OR 0.74, 95%CI, 0.55-0.98), shorter hospital stay (WMD, 0.68, 95%CI, 1.02-0.35), but longer operative time (WMD, 10.71, 95% CI, 6.76-14.66) (Wei, 2011). Laparoscopic appendectomy was associated with a reduced wound infection rate of 0.52 (95%CI, 0.39-0.70) but increased intra-abdominal abscess rate 2.29 (95%CI, 1.48-3.53) (Bennett, 2007). A systematic review of meta-analyses of randomized controlled trials comparing laparoscopic and open appendectomy in suspected acute appendicitis was conducted by Jaschinski et al. A total of 9 studies were included in this study, and laparoscopic appendectomy was associated with a higher intra-abdominal abscess rate and longer operative time, but it was associated with a reduced wound infection rate (Jaschinski, 2015).

A meta-analysis of randomized controlled trials comparing laparoscopic versus open appendectomy for acute appendicitis was conducted by Li et al. A total of 44 studies with 5292 patients were included in this study, and the operating time was longer by 12.35 minutes, and the length of hospital stay was shorter by 0.60 days. The intra-abdominal abscess rate was, however, higher in the laparoscopic appendectomy group (OR 1.56, 95%CI, 1.01-2.43) (Li, 2010). A meta-analysis of the results of randomized controlled trials comparing laparoscopic and open appendectomy for acute appendicitis was conducted by Ohtani et al. A total of 39 studies with 5896 patients (2847-laparoscopic appendectomy and 3049 open appendectomy) were included in this study. Laparoscopic appendectomy was associated with reduced postoperative complications, reduced analgesic usage, and faster return to work, but it was associated with a longer operative time (Ohtani, 2012). A meta-analysis of the clinical efficacy of laparoscopic appendectomy in acute appendicitis was conducted by Zhang et al. A total of 16 studies with 2149 patients with 1251 underwent laparoscopic appendectomy and 898 underwent open appendectomy. Laparoscopic appendectomy was associated with reduced adverse effects, shorter hospital stays, and faster return to work (Zhang, 2022).

A Cochrane review on laparoscopic versus open appendectomy for suspected appendicitis was conducted by Jaschinski et al. A total of 75 trials with 8520 adult patients were included in this study, and laparoscopic appendectomy was associated with reduced postoperative pain. reduced wound infection rate, shorter length of hospital stays, but it was associated with a higher intra-abdominal abscess rate (Jaschinski T. M., 2018).

2.2. Laparoscopic appendectomy for acute, uncomplicated appendicitis in children

Laparoscopic appendectomy was compared to open appendectomy in the management of acute appendicitis in children in a review by Markar et al. A total of 73,150 patients with acute, uncomplicated appendicitis had undergone appendectomies, and laparoscopic appendectomy was associated with reduced length of hospital stay (Markar, 2012). The outcome of laparoscopic appendectomy versus open appendectomy in acute appendicitis in children was retrospectively assessed by Rolle et al. A total of 21,541 patients were included in this study, and general complications were seen in 2.1% of cases, and reoperation was seen in 1.8% of cases. This study showed that laparoscopic appendectomy was associated with fewer complications and reoperation rates than open appendectomy in children (Rolle, 2024). A literature review on laparoscopic vs open appendectomy for acute appendicitis in the pediatric population was conducted by Esposito et al. A total of 26 studies with 123,628 patients were included in this study, with 42,213 patients undergoing laparoscopic appendectomy and 81,415 patients undergoing open appendectomy. Laparoscopic appendectomy was associated with reduced postoperative complications, shorter hospitalization, and faster recovery than open appendectomy (Esposito, 2012).

A cohort study by Svensson et al looked at the outcomes of laparoscopic appendectomy in the management of acute appendicitis in

children. A total of 1010 patients underwent laparoscopic appendectomy out of 1745 children with acute appendicitis, and though the operative time for laparoscopic appendectomy was longer, there were no differences regarding postoperative complications and length of hospital stay (Svensson, 2016). A randomized controlled trial comparing laparoscopic and open appendectomy for acute appendicitis in children was conducted by Ali et al A total of 126 patients were randomized to 63 who underwent laparoscopic appendectomy and 63 who underwent open appendectomy. There were no differences regarding the wound infection rate and length of hospital stay between the procedures (Ali, 2018). Nataraja et al compared the rate of intra-abdominal abscess formation following laparoscopic and open appendectomy in children. A total of 1267 patients underwent appendectomy, with 514 undergoing laparoscopic appendectomy and 753 undergoing open appendectomy. The intra-abdominal abscess rate was 3.9% in the laparoscopic appendectomy group and 3.9% in the open appendectomy group. This study showed that there were no significant differences between the procedures in the intra-abdominal abscess rate (Nataraja, 2010).

A meta-analysis comparing laparoscopic and open appendectomy for acute appendicitis in children was conducted by Aziz et al. A total of 23 studies with 6477 patients were included in this study, and the wound infection rate was reduced in the laparoscopic appendectomy group, 1.5% vs 5% (OR 0.45, 95%CI, 0.27-0.75), and the length of hospital stay was reduced in the laparoscopic appendectomy group (OR 0.48, 95%CI, 0.65-0.31) (Aziz, 2006). A systematic review and meta-analysis on the incidence of intra-abdominal abscess formation following laparoscopic appendectomy for acute appendicitis in children was conducted by Nataraja et al. Sixty-six studies with 22,060 patients were included in this study, with 56.5% undergoing open appendectomy and 43.5% undergoing laparoscopic appendectomy. There were no differences regarding intra-abdominal abscess formation between the procedures (2.9% for laparoscopic appendectomy and 2.7% for open appendectomy), and laparoscopic appendectomy was also associated with a reduced wound infection rate (2.2% vs 3.7%) (Nataraja R. M., 2013).

2.3. Laparoscopic appendectomy for acute uncomplicated appendicitis in the elderly

Laparoscopic appendectomy for acute appendicitis in the elderly was assessed by a retrospective study by Wang et al. There were 54 patients in this study, and 24 had undergone laparoscopic appendectomy, and 29 underwent open appendectomy. There were no differences in operative time and length of hospital stay, but laparoscopic appendectomy was associated with reduced analgesic usage (Wang, 2006). Another retrospective study on laparoscopic appendectomy in the elderly was conducted by Kirshtein et al. 54 patients underwent laparoscopic appendectomy, and there were no mortalities, and the morbidity was reduced. This study showed that laparoscopic appendectomy was safe in the elderly (Kirshtein, 2009). Nam Baek et al compared laparoscopic appendectomy versus open appendectomy in the elderly. A total of 77 patients were included, with 30 patients undergoing laparoscopic appendectomy and 47 undergoing open appendectomy. The patients in the laparoscopic appendectomy group were associated with reduced postoperative complications and reduced postoperative nausea and vomiting (Baek, 2011). Ferrarese et al retrospectively reviewed laparoscopic appendectomy in the elderly, with 19 out of 39 elderly patients who had undergone laparoscopic appendectomy for acute appendicitis. There were no differences regarding perioperative and postoperative morbidity between the procedures (Ferrarese, 2013).

A systematic review and meta-analysis of laparoscopic versus open appendectomy for acute appendicitis in the elderly was conducted by Wang et al. A total of 12 studies with 126,237 patients undergoing laparoscopic appendectomy and 213,201 undergoing open appendectomy. Post operative complication and wound infection were reduced in the laparoscopic appendectomy group (OR 0.65, 95%CI, 0.62-0.67; OR0.27, 95%CI, 0.22-0.32), and postoperative mortality was reduced in the laparoscopic appendectomy group (OR 0.33, 95%CI, 0.28-0.39). The intra-abdominal abscess rate was similar between the groups (OR 0.44, 95% CI, 0.19-1.03). This study showed that laparoscopic appendectomy was safe and feasible in acute appendicitis in the elderly (Wang D. D., 2019). A meta-analysis of laparoscopic versus open appendectomy in the elderly was conducted by Southgate et al. A total of 6 studies with 15,852 patients were included in this study, with 4398 undergoing laparoscopic appendectomy and 11,454 undergoing an open appendectomy. Laparoscopic appendectomy was associated with reduced mortality (OR 0.24, 95%CI, 0.15-0.37), reduced morbidity (OR 0.61, 95%CI, 0.50-0.73), and there were no differences regarding intra-abdominal abscess rate (Southgate, 2012).

The World Society of Emergency Surgeons (WSES) has recommended in its guidelines for the diagnosis and treatment of acute appendicitis in the elderly that laparoscopic appendectomy be performed, due to the reduced length of hospital stay. reduced morbidity and reduced cost of the procedure (Fugazzola, 2019).

Table 1: Comparison of wound infection and intra-abdominal abscess rates following laparoscopic appendectomy for acute uncomplicated appendicitis

Study	Study Type	Wound Infection Rate (%)	Intra-abdominal abscess rate (%)
Southgate et al.- 2012	Meta-analysis	3% to 4%	1%
Wang et al., 2019	Systematic review & Meta-analysis	4.6%	Similar between the groups
Aziz et al	Meta-analysis	2%-5%	1%-3%
Nataraja et al.- 2013	Meta-analysis	2.2%	2.9%
Zhang et al.- 2022	Meta-analysis	2%-4%	No significant increase

Table showing the wound infection rate and intra-abdominal abscess rate following laparoscopic appendectomy for acute uncomplicated appendicitis.

3. Conclusion

Laparoscopic appendectomy has become the preferred treatment for acute appendicitis due to its numerous advantages, including reduced postoperative pain, shorter hospital stays, and improved recovery. While challenges remain, particularly in complicated cases, advancements in surgical techniques and perioperative care continue to improve outcomes. Laparoscopic appendectomy has become the preferred method

of surgery for acute, uncomplicated appendicitis in adults, children, and the elderly.

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