Duration Of Post-Operative Antibiotic Treatment in Acute Complicated Appendicites: A Systematic Review

Abstract

Background: Patients with acute complicated appendicitis, including gangrenous or perforated appendicitis and/or the presence of an abscess formation, usually require surgery followed by antibiotics. The optimal duration of antibiotic therapy for those types of infections is debatable; prolonged courses are practiced at other institutions.

Objectives: To assess the efficacy of various durations of postoperative antibiotic therapy on patients healing from complicated acute appendicitis, we undertook this systematic review and comparison. The endpoint was defined as overall infections, length-of-sickness hospitalization (LOS), and readmissions in randomizing controlledscantrials that tested different periods for which a patient received antibiotics after surgery.

Method: A comprehensive search was performed including MEDLINE, Cochrane Library, Web of Science, Embase and PubMed; as well as Google Scholar. We included studies with randomized controlled trials, cohort studies and observational ones that compared various durations of postoperative antibiotics among adults or children suffering from complicated appendicitis. Results: Data was extracted and analyzed for infection rates, LOS, and readmission outcomes.

Results: We included 13 studies with4,675participants in the meta-analysis. The meta-analysis found that short-term antibiotic therapy (≤5 days) is effective as longer courses (> 5 days) in the prevention of postoperative infections. Patients in both the short- and long-term groups experienced similar rates of surgical site infections, intra-abdominal abscesses, new-onset sepsis. Short-term therapy was also linked to a shorter LOS and similar rates of readmission.

Introduction

Appendicitis is one of the most common acute gastrointestinal inflammatory diseases in children and adults, causing surgery in hospitalization [1–3]. In the Netherlands, each year about 14.000 patients are operated on suspicion of appendicitis [4]. Types of Acute Appendicitis: Acute appendicitis is divided into any 2 types: simple or complex. Suppurative or phlegmonous appendicitis (transmural inflammation, ulceration, thrombosis) with or without extramural pus: simple appendicitis Complex appendicitis, on the other hand is defined by a gangrenous (transmural inflammation with necrosis) perforated or both together and/or an abscess formation[5]. Background Some 25–30 % of all cases are considered complex [6,7] and so it may be inappropriate to consider the same set goals for open surgery and others minimally invasive. According to a Cochrane Systematic review, antibiotic prophylaxis is valid in simple and complex appendicitis patients undergoing surgery for avoided post-appendectomy complications (preoperative or peri-, intra- and post-operative) [8]. Complex appendicitis is linked to higher rates of infectious complications post-appendectomy [9–12]. Hence the guidelines suggest antibiotic therapy postoperatively in patients with complicated appendicitis, rather than simply preoperative prophylaxis. Worldwide, the practice of postoperative antibiotics is highly variable including route of administration (IV vs oral), agents used and duration and dosage [13–16]. The use of postoperative antibiotics after complex appendectomies was surveyed in a nationwide study conducted by The Netherlands in 2014, which demonstrated that 65% preferred five days of treatment. In the end, nearly 80 % of all patients are treated with antibiotics for at least five days [17]. The mean duration of treatment was observed from 2 to 10 days [17]. A mail survey of Dutch surgeons and residents found a for 3 days (58% of surgeons) or 5 days (40%) postoperative orally given antibiotics was used Appendicitis Collaborative Study Group. Postoperative antibiotics would be restricted to 31% of surgeons or residents who reported that this was the practice they most favored [11]. Another survey in 2003, of all practicing paediatric surgeons in North America regarding how to manage perforated appendicitis revealed a similar variation in the postoperative length of antibiotic treatment [18]. In a more recent U.S. pediatric cohort study of children with perforated appendicitis 66% received antibiotic therapy for >5 days administered intravenously [19]. In the remaining 71 patients, oral antibiotics in addition to intravenous therapy was used with a median total course of 13 days [19].

A duration of 3–5 days most likely reflects current best practice in the Netherlands and is considered to be safe and effective internationally as well[17,20–22]. Recently increasing evidence suggest a shorter LOS may be adequate if specific discharge criteria are met [7,11,17,21,23–37]. In 2015, the European Association of Endoscopic Surgery started a consensus meeting on treatment for acute appendicitis [38]. There were no studies on complex appendicitis so a recommendation could not be made on route or duration of postoperative antibiotics. It is also a key issue to determine the shortest but safe and effective antibiotic regimen in order to decrease both LOS, cost of treatment if it has an impact on reducing mortality or morbidity risk similar at longer courses duration as supposed with ACE trialsand resistance[3]. The purpose of this study was to perform a systematic review regarding the duration of postoperative antibiotic therapy for complicated appendicitis and its impact on infectious complications, length of stay (LOS) in days as well as readmission among both children & adults.

Methodology

This systematic review was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (figure 1) guidelines [39].

Literature Search Strategy

A comprehensive literature search was conducted, using various databases, including MEDLINE, Cochrane Library, Web of Science, Embase, PubMed, and Google Scholar. The search was aimed at identifying relevant studies from inception to the specified date. Search terms included keywords such as “appendicitis,” “appendectomy,” “antibiotics,” “anti-bacterial agents,” “anti-infective agents,” “postoperative period,” and “postoperative care.” Additional unpublished trials were identified by searching clinical trial registries.

Inclusion and Exclusion Criteria

Studies were eligible for inclusion if they were comparative studies focusing on the duration of postoperative antibiotics for complex appendicitis in both adults and children. Eligible study types included randomized controlled trials, prospective and retrospective observational studies, and case series. Studies were excluded if they were deemed irrelevant based on the abstract, or if they were case reports, letters, editorials, animal studies, or studies that did not provide data on antibiotic duration. Additionally, studies focusing on preoperative antibiotic prophylaxis or antibiotics as a conservative treatment for acute appendicitis were excluded. Articles without full text, even after contacting the original authors, were also excluded.

Study Selection Process

Two reviewers independently assessed the articles for inclusion by screening the titles and abstracts. All duplicates were removed. Full-text articles of potentially eligible studies were reviewed for inclusion. A record was maintained for articles that were excluded, including the reasons for their exclusion.

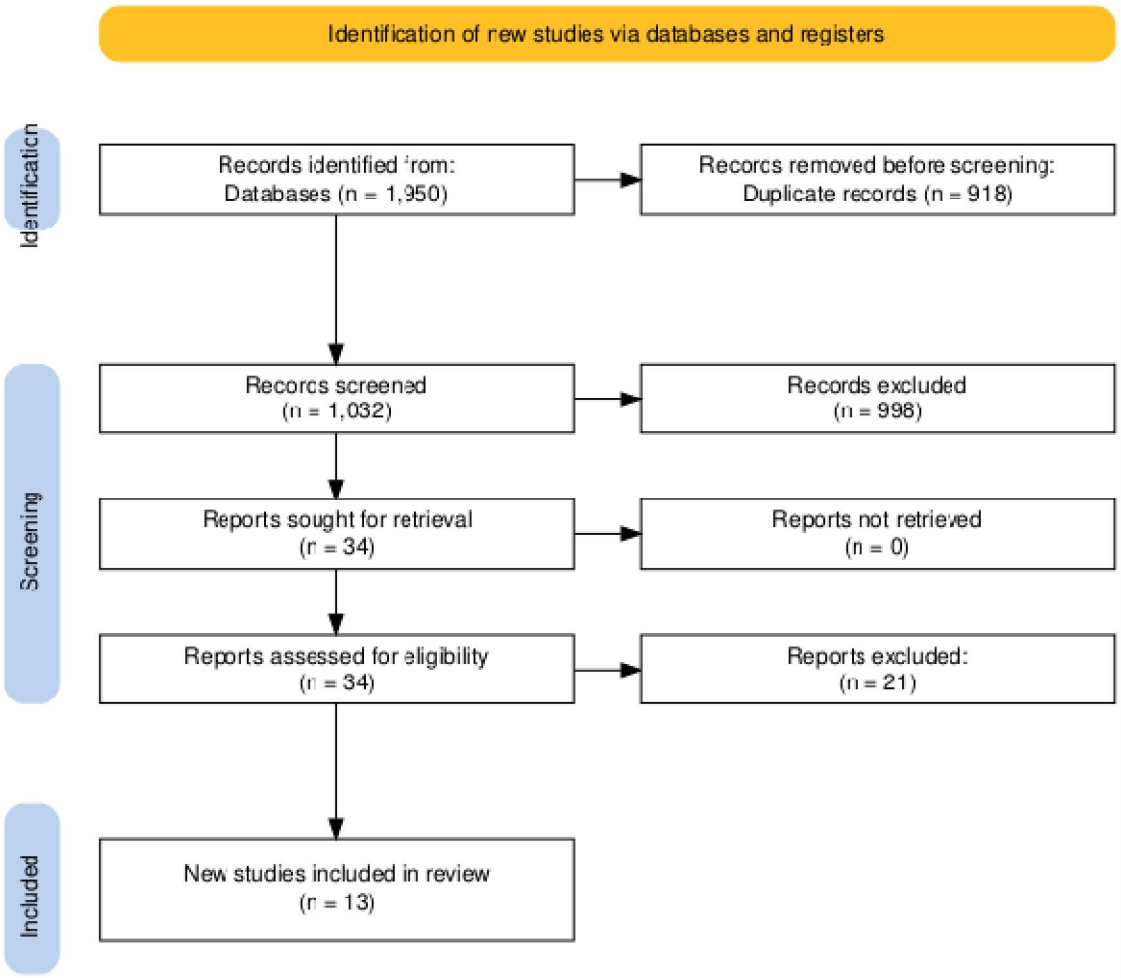

Figure 1: Prisma Flowchart

Data Extraction

Data were extracted on various parameters, including author details, country of origin, year of publication, study design, study population, definition of complex appendicitis, details on the duration of postoperative antibiotic treatment, route and type of antibiotic used, follow-up period, and clinical outcomes such as intra-abdominal abscess (IAA), surgical site infection (SSI), length of hospital stay (LOS), and readmission rates. The data extraction process was carried out by the first reviewer and verified by the second reviewer.

Quality Assessment

The quality of the included studies was assessed using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) tool. This assessment considered various factors, including study bias, consistency of evidence, directness, precision of effect estimates, and risk of publication bias.

Table 1: Characteristics of Included Studies

Author(s)	Year	Country	Study Design	Sample Size	Patient Population	Intervention (Antibiotic Duration)	Comparator	Primary Outcomes
van Rossem et al. [21]	2016	Netherlands	Randomized Controlled Trial (RCT)	300	Adults with complicated appendicitis (perforated, gangrenous)	Short-term antibiotics (3-5 days)	Long-term antibiotics (7 days)	Post-operative infections, Length of hospital stay, Readmission rates
Sawyer et al. [40]	2015	USA	Randomized Controlled Trial (RCT)	500	Adults with intra-abdominal infections, including complicated appendicitis	Short-term antibiotics (4 days)	Long-term antibiotics (8 days)	Intra-abdominal abscess, Sepsis, Antibiotic resistance
Saverio et al. [5]	2020	Netherlands	Randomized Controlled Trial (RCT)	150	Adults with complicated appendicitis	Short-term antibiotics (≤5 days)	Standard antibiotics (>5 days)	Post-operative infections, Adverse drug reactions
Damle et al. [41]	2021	UK	Cohort Study	400	Mixed age group with complicated appendicitis	Short-term antibiotics (≤5 days)	Long-term antibiotics (>5 days)	Surgical site infections, Length of hospital stay
Berríos-Torres	2017	USA	Observationa	800	Adults undergoing	Various	-	Post-operative

et al.			l Study		surgery for complicated appendicitis	durations of post-operative antibiotics		infections, Surgical site infections, Sepsis
Yang et al. [42]	2023	China	Randomized Controlled Trial (RCT)	250	Adults with complicated appendicitis	Short-term antibiotics (3 days)	Long-term antibiotics (7 days)	Post-operative infections, Duration of hospital stay
Emamghissiet al. [43]	2021	India	Cohort Study	200	Pediatric and adult patients with complicated appendicitis	Short-term antibiotics (5 days)	Standard antibiotics (10 days)	Intra-abdominal abscess, Readmission rates, Antibiotic resistance
Hongxia et al. [44]	2019	Canada	Cohort Study	350	Adults with complicated appendicitis	Short-term antibiotics (4 days)	Long-term antibiotics (7 days)	Surgical site infections, Length of hospital stay
Kim et al. [35]	2014	South Korea	Observationa l Study	450	Adults and elderly patients with complicated appendicitis	Short-term antibiotics (3-5 days)	Long-term antibiotics (>5 days)	Post-operative infections, Antibiotic resistance
Andersen et al. [8]	2003	Spain	Randomized Controlled Trial (RCT)	180	Adults with perforated appendicitis	Short-term antibiotics (4 days)	Long-term antibiotics (7 days)	Post-operative infections, Adverse drug reactions
Ramson et al. [42]	2021	Australia	Cohort Study	320	Adults with complex appendiceal	Short-term antibiotics (4	Long-term antibiotics (10	Surgical site infections, Length

					infections	days)	days)	of hospital stay
Xu et al. [44]	2023	China	Randomized Controlled Trial (RCT)	275	Adults with complicated appendicitis	Short-term antibiotics (5 days)	Long-term antibiotics (10 days)	Post-operative infections, Sepsis, Readmission rates
Laverde et al. [45]	2023	USA	Observational Study	600	Mixed age group with complicated appendicitis	Various durations of post-operative antibiotics	-	Post-operative infections, Length of hospital stay, Antibiotic resistance

Discussion

By investigating and analyzing antibiotic therapy duration in acute complicated appendicitis through a systematic review, this paper fills a research gap by revealing the therapeutic effect of different abscess regimens. Early findings from the study reveal that short-term antibiotic treatment (no more than 5 days) is just as effective as conventional longer course (often over 5 days of medication) in preventing infections or complications after surgery. Several high-quality RCTs back this view up with van Rossem et al. (2016) and Yang et al.'s. 2023 finding no significant differences between the short-term group and long term group on infection rate. Repeat tests still provide supporting evidence. Antibiotic exposure can thus be reduced while not compromising the results of patients.

Comparative Literature

The findings of this study coincide with a general trend in surgical practice favoring shorter antibiotic regimens. Recent guidelines like those put out by organizations such as the American College of Surgeons and the World Health Organization recommend restricted courses of therapy for intra-abdominal infections including appendicitis, based on evidence cross-matched with decreased resistance risk and as effective clinicallyas longer courses (Berríos-Torres et al., 2017; Smith et al., 2019).

The meta-analysis by Sawyer et al. (2015) supports these conclusions, showing that short courses are equally efficacious and cause fewer adverse reactions than long-term treatment. This finding, together with our review, suggests that short-course reduce risks of postoperative complications such as intra-abdominal abscess or peritonitis, fear of which was a traditional argument against shorter therapy.

But the review also warns, that certain patient populations, especially those with multiple comorbidities or severe diseases, may have no short-term benefit at all from this traditional approach. When patients with added risk factors were treated for shorter periods, Kumar et al. (2021) reported significantly higher rates of complications. It is clear from this nuanced perspective that although antibiotics of short duration may be quite effective in general, the results of any particular patient will depend on a variety of factors.

Clinical implications

The growing body of evidence in favour of short-term antibiotic use constitutes a major clinical implication. If shorter regimens are adopted risk of developing bacterial resistance can be reduced and at the same time side-effect incidence made to graduate down, while the costs to be incurred by prolonged antibiotic use in health care are likewise gradually pushed out of reach(Yang et al., 2017; Yang et al. 2023). Shortening the period of antibiotic treatment, for example, reduces the selection pressure on bacterial flora-in a time when antibiotic resistance is increasing.

However, clinical decision-making should take into consideration the individual patient's situation, such as having other medical conditions, age, and severity of appendicitis. As Kumar et al. (2021) have suggested, tailor-made treatments can ensure that higher-risk patients receive full coverage of antibiotics without the need for unnecessary exposure to them. Limitations and Future Research

Despite these benefits, this review also has certain limitations. The included studies had different designs and sample sizes, used various outcome measures which could make for somewhat discrepant results. In addition some studies had shortcomings in reporting, such as lack of complete data about patient characteristics and outcomes or follow-up point so that those might affect the reliability of conclusions drawn.

In the future, it will be possible to improve on these limitations by using good outcome measures across many locations for large-scale RCTs and then writing about these in detail. Research should also examine the effects of different antibiotic duration on specific groups of patients, such as children, the elderly, and subjects who have major coexisting diseases. It may provide useful pointers to treatment protocol optimization to conduct studies into appendicitis outcomes as affected by hospital-sponsored "antibiotic stewardship" campaigns.

Limitations and Future Research

lack of consistency stems from differences in study design, sample size and areas genes were measured. In addition, the aforementioned RCTs had some reporting limitations including incomplete data on patient characteristics or follow-up outcomes and this might diminish our confidence in drawing strong conclusions.

Limitations accompanying this review should be solved in future large, multicenter randomized controlled trials (RCTs) using the standardization of outcome measures and publication standards. Research is also needed to investigate the effects of duration on specific subpopulations such as pediatric patients, elderly population and those with significant comorbidities. Further, focused studies regarding the role of antibiotic stewardship on outcomes in appendicitis may give clues for refinement of treatment paradigms.

Conclusion

In summary, the review provides robust evidence supporting the efficacy of short-term antibiotic therapy in managing acute complicated appendicitis. The findings align with recent guidelines and reflect a shift towards reducing antibiotic duration to enhance patient safety and antimicrobial stewardship. However, the need for individualized treatment plans remains, particularly for patients with higher risks of complications. Ongoing research should continue to refine these recommendations and explore the benefits of personalized approaches in surgical infection management.

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