**Final Mini CAT Name:** Markenzie Jean-baptiste

**Clinical Question:** **Brief description of patient problem/setting (summarize the case very briefly)**

     In my General Surgery rotation at QHC, I had a 43 y/o M who presented to the emergency department w/ abdominal pain, mostly in the right lower abdomen and worst with movement x 1 day. He underwent a laparoscopic appendectomy in which the appendix was successfully removed. There are both benefits and risks in performing laparoscopic appendectomy. Is there better efficacy with performing the laparoscopic versus the open approach in regard to post op complications, morbidity and mortality?

**PICO Question:** Clearly state the question (including outcomes or criteria to be tracked)

In patients with appendicitis, how does laparoscopic appendectomy compare to open appendectomy with risk of intra-abdominal abscess and post-op wound infections?

**PICO search terms:**

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| **P** | **I** | **C** | **O** |
| Adult Patients | Laparoscopy | Open | Infection |
| Appendicitis | Laparoscopic surgery  | Open surgery  | abscess |
| Appendectomy |   |   | morbidity |
| Appendix Surgery |   |   | mortality |
|   |   |   | complication |
|   |   |   |   |

**Search tools and strategy used:**

Please indicate what data bases/tools you used, provide a list of the terms you searched together in each tool, and how many articles were returned using those terms and filters.

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| Database | Terms | Filter | Articles |
| PubMed | Appendicitis LaparoscopyOpen surgery | Meta-AnalysisSystematic ReviewRandomized Control TrialLast 10 Years  | 159 |
| TRIP Database | PICO Format:P: appendicitisI: laparoscopyC: open surgeryO: complications | Systematic Reviews: 34Controlled Trials: 37Primary Research: 121 | 316 |
| Cochrane Library (Wiley) | Appendicitis LaparoscopyOpen surgery | N/A | 0 |
| JAMA | LaparoscopyOpen appendectomy | ReviewResearch | 97 |
| ScienceDirect | laparoscopyopen appendectomy | Last 10 YearsReview ArticlesOpen Access | 24 |
| Google Scholar | laparoscopic versus open appendectomy | Since 2015Sort by Relevance  | 13,300 |

**Results found: 13,896**

**Explain how you narrow your choices to the few selected articles.**

I was able to find a good amount of research relating to the use of laparoscopic and open approach for appendectomies. I used all the various data bases to find studies related to my clinical question but eventually focused on using PubMed and Trip Data Base. I yielded a lot of studies initially but was able to narrow down the search with filters by study type and year. After applying the filters, I was able to select studies by reading the title, abstract and looking to see if the studies answered my specific question. When I narrowed down my studies, I chose the highest available level of evidence, systematic reviews, meta-analyses, and/or Randomized Controlled Trials (RCTs).

**Articles Chosen:**

**Article 1:**

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| [Cochrane Database Syst Rev.](https://www.ncbi.nlm.nih.gov/pubmed/30484855) 2018 Nov 28;11:CD001546. doi: 10.1002/14651858.CD001546.pub4.Laparoscopic versus open surgery for suspected appendicitis.[Jaschinski T](https://www.ncbi.nlm.nih.gov/pubmed/?term=Jaschinski%20T%5BAuthor%5D&cauthor=true&cauthor_uid=30484855)1, [Mosch CG](https://www.ncbi.nlm.nih.gov/pubmed/?term=Mosch%20CG%5BAuthor%5D&cauthor=true&cauthor_uid=30484855), [Eikermann M](https://www.ncbi.nlm.nih.gov/pubmed/?term=Eikermann%20M%5BAuthor%5D&cauthor=true&cauthor_uid=30484855), [Neugebauer EA](https://www.ncbi.nlm.nih.gov/pubmed/?term=Neugebauer%20EA%5BAuthor%5D&cauthor=true&cauthor_uid=30484855), [Sauerland S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Sauerland%20S%5BAuthor%5D&cauthor=true&cauthor_uid=30484855). |
| **Type of article:** Systematic Review/Meta-analysis |
| **Abstract****BACKGROUND:** The removal of the acute appendix is one of the most frequently performed surgical procedures. Open surgery associated with therapeutic efficacy has been the treatment of choice for acute appendicitis. However, in consequence of the evolution of endoscopic surgery, the operation can also be performed with minimally invasive surgery. Due to smaller incisions, the laparoscopic approach may be associated with reduced postoperative pain, reduced wound infection rate, and shorter time until return to normal activity. This is an update of the review published in 2010.**OBJECTIVES:** To compare the effects of laparoscopic appendectomy (LA) and open appendectomy (OA) with regard to benefits and harms.**SEARCH METHODS:** We searched the Cochrane Central Register of Controlled Trials (CENTRAL), Ovid MEDLINE and Embase (9 February 2018). We identified proposed and ongoing studies from World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP), ClinicalTrials.gov and EU Clinical Trials Register (9 February 2018). We hand searched reference lists of identified studies and the congress proceedings of endoscopic surgical societies.**SELECTION CRITERIA:** We included randomized controlled trials (RCTs) comparing LA versus OA in adults or children.**DATA COLLECTION AND ANALYSIS:** Two review authors independently selected studies, assessed the risk of bias, and extracted data. We performed the meta-analyses using Review Manager 5. We calculated the Peto odds ratio (OR) for very rare outcomes, and the mean difference (MD) for continuous outcomes (or standardised mean differences (SMD) if researchers used different scales such as quality of life) with 95% confidence intervals (CI). We used GRADE to rate the quality of the evidence.**MAIN RESULTS:** We identified 85 studies involving 9765 participants. Seventy-five trials included 8520 adults and 10 trials included 1245 children. Most studies had risk of bias issues, with attrition bias being the largest source across studies due to incomplete outcome data.In adults, pain intensity on day one was reduced by 0.75 cm on a 10 cm VAS after LA (MD -0.75, 95% CI -1.04 to -0.45; 20 RCTs; 2421 participants; low-quality evidence). Wound infections were less likely after LA (Peto OR 0.42, 95% CI 0.35 to 0.51; 63 RCTs; 7612 participants; moderate-quality evidence), but the incidence of intra-abdominal abscesses was increased following LA (Peto OR 1.65, 95% CI 1.12 to 2.43; 53 RCTs; 6677 participants; moderate-quality evidence).The length of hospital stay was shortened by one day after LA (MD -0.96, 95% CI -1.23 to -0.70; 46 RCTs; 5127 participant; low-quality evidence). The time until return to normal activity occurred five days earlier after LA than after OA (MD -4.97, 95% CI -6.77 to -3.16; 17 RCTs; 1653 participants; low-quality evidence). Two studies showed better quality of life scores following LA, but used different scales, and therefore no pooled estimates were presented. One used the SF-36 questionnaire two weeks after surgery and the other used the Gastro-intestinal Quality of Life Index six weeks and six months after surgery (both low-quality evidence).In children, we found no differences in pain intensity on day one (MD -0.80, 95% CI -1.65 to 0.05; 1 RCT; 61 participants; low-quality evidence), intra-abdominal abscesses after LA (Peto OR 0.54, 95% CI 0.24 to 1.22; 9 RCTs; 1185 participants; low-quality evidence) or time until return to normal activity (MD -0.50, 95% CI -1.30 to 0.30; 1 RCT; 383 participants; moderate-quality evidence). However, wound infections were less likely after LA (Peto OR 0.25, 95% CI 0.15 to 0.42; 10 RCTs; 1245 participants; moderate-quality evidence) and the length of hospital stay was shortened by 0.8 days after LA (MD -0.81, 95% CI -1.01 to -0.62; 6 RCTs; 316 participants; low-quality evidence). Quality of life was not reported in any of the included studies.**AUTHORS' CONCLUSIONS:** Except for a higher rate of intra-abdominal abscesses after LA in adults, LA showed advantages over OA in pain intensity on day one, wound infections, length of hospital stay and time until return to normal activity in adults. In contrast, LA showed advantages over OA in wound infections and length of hospital stay in children. Two studies reported better quality of life scores in adults. No study reported this outcome in children. However, the quality of evidence ranged from very low to moderate and some of the clinical effects of LA were small and of limited clinical relevance. Future studies with low risk of bias should investigate, in particular, the quality of life in children. |
| **Hyperlink: https://www.ncbi.nlm.nih.gov/pubmed/30484855** |

**Article 2:**

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| [Int J Surg.](https://www.ncbi.nlm.nih.gov/pubmed/28302449) 2017 Apr;40:187-197. doi: 10.1016/j.ijsu.2017.03.022. Epub 2017 Mar 14.Is laparoscopic appendectomy feasible for complicated appendicitis ?A systematic review and meta-analysis.[Yu MC](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yu%20MC%5BAuthor%5D&cauthor=true&cauthor_uid=28302449)1, [Feng YJ](https://www.ncbi.nlm.nih.gov/pubmed/?term=Feng%20YJ%5BAuthor%5D&cauthor=true&cauthor_uid=28302449)2, [Wang W](https://www.ncbi.nlm.nih.gov/pubmed/?term=Wang%20W%5BAuthor%5D&cauthor=true&cauthor_uid=28302449)2, [Fan W](https://www.ncbi.nlm.nih.gov/pubmed/?term=Fan%20W%5BAuthor%5D&cauthor=true&cauthor_uid=28302449)2, [Cheng HT](https://www.ncbi.nlm.nih.gov/pubmed/?term=Cheng%20HT%5BAuthor%5D&cauthor=true&cauthor_uid=28302449)2, [Xu J](https://www.ncbi.nlm.nih.gov/pubmed/?term=Xu%20J%5BAuthor%5D&cauthor=true&cauthor_uid=28302449)2. |
| **Type of article:** Systematic Review/Meta-analysis |
| **Abstract****BACKGROUND:** laparoscopic appendectomy(LA) has proved to be a safe alternative to open appendectomy(OA) in uncomplicated appendicitis; however, the feasibility of LA for complicated appendicitis(CA) has not been conclusively determined.**OBJECTIVES:** To assess the feasibility and safety of LA for CA through a systematic review and meta-analysis.**METHODS:** A literature search in PubMed, Embase, Cochrane Library, and web of Science was performed for eligible studies published from the inception of the databases to January 2016. All studies comparing LA and OA for CA were reviewed. After literature selection, data extraction and quality assessment were performed by two reviewers independently, and meta-analysis was conducted using Revman software, vision 5.2.**RESULTS:** Two randomized controlled trials (RCTs) and 14 retrospective cohort studies(RCSs) were finally identified. Our meta-analysis showed that LA for CA could reduce the rate of surgical site infections (SSIs) (OR = 0.28; 95% CI: 0.25 to0.31, P < 0.00001), but LA did not increase the rate of postoperative intra-abdominal abscess(IAA) (OR = 0.79; 95% CI: 0.45 to 1.34, P = 0.40). The results showed that the operating time in the LA groups was much longer than that in the OA groups (WMD = 13.78, 95% CI: 8.99 to 18.57, P < 0.00001). However, the length of hospital stays in the LA groups were significantly shorter than those in the OA groups (WMD = -2.47, 95%CI: -3.75 to -1.19, P < 0.0002), and the time until oral intake(TTOI) was much earlier in the LA groups than in the OA groups (WMD = -0.88, 95% CI: -1.20 to -0.55, P < 0.00001). No significant difference was observed in the times of postoperative analgesia between the two groups(P > 0.05).**CONCLUSION:** LA was feasible and safe for complicated appendicitis, and it not only could shorten the hospital stays and the time until oral intake, but it could also reduce the risk of surgical site infection. |
| **Hyperlink: https://www.ncbi.nlm.nih.gov/pubmed/28302449** |

 **Article 3:**

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| [BMC Gastroenterol](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2988072/). 2010; 10: 129. Published online 2010 Nov 3. doi: [10.1186/1471-230X-10-129](https://dx.doi.org/10.1186/1471-230X-10-129)PMCID: PMC2988072PMID: [21047410](https://www.ncbi.nlm.nih.gov/pubmed/21047410)Laparoscopic versus conventional appendectomy - a meta-analysis of randomized controlled trials[Xiaohang Li](https://www.ncbi.nlm.nih.gov/pubmed/?term=Li%20X%5BAuthor%5D&cauthor=true&cauthor_uid=21047410),1 [Jialin Zhang](https://www.ncbi.nlm.nih.gov/pubmed/?term=Zhang%20J%5BAuthor%5D&cauthor=true&cauthor_uid=21047410),1 [Lixuan Sang](https://www.ncbi.nlm.nih.gov/pubmed/?term=Sang%20L%5BAuthor%5D&cauthor=true&cauthor_uid=21047410),2 [Wenliang Zhang](https://www.ncbi.nlm.nih.gov/pubmed/?term=Zhang%20W%5BAuthor%5D&cauthor=true&cauthor_uid=21047410),2 [Zhiqiang Chu](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chu%20Z%5BAuthor%5D&cauthor=true&cauthor_uid=21047410),1 [Xin Li](https://www.ncbi.nlm.nih.gov/pubmed/?term=Li%20X%5BAuthor%5D&cauthor=true&cauthor_uid=21047410),1 and [Yongfeng Liu](https://www.ncbi.nlm.nih.gov/pubmed/?term=Liu%20Y%5BAuthor%5D&cauthor=true&cauthor_uid=21047410)1 |
| **Type of article:** Meta-analysis |
| **Abstract****Background**Although laparoscopic surgery has been available for a long time and laparoscopic cholecystectomy has been performed universally, it is still not clear whether open appendectomy (OA) or laparoscopic appendectomy (LA) is the most appropriate surgical approach to acute appendicitis. The purpose of this work is to compare the therapeutic effects and safety of laparoscopic and conventional "open" appendectomy by means of a meta-analysis.**Methods**A meta-analysis was performed of all randomized controlled trials published in English that compared LA and OA in adults and children between 1990 and 2009. Calculations were made of the effect sizes of: operating time, postoperative length of hospital stay, postoperative pain, return to normal activity, resumption of diet, complications rates, and conversion to open surgery. The effect sizes were then pooled by a fixed or random-effects model.**Results**Forty-four randomized controlled trials with 5292 patients were included in the meta-analysis. Operating time was 12.35 min longer for LA (95% CI: 7.99 to 16.72, p < 0.00001). Hospital stay after LA was 0.60 days shorter (95% CI: -0.85 to -0.36, p < 0.00001). Patients returned to their normal activity 4.52 days earlier after LA (95% CI: -5.95 to -3.10, p < 0.00001), and resumed their diet 0.34 days earlier(95% CI: -0.46 to -0.21, p < 0.00001). Pain after LA on the first postoperative day was significantly less (p = 0.008). The overall conversion rate from LA to OA was 9.51%. With regard to the rate of complications, wound infection after LA was definitely reduced (OR = 0.45, 95% CI: 0.34 to 0.59, p < 0.00001), while postoperative ileus was not significantly reduced(OR = 0.91, 95% CI: 0.57 to 1.47, p = 0.71). However, intra-abdominal abscess (IAA), intraoperative bleeding and urinary tract infection (UIT) after LA, occurred slightly more frequently(OR = 1.56, 95% CI: 1.01 to 2.43, p = 0.05; OR = 1.56, 95% CI: 0.54 to 4.48, p = 0.41; OR = 1.76, 95% CI: 0.58 to 5.29, p = 0.32).**Conclusion**LA provides considerable benefits over OA, including a shorter length of hospital stay, less postoperative pain, earlier postoperative recovery, and a lower complication rate. Furthermore, over the study period it was obvious that there had been a trend toward fewer differences in operating time for the two procedures. Although LA was associated with a slight increase in the incidence of IAA, intra operative bleeding and UIT, it is a safe procedure. It may be that the widespread use of LA is due to its better therapeutic effect.  |
| **Hyperlink: https://www.ncbi.nlm.nih.gov/pubmed/21047410** |

**Summary of the Evidence**:

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| Author (Date) | Level of Evidence | Sample/Setting(# of subjects/ studies, cohort definition etc. ) | Outcome(s) studied | Key Findings | Limitations and Biases |
| Jaschinski T, Mosch CG, Eikermann M, Neugebauer EA, Sauerland S.( Nov 28 2018) | Systematic Review/Meta-Analysis of Randomized Controlled Trials | - Authors searched Cochrane Central Register of Controlled Trials (CENTRAL), Ovid MEDLINE and Embase (9 February 2018). They identified proposed and ongoing studies from World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP), ClinicalTrials.gov and EU Clinical Trials Register (9 February 2018) - Inclusion Criteria: Included randomized controlled trials (RCTs) comparing LA versus OA in adults or children. Included all participants regardless of age with symptoms and signs of acute appendicitis. -85 randomised studies met the inclusion criteria with 9765 participants. Seventy‐five trials included 8520 adults and 10 trials included 1245 children.  |  (1) Pain intensity on day one (any validated score such as visual analogue scale);(2) Wound infections (defined by the study authors as a rate) up to 14 days after surgery;(3) Intra‐abdominal abscesses (defined by the study authors as a rate) up to 14 days after surgery  | In adults, wound infections were less likely after LA (Peto OR 0.42, 95% CI 0.35 to 0.51; 63 RCTs; 7612 participants; moderate‐quality evidence), but the incidence of intra‐abdominal abscesses was increased following LA (Peto OR 1.65, 95% CI 1.12 to 2.43; 53 RCTs; 6677 participants; moderate‐quality evidence). In children, there were no differences in intra‐abdominal abscesses after LA (Peto OR 0.54, 95% CI 0.24 to 1.22; 9 RCTs; 1185 participants; low‐quality evidence) However, wound infections were less likely after LA (Peto OR 0.25, 95% CI 0.15 to 0.42; 10 RCTs; 1245 participants; moderate‐quality evidence  | - Authors recognize: The quality of evidence ranged from very low to moderate and some of the clinical effects of LA were small and of limited clinical relevance.  |
| Yu MC, Feng YJ, Wang W,Fan W, Cheng HT XU J (Feb 2014) | Systematic Review and Meta-analysis of randomized trials | - Authors searched Relevant studies were searched from the PubMed, Embase, Cochrane Library, and Web of Science databases. - Two randomized controlled trials (RCTs) and 14 retrospective cohort studies(RCSs) were finally identified.  | -primary outcomes include (1)postoperative [surgical site infections](https://www.sciencedirect.com/topics/medicine-and-dentistry/surgical-infection) (SSIs) and (2) postoperative intra-abdominal abscess(IAA).    |  Our meta-analysis showed that LA for CA could reduce the rate of [surgical site infections](https://www.sciencedirect.com/topics/medicine-and-dentistry/surgical-infection) (SSIs) (OR = 0.28; 95% CI: 0.25 to0.31, *P* < 0.00001), but LA did not increase the rate of postoperative intra-abdominal abscess(IAA) (OR = 0.79; 95% CI: 0.45 to 1.34, *P* = 0.40)  | (1)the main limitation was that most of the included studies were retrospective, except for two RCTS, and the inadequate random sequence generation and lack of blinding tended to increase the risk of bias.(2)different studies had different defining criteria for complicated appendicitis (CA) and different outcome measurements, most of the studies defined CA as a perforated appendix with or without abscess formation and with or without peritonitis, but some articles also included gangrenous appendicitis as complicated appendicitis.(3) Third, the small sample size, single-centre experience and lack of data entirely from double-blind studies might have decreased the reliability of the results. (4)The surgeons had various levels of experience in LA for CA, and treatment protocols amongst the studies differed, therefore heterogenity in the studies might have existed. (5) The degree of appendicitis in the studies might have been different; the greater the severity of appendicitis, the more complications that might occur, and the severity of appendicitis could also influence the recovery and operation time.    |
| Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, Liu Y. (Jun 2010) | Meta-Analysis of Randomized Controlled Trials | - Authors searched  electronic databases (MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Trials) for potentially relevant randomized controlled trials comparing LA and OA conducted from January 1990 to December 2009, - Inclusion Criteria: (1) a prospective randomized study format only; (2) a comparison of laparoscopic and open appendicectomy; (3) The study reported at least one of the desirable outcomes mentioned below and the standard deviation of the mean for continuous outcomes of interest was reported or can be calculated; (4) Studies that allocated patients depending on the availability of staff or instruments were excluded; (5) Studies that used variations on the standard laparoscopic technique, including hybrid procedures or single trochar techniques, were also excluded. - Exclusion Criteria: (1) Studies that allocated patients depending on the availability of staff or instruments were excluded; (2) Studies that used variations on the standard laparoscopic technique, including hybrid procedures or single trochar techniques, were also excluded.  - Forty-four randomized controlled trials with 5292 patients were included in the meta-analysis.   | - several complications were observed: wound infection, postoperative ileus, intraoperative bleeding (>500 mL), urinary tract infection (UTI) and intra-abdominal abscess (IAA) formation following LA vs. OA techniques.  | -With regard to the rate of complications, wound infection after LA was definitely reduced (OR = 0.45, 95% CI: 0.34 to 0.59, p < 0.00001), while postoperative ileus was not significantly reduced(OR = 0.91, 95% CI: 0.57 to 1.47, p = 0.71). However, intra-abdominal abscess (IAA), intraoperative bleeding and urinary tract infection (UIT) after LA, occurred slightly more frequently(OR = 1.56, 95% CI: 1.01 to 2.43, p = 0.05; OR = 1.56, 95% CI: 0.54 to 4.48, p = 0.41; OR = 1.76, 95% CI: 0.58 to 5.29, p = 0.32).  | - (1) different studies included in our research may have had slightly different defining criteria for the outcome measures, e.g., wound infection and ileus. (2) not all the studies measured data based on a double-blind.(3) there was variation in surgical techniques and treatment protocols amongst the studies, and therefore heterogeneity in the studies might exist. (4)although most studies were comparable with regard to age and sex, fewer were matched for severity of appendicitis (represented by fever, raised WBC, peritonitis and perforated rate) and weight   |

**Conclusion(s):**

Jaschinski et al concluded that laparoscopic appendectomy had a lower incidence of post-op wound infections and higher incidence of intra-abdominal abscess compared to open appendectomy in adults. For children, there were no differences in intra-abdominal abscess post op but there were slightly fewer wound infections with laparoscopic appendectomy compared to open appendectomy.

Yu et al concluded that there was lower incidence of post-operative abscess with Laparoscopic appendectomy compared to open appendectomy. There was no significant difference in incidence of post-operative abscess between laparoscopic and open appendectomy.

Li et al concluded that there was a lower incidence of wound infection for laparoscopic appendectomy compared with open appendectomy but there was not any significant difference in incidence of intra-abdominal abscess.

My overall conclusion based on these three systematic review/meta-analysis studies is that laparoscopic appendectomy has a lower incidence of post op wound infections compared to open appendectomy and there is no significant difference between the procedures when it comes to rates of intra-abdominal abscess.

Clinical Bottom Line:

I will weigh my studies in the following order: Jaschinski et al, Li et al and lastly Yu et al.

I weighed Jaschinski et al as the highest because even though all the three studies were systematic review or metanalysis, this study was the most recent study being published in 2018. This study also included the largest number of participants n= 9765 participants and the studies within the systematic review/meta-analysis were randomized control trials. I also liked that this study included data about both adults and children which were similar. A limitation to this study is that it did have a risk of attrition bias since there was incomplete outcome data of some of the participants. Also the level of evidence in some of the outcomes becing measured were moderate or low level.

I weighed Li et al as the second highest study. It was published in 2010, earlier than the other two studies. However, it did include 44 randomized control trials with n=5292 participants which was the second highest within all 3 studies. The larger sample size helps with the reliability and validity of the results. The limitations of this study is that there was variation in the surgical techniques and treatment protocols amongst the studies, in so heterogeneity may exist. Also, fewer of the studies matched the severity of the appendicitis (fever, elevated wbc, peritonitis, perforation rate) which could affect rates of intrabdominal abscess and post op infection.

I weighed Yu et al as the third highest study because even though it was also a systematic review/meta-analysis, 2 of the studies were randomized control trials comparing laparoscopic and open appendectomy and 14 of the studies were retrospective cohort studies which is of lower level of evidence. The study was published in 2017 so it was recent. A limitation to this study was that there was a lack of double blind studies which reduces the reliability.

**Magnitude of any effects**

**1)**Jaschinski, T., Mosch, C., Eikermann, M., Neugebauer, E., & Sauerland, S. (2018).

In adults, wound infections were less likely after laparascopic appendectomy(LA) (Peto OR 0.42, 95% CI 0.35 to 0.51; 63 RCTs; 7612 participants), but the incidence of intra-abdominal abscesses was increased following LA (Peto OR 1.65, 95% CI 1.12 to 2.43; 53 RCTs; 6677 participants). In children, there was  no differences in intra-abdominal abscesses after LA (Peto OR 0.54, 95% CI 0.24 to 1.22; 9 RCTs; 1185 participants; but  wound infections were less likely after LA (Peto OR 0.25, 95% CI 0.15 to 0.42; 10 RCTs; 1245 participants.

**2)** Yu, M., Feng, Y., Wang, W., Fan, W., Cheng, H., & Xu, J. (2017). Is laparoscopic appendectomy feasible for complicated appendicitis ?A systematic review and meta-analysis.

There was no significant difference in rates of post-operative intra-abdominal abscess between laparoscopic and open appendectomy (OR = 0.79; 95% CI: 0.45 to 1.34; P = 0.40). Laparoscopic appendectomy  could reduce the rate of surgical site infections  (OR = 0.28; 95% CI: 0.25 to0.31, P < 0.00001)

**3)**  Li, X., Zhang, J., Sang, L., Zhang, W., Chu, Z., Li, X., & Liu, Y. (2010). Laparoscopic versus conventional appendectomy - a meta-analysis of randomized controlled trials.

There was a 3.81% (76/1994) incidence of wound infection for laparoscopic appendectomy, compared with 8.41% (174/2069) for open appendectomy. The difference was statistically significant (OR = 0.45, 95% CI: 0.34 to 0.59, p < 0.00001. Regarding intra-abdominal abscess, the results failed to show any statistically significant difference in the incidence of intra-abdominal abscess but there was a trend in favor of open appendectomy as intra-abdominal abscess occurred slightly more frequently (OR = 1.56, 95% CI: 1.01 to 2.43, p = 0.05) with laparoscopic appendectomy.

Clinical Significance:

In conclusion, laparoscopic appendectomy was superior to open surgery in having reduced rates of wound infection and there was not any significant difference in rates of intra-abdominal abscess. Being minimally invasive, there has been many advances and improvements with use of laparoscopic techniques. Ultimately, the preferred evidenced based surgical intervention is laparoscopic appendectomy taking into account the patient’s unique presentation, history, physical exam, tests performed, surgeons experience and judgment.

Other Considerations:

Future research should aim to include information about the specific measures that can affect rates of intrabdominal abscess and post op infections during and after surgery. This could include degree of irrigation of the abdomen, antibiotic used and usage of abdominal drains in respect to both laparoscopic and open appendectomies. Also, the severity of appendicitis is also important to consider when deciding the best approach. This is especially true in cases of complicated appendicitis due to perforation, peritonitis and gangrene that can occur.

**Citations:**

 1)  Jaschinski, T., Mosch, C., Eikermann, M., Neugebauer, E., & Sauerland, S. (2018). Laparoscopic versus open surgery for suspected appendicitis. *Cochrane Database Of Systematic Reviews*. doi: 10.1002/14651858.cd001546.pub4

2) Yu, M., Feng, Y., Wang, W., Fan, W., Cheng, H., & Xu, J. (2017). Is laparoscopic appendectomy feasible for complicated appendicitis ?A systematic review and meta-analysis. *International Journal Of Surgery*, *40*, 187-197. doi: 10.1016/j.ijsu.2017.03.022

3) Li, X., Zhang, J., Sang, L., Zhang, W., Chu, Z., Li, X., & Liu, Y. (2010). Laparoscopic versus conventional appendectomy - a meta-analysis of randomized controlled trials. *BMC Gastroenterology*, *10*(1). doi: 10.1186/1471-230x-10-129