Defining treatment strategy for uncomplicated appendicitis based on patient satisfaction feedback: A cross-sectional study

Kyota Tatsuta (kyota0420@gmail.com)
Hamamatsu Medical Center https://orcid.org/0000-0001-8513-0039
Shinichiro Miyazaki
Hamamatsu Medical Center
Masahito Ogiku
Hamamatsu Medical Center
Takashi Harada
Hamamatsu Medical center
Nishiwaki Yoshiro
Hamamatsu Medical Center

Research article

Keywords: uncomplicated appendicitis, patient feedback, treatment strategy, laparoscopic appendectomy

DOI: https://doi.org/10.21203/rs.3.rs-31365/v1

Abstract

Background

Two surgical strategies are available for appendicitis: emergency laparoscopic appendectomy and interval laparoscopic appendectomy. However, timing of surgical intervention remains debatable. This study aimed to compare the surgical outcomes of emergency laparoscopic appendectomy (ELA) and interval laparoscopic appendectomy (ILA) and conduct a questionnaire survey to investigate the use of ELA and patient satisfaction with regard to treatment.

Methods

We included 162 patients who underwent laparoscopic appendectomy at our hospital. Outcomes were assessed by operation time, blood loss, postoperative fasting time, length of hospital stay, and complication rate. Patient satisfaction was measured by questionnaire addressing degree of satisfaction, pre-surgery anxiety, and length of hospital stay. Continuous variables were compared by Student's *t*-test, and discrete variables, expressed as percentages, were analyzed via chi-squared test.

Results

Of 162 patients, 74 (46%) and 88 (54%) received emergency and ILA, respectively. No significant difference was observed in the operation time, blood loss, length of hospital stay, or complication rate. Among 66 patients who responded to the questionnaire (28 emergency, 38 interval), a significant difference was observed only in the degree of satisfaction regarding the timing of the surgical intervention ($p = 0.04$).

Conclusions

Surgical outcomes of emergency and interval appendectomy were equivalent; however, patient satisfaction favored emergency appendectomy, suggesting it is a preferable approach for the treatment of uncomplicated appendicitis.

Trial registration:

NA

Background

Acute appendicitis is the most frequent abdominal emergency worldwide. In 1880, Lawson Tait was the first to diagnose and remove an infected appendix in England [1], and since then, appendectomy has been widely performed and remains the main treatment for acute appendicitis. Recently, numerous randomized controlled trials have demonstrated the many benefits of laparoscopic appendectomy compared with open appendectomy. For example, laparoscopic appendectomy produces a comparatively shorter length of hospital stay and less time to return to normal activities [2–5]. In addition, the procedure has also been reported to show a magnified effect, fewer wound infections, and improved intraperitoneal irrigation efficiency [6–8].

Advances in modern antibiotics have facilitated their successful use as a therapeutic option for appendicitis. In recent years, increasing evidence from randomized clinical trials [9–11] has shown that patients with uncomplicated acute appendicitis can be treated safely and efficiently with antibiotics. Although most cases using only antibiotics are successful, nonoperative management may fail within 24 to 48 h in about 8% of cases, and an additional 20% may require second hospitalization for recurrent acute appendicitis [12]. Therefore, appendectomy remains an important treatment strategy for acute appendicitis. However, the timing of surgical intervention remains debatable.

In general, two laparoscopic surgery strategies are available: emergency laparoscopic appendectomy (ELA) and interval laparoscopic appendectomy (ILA). In ELA, the patient undergoes an urgent appendectomy within the first 24 h of hospitalization, and any intra-abdominal abscess is drained during surgery. In ILA, surgery is scheduled to follow 6–8 weeks after initial diagnosis and start of antibiotic therapy. In the interim, the patient is discharged and resumes normal activities. The potential advantage of ELA is that it halts disease progression, with the disadvantage of potential risks of intraoperative organ injury and wound infections [10]. The putative advantage of ILA is that fewer intraoperative and postoperative complications occur due to reduced peritoneal contamination. Therefore, ILA is preferred in most pediatric cases of appendicitis. However, some researchers disapprove of the use of ILA because of increased hospital costs, risk of recurrence, and strong inflammatory adhesion [13–15]. However, with the recent technical improvements in laparoscopic surgery, ELA has been reported to be equivalent to ILA in terms of the frequency of complications [16–18].

Thus, the utility of ELA for appendicitis has been reaffirmed. In the present study, we compared the surgical outcomes of ELA and ILA and conducted a questionnaire survey to investigate the use of ELA and patient satisfaction with regard to treatment.

Methods

Study design and patients

A total of 162 patients (6–86 years old) were included who underwent laparoscopic surgery for appendicitis between January 2015 and December 2018 at our hospital. Patients who transitioned from

laparoscopy to laparotomy were excluded. The primary attending physician was given the choice between ELA and ILA (Table 1).

Table 1
Patient background

	ELA (n = 74)	ILA (n = 88)	*p*-value
Age, year, median (range)	33.9, (6–81)	38.4, (6–86)	0.21*
Sex, n (%)	Male, 40 (54)	Male, 42 (48)	0.36**
Number of treatments, n (%)	First, 62 (84)	First, 65 (74)	0.13**
	Multiple, 12 (16)	Multiple, 23 (26)	
Alvarado score, points, n (%)	≤ 4, 0 (0)	≤ 4, 2 (2)	0.15**
	5–6, 18 (13)	5–6, 29 (20)	
	≥ 7, 62 (61)	≥ 7, 61 (66)	
*Student t-test, ** chi-squared test.			
ELA, emergency laparoscopic appendectomy; ILA, interval laparoscopic appendectomy			

Complicated appendicitis was defined as the presence of a perforation, abscess, or suspicion of a tumor via computed tomography scan.

The study was approved by the independent ethics committee of our hospital in January 2017 and was performed in accordance with the ethical standards laid down by the 1964 Declaration of Helsinki and its later amendments. All study participants provided informed consent and were researched by mail survey. Pre-approval cases (cases from January 2015 to December 2016) were retrospectively investigated, and post-approval cases (cases from January 2017 to December 2018) were prospectively followed up within 1–2 months postoperatively. All patients provided informed consent for the publication of their data/survey responses. Our study obtained the written consent from study participants. Written consent from patient's parent was obtained for participants under 16 years old.

Patients were divided into ELA or ILA groups based on their respective questionnaire responses, and we performed a comparative review of the surgical outcomes.

Surgical outcomes

Surgical outcomes were measured by assessing operation time, blood loss, postoperative fasting time, postoperative length of stay, and complication rate. Intraoperative and postoperative complications were separated; events that occurred within 30 days were classified as > grade I using the Clavien–Dindo classification system.

Questionnaire investigation

We developed an original patient questionnaire for this study. The questionnaire assessed the age, number of recurrences, whether ELA or ILA was performed, degree of satisfaction (overall treatment and the timing of the surgical intervention), adequacy of the length of stay, preoperative anxiety, and recommended surgical approach (ELA or ILA). The degree of satisfaction, the length of hospital stay, and preoperative anxiety were scored on a five-point scale (− 2, − 1, 0, 1, and 2) (Table 2). In addition to this, an answer space was provided for patients to add any other relevant comments.

Table 2
Original patient questionnaire

1.	**How old were you when undergoing the operation for appendicitis? What is your sex?**
2.	How many times was your appendicitis treated by antibiotics only?
3.	Which procedure was performed: emergency surgery or interval surgery?
4.	What was the satisfaction level for the treatment underwent in our hospital? (very satisfied; satisfied; no opinion; dissatisfied; very dissatisfied)
5.	How long did you stay? (very long; long; appropriate; short; very short)
6.	When you underwent emergency surgery, what was your level of anxiety? (very anxious; anxious; no opinion; no anxious; strikingly absent)
7.	When you underwent emergency surgery, you had the option to select the interval approach. How satisfied were you regarding the time to surgery? (very satisfied; satisfied; no opinion; dissatisfied; very dissatisfied)
8.	When you underwent interval surgery, how much pre-surgery anxiety did you have? (very anxious; anxious; no opinion; no anxious; strikingly absent)
9.	When you underwent interval surgery, you had the option to select the emergency approach. Were you satisfied with the timing of the surgery intervention? (very satisfied; satisfied; no opinion; dissatisfied; very dissatisfied)
10.	What is the timing of surgery intervention that you would recommend for families? emergency or interval?
	(free answer space)

Statistical analysis

Statistical comparisons were conducted using SAS version 9.4 (SAS Institute, Cary, NC, USA). Student's *t*-test was used to compare normally distributed continuous variables. The difference between discrete

variables, expressed as frequencies (percentages), was analyzed using a chi-squared test. A p-value of < 0.05 was regarded as statistically significant. The content of the free-space responses was divided into two groups (ELA and ILA).

Results

Surgical outcomes

A total of 74 patients (46%) were classified in the ELA group, and 93 patients (54%) were in the ILA group. No significant difference was observed between the two patient groups in terms of operation time (p = 0.93), blood loss (p = 0.48), or length of postoperative hospital stay (p = 0.30). However, a significant difference in the fasting time was observed postoperatively (p < 0.01).

The incidence of intraoperative complications did not show a significant clinical difference (p = 0.19). Complications included cecum serosa injury, and surgical suture repair was performed for this. Likewise, no significant clinical difference arose for the incidence of postoperative complications (p = 0.11). Regarding grade II Clavien–Dindo complications, no significant difference in wound infection (p = 0.29) or paralytic ileus (p = 0.46) was observed. Clavien–Dindo grade III was only found in ELA patients (p = 0.27), which may have been due to reoperation because of a small bowel obstruction (Table 3).

Table 3
Surgical outcomes

	ELA	ILA	*p*-value
Operation time, minutes, median (range)	66.4 (22–152)	66.9 (28–224)	0.93*
Blood loss, ml, median (range)	6.1 (5–70)	5.5 (5–30)	0.48*
Fasting time after surgery, days, median (range)	1.5 (1–10)	1.1 (1–3)	< 0.01*
Length of stay after surgery, days, median (range)	5.9 (3–17)	5.5 (3–24)	0.30*
Intraoperative complications			
Intraoperative organ damage, n (%)	0 (0)	1 (2.2)	0.19**
Postoperative complications			
Total postoperative complications, n (%)	7 (9.5)	3 (3.4)	0.11**
Clavien–Dindo ≥ grade II, n (%)	6 (8.1)	3 (3.4)	0.19**
Wound infection, n (%)	4 (5.4)	2 (2.2)	0.29**
Paralytic ileus, n (%)	2 (2.7)	1 (1.1)	0.46**
Clavien–Dindo ≥ grade IIIa, n (%)	1 (1.3)	0 (0)	0.27**
*Student t-test, ** chi-squared test.			
ELA, emergency laparoscopic appendectomy; ILA, interval laparoscopic appendectomy			

Questionnaire results

Sixty-six (41%) patients responded to the questionnaire. Respondents were divided by age: 43.8% in the young population (< 15 years old), 37.6% in the productive-age population (15–64 years old), and 33.3%

in the elderly population (≥ 65 years old). The rate of response was nearly equal in all populations. A total of 28 (42%) patients were categorized in the ELA group and 38 (58%) in the ILA group.

A significant difference was noted in the degree of satisfaction regarding the timing of the surgical intervention ($p = 0.04$). However, no significant difference was found in the degree of satisfaction concerning the overall treatment ($p = 0.19$) or the adequacy of the length of hospital stay ($p = 0.35$). The occurrence of preoperative anxiety was not significantly different, but it tended to occur less frequently in the ELA group ($p = 0.10$). No significant difference was observed in the surgical approach recommendation, but ELA tended to be recommended more often ($p = 0.19$) (Table 4).

Table 4
Questionnaire investigation outcomes

	ELA		ILA		*P*-value
Satisfaction with overall treatment	1.30		1.03		0.19
	Points	Cases	Points	Cases	
Very satisfied	2	11	2	10	
Satisfied	1	14	1	22	
No opinion	0	1	0	4	
Dissatisfied	−1	1	−1	1	
Very dissatisfied	−2	0	−2	1	
Satisfaction with the timing of the surgical intervention	1.22		0.73		0.04
	Points	Cases	Points	Cases	
Very satisfied	2	9	2	9	
Satisfied	1	15	1	16	
No opinion	0	3	0	7	
Dissatisfied	−1	0	−1	3	
Very dissatisfied	−2	0	−2	2	
Adequacy of length of stay	−0.07		0.03		0.35
	Points	Cases	Points	Cases	
Very long	2	0	2	0	
Long	1	1	1	3	
Appropriate	0	25	0	32	
Short	−1	1	−1	2	
Very short	−2	1	−2	0	
Pre-surgery anxiety	0		0.34		0.10
	Points	Cases	Points	Cases	
Very anxious	2	0	2	5	
Anxious	1	4	1	15	

ELA, emergency laparoscopic appendectomy; ILA, interval laparoscopic appendectomy

	ELA		ILA		*P*-value
No opinion	0	20	0	7	
Not anxious	−1	4	−1	10	
Strikingly absent	−2	0	−2	1	
Which surgical	ELA	20	ILA	22	0.19
approach was recommended	ILA	6	ELA	14	
ELA, emergency laparoscopic appendectomy; ILA, interval laparoscopic appendectomy					

There were 46 free-space responses (ELA: 19 cases, ILA: 27 cases). In the ELA group, the most frequent response was “achieved a pain-free state by surgery” (7 cases). Other responses included “removed anxiety regarding recurrence” (4 cases); “there is no need for rehospitalization because of ELA;” “feel fortunate for the quick medical response;” “feel relieved because of a short hospital stay;” and “feel anxious regarding the risk of emergency surgery and transition from laparoscopy to laparotomy” (2 cases). In the ILA group, the most frequent response was: “plan to undergo surgery at a convenient time” (15 cases). Another response was “feeling fortunate because of the minimal surgical wound” (5 cases).

Discussion

Given the advantages and disadvantages of ELA and ILA, herein we examined ELA by comparing its surgical results with those of ILA and conducted a patient questionnaire survey to assess treatment satisfaction between the two surgical interventions for appendicitis. Although in the category of surgical outcomes postoperative fasting time showed a significant clinical difference between the groups, we believe that the surgical outcomes of ELA and ILA were equivalent based on other outcome measures. The questionnaire responses demonstrated a significant difference in the degree of satisfaction regarding the timing of surgical intervention, while satisfaction with the overall treatment, preoperative anxiety, and the recommended surgical approach tended to favor ELA. Based on patient satisfaction feedback, we recommend ELA for the treatment of uncomplicated appendicitis.

Acute appendicitis remains the most common reason for emergency abdominal surgery. The lifetime risk of developing appendicitis is 7–15%, with a peak incidence in the young and productive-age population [19]. Recently, nonoperative management for uncomplicated appendicitis has stood out as a safe option for patients keen to avoid appendectomy [20]. However, it is reported that appendectomy is the most effective treatment for uncomplicated appendicitis because of the reduced risk of developing peritonitis [21]. When determining a treatment strategy for appendicitis, we must consider that malignant tumors are confirmed using pathological analysis in 0.9–1.4% of all appendectomies performed to treat acute appendicitis [22].

Studies have reported treatment strategies and surgical outcomes resulting in rapid progression in appendicitis treatment. However, it is uncertain whether advances in treatment correlate with treatment satisfaction [6–8, 12, 16–18, 21, 22]. The timing of surgical intervention must be chosen on the status of disease and patient condition. In addition to medical validity, based on patient satisfaction following treatment, we believe ELA to be the most suitable treatment choice for uncomplicated appendicitis.

The quality of life associated with appendicitis treatment was considered in previous studies by comparing outcomes following antibiotic drug treatment and appendectomy [10, 23, 24]. Previous studies evaluated health-related quality of life (HR-QOL) and related factors [25] and compared ELA and ILA for appendicitis in terms of patient quality of life and its effects on parents and patients [26]. According to previous research, using antibiotics alone had a smaller impact on social life, and patients resumed their normal activity earlier than after surgery [23]. However, long-term QOL of patients taking antibiotics who later underwent appendectomy were less satisfied than patients with successful antibiotics or appendectomy [24]. In a study similar to ours, the emergency approach was reported to be better than the interval approach because patient families experienced less distress concerning the quality of life outcomes of their children [25]. Therefore, based on our findings and those reported in previous studies, we regard ELA as the preferred approach for appendicitis.

To ensure a patient-centered approach, we developed an original questionnaire to assess satisfaction from the point of view of the patient. This patient-centered concept has gained worldwide recognition since the 2000s, and patient-reported outcome (PRO) has emerged as the standard clinical outcome measure [27]. Patient satisfaction, subjective symptoms, and quality of life are all recognized by PRO. In this study, we were unable to compare the subjective symptoms of ELA with those of ILA, because ILA was not performed during active symptoms. HR-QOL has been measured in previous clinical trials using such tools as the 36-item Short Form Survey Instrument (SF-36) and the EuroQoL-5D (EQ-5D) [10, 23, 25]. We regarded assessment of the treatment satisfaction of patients to be insufficient because both ILA and ELA surgeries had equal surgical outcomes. Therefore, to assess patient satisfaction, we developed a simple and easy-to-answer original questionnaire on appendicitis using a five-point scale.

Given the addition to all other parameters for assessment, the questionnaire outcomes also indicate ELA as the recommended appendicitis treatment. However, the adequacy of the length of stay tended to be weighted in favor of ILA. The free-space responses regarding the risks of emergency surgery and transition from laparoscopy to laparotomy had to be considered.

The limitations of this study were that it was a single-center study using an original questionnaire with a low number of respondents and a small sample size. The rate of response in our study was 41%, which was lower than that of previous studies. We believe that the number of respondents was low because the survey was conducted by mail, making it cumbersome, and no compensation was provided. Previous questionnaires investigating benign and malignant diseases in Japan revealed a higher rate of responders for malignant diseases than for benign diseases [28, 29]. We believe that this difference may be attributed to the higher degree of attention patients pay to certain diseases and their risks than they do

for others, and this tendency is the same in questionnaires from other countries [30]. Moreover, the content of the questionnaire was based on disease-specific characteristics but may not be sufficiently accurate because of its novelty. A total of 105 cases (60.5%) were pre-approved by the independent ethics committee of our hospital and did not receive a full explanation in this study.

Conclusion

The surgical outcomes of ELA and ILA are equivalent. However, patient satisfaction was weighted in favor of ELA, suggesting that it is a preferable approach for the treatment of uncomplicated appendicitis.

Abbreviations

ELA
emergency laparoscopic appendectomy
ILA
interval laparoscopic appendectomy
HR-QOL
health-related quality of life
PRO
patient-reported outcome
SF-36
36-item Short Form Survey Instrument
EQ-5D
EuroQoL-5D

Declarations

Ethics approval and consent to participate

The ethics committee of the Hamamatsu Medical Hospital approved this study (approval no. 52017). The study was performed in accordance with the ethical standards laid down by the 1964 Declaration of Helsinki and its later amendments. All study participants provided informed consent and were researched by mail survey. Our study obtained the written consent from study participants. Written consent from patient's parent was obtained for participants under 16 years old.

Consent for publication

Not applicable

Availability of data and materials

All data is present in manuscript an supplementary files.

Competing interests

The authors declare that they have no competing interests.

Funding Sources

Not applicable

Author contributions

MO and TH analyzed and interpreted the patient data. SM made questionnaire , and was a major contributor in writing the manuscript. YN is responsible for this study. All authors read and approved the final manuscript

Acknowledgments

We are grateful to Dr. Unno for engaging in helpful discussion.

References

1. Seal A. Appendicitis: A historical review. Can J Surg. 1981;24:427–33.
2. Wei B, Qi CL, Chen TF, Zheng ZH, Huang JL, Hu BG, et al. Laparoscopic versus open appendectomy for acute appendicitis: A metaanalysis. Surg Endosc. 2011;25:1199–208.
3. Gavriilidis P, de'Angelis N, Katsanos K, Di Saverio S. Acute appendicectomy or conservative treatment for complicated appendicitis (phlegmon or abscess)? A systematic review by updated traditional and cumulative meta-analysis. J Clin Med Res. 2019;11:56–64.
4. Li P, Han Y, Yang Y, Guo H, Hao F, Tang Y, et al. Retrospective review of laparoscopic versus open surgery in the treatment of appendiceal abscess in pediatric patients. Medicine. 2017;96:e7514. doi:10.1097/MD.0000000000007514.
5. Guller U, Hervey S, Purves H, Muhlbaier LH, Peterson ED, Eubanks S, et al. Laparoscopic versus open appendectomy: outcomes comparison based on a large administrative database. Ann Surg. 2004;239:43–52.
6. Wullstein C, Barkhausen, Gross E. Result of laparoscopic vs conventional appendectomy in complicated appendicitis. Surg Endosc. 2004;18:969–73.
7. Towfigh S, Chen F, Mason R, Katkhouda N, Chan L, Berne T. Laparoscopic appendectomy significantly reduces length of stay for perforated appendicitis. Surg Endosc. 2006;20:495–59.
8. Katsuno G, Fukunaga M, Nagakari K, et al. Laparoscopic versus open surgery for complicated appendicitis. Jpn J Gastroenterol Surg. 2009;42:16–24.
9. Talan DA, Saltzman DJ, Mower WR, Krishnadasan A, Jude CM, Amii R, et al. Antibiotics-first versus surgery for appendicitis: A US pilot randomized controlled trial allowing outpatient antibiotic management. Ann Emerg Med. 2017;70:1–11.

10. Bachur RG, Lipsett SC, Monuteaux MC. Outcomes of nonoperative management of uncomplicated appendicitis. Pediatrics. 2017;140:e20170048.
11. Haijanen J, Sippola S, Grönroos J, Rautio T, Nordström P, Rantanen T, et al. Optimising the antibiotic treatment of uncomplicated acute appendicitis: A protocol for a multicentre randomized clinical trial (APPAC II trial). BMC Surg. 2018;18:117. https://doi.org/10.1186/s12893-018-0451-y.
12. Podda M, Gerardi C, Cillara N, Fearnhead N, Gomes CA, Birindelli A, et al. Antibiotic treatment and appendectomy for uncomplicated acute appendicitis in adults and children: a systematic review and meta-analysis. Ann Surg. 2019;270:1028–40.
13. Ingraham AM, Cohen ME, Bilimoria KY, Pritts TA, Ko CY, Esposito TJ. Comparison of outcomes after laparoscopic versus open appendectomy for acute appendicitis at 222 ACS NSQIP hospitals. Surgery. 2010;148:625–37.
14. Sceats LA, Trickey AW, Morris AM, Kin C, Staudenmayer KL. Nonoperative management of uncomplicated appendicitis among privately insured patients. JAMA Surg. 2019;154:141–49.
15. Fawkner-Corbett D, Jawaid WB, McPartland J, Losty PD. Interval appendectomy in children clinical outcomes, financial costs and patient benefits. Pediatr Surg Int. 2014;30:743–6.
16. Church JT, Klein EJ, Carr BD, Bruch SW. Early appendectomy reduces costs in children with perforated appendicitis. J Surg Res. 2017;220:119–24.
17. Tsai HY, Chao HC, Yu WJ. Early appendectomy shortens antibiotic course and hospital stay in children with early perforated appendicitis. Pediatr Neonatol. 2017;58:406–14.
18. Blakely ML, Williams R, Dassinger MS, Eubanks JW, Fischer P, Huang EY, et al. Early vs interval appendectomy for children with perforated appendicitis. Arch Surg. 2011;146:660–5.
19. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol. 1990;132:910–25.
20. Salminen P, Paajanen H, Rautio T, Nordström P, Aarnio M, Rantanen T, et al. Antibiotic therapy vs appendectomy for treatment of uncomplicated acute appendicitis: the APPAC Randomized Clinical Trial. JAMA. 2015;313:2340–8.
21. Podda M, Cillara N, Di Saverio S, Lai A, Feroci F, Luridiana G, et al. Antibiotics-first strategy for uncomplicated acute appendicitis in adults is associated with increased rates of peritonitis at surgery. A systematic review with meta-analysis of randomized controlled trials comparing appendectomy and non-operative management with antibiotics. Surgeons. 2017;15:303–14.
22. Teixeira FJR Jr, Netto C, Akaishi SDD, Utiyama EH, Menegozzo EM, Rocha CAM. MC. Acute appendicitis, inflammatory appendiceal mass and the risk of a hidden malignant tumor: a systematic review of the literature. World J Emerg Surg. 2017;12:12. https://doi.org/10.1186/s13017-017-0122-9.
23. Davidson GH, Flum DR, Talan DA, Kessler LG, Lavallee DC, Bizzell BJ, et al. Comparison of Outcomes of antibiotic Drugs and Appendectomy (CODA) trial: A protocol for the pragmatic randomised study of appendicitis treatment. BMJ Open. 2017;7:e016117. http://dx.doi.org/10.1136/bmjopen-2017-016117.

24. Sippola S, Haijanen J, Viinikainen L, Grönroos J, Paajanen H, Rautio T, et al. Quality of life and patient satisfaction at 7-year follow-up of antibiotic therapy vs appendectomy for uncomplicated acute appendicitis: a secondary analysis of a randomized clinical trial. JAMA Surg. 2020;155(4):283–9.
25. Koumarelas K, Theodoropoulos GE, Spyropoulos BG, Bramis K, Marouras A, Zografos G. A prospective longitudinal evaluation and affecting factors of health related quality of life after appendectomy. Int J Surg. 2014;12:848–57.
26. Schurman JV, Cushing CC, Garey CL, Laituri CA, St Peter SD. Quality of life assessment between laparoscopic appendectomy at presentation and interval appendectomy for perforated appendicitis with abscess: Analysis of aprospective randomized trial. J Pediatr Surg. 2011;46:1121–5.
27. Marquis P, Caron M, Emery MP, Scott J, Arnould B, Acquadro C. The role of health-related quality of life data in the drug approval processes in the US and Europe: a review of guidance documents and authorizations of medicinal products from 2006 to 2010. Pharm Med. 2011;25:147–60.
28. Teramoto S, Ota T, Itaya N, Maniwa A, Matsui T, Nishimura Y, et al. Survey of factors underlying treatment choice for patients with localized prostate cancer (radical prostatectomy vs extrabeam radiotherapy) (in Japanese). Nihon Hinyokika Gakkai Zasshi. 2006;97:823–9.
29. Muraoka I, Ohno Y, Satomi A. Transumbilical laproscopic: Assisted appendectomy for acute appendicitis in children: result of a written survey and current trend in patient reported outcomes. J Jpn Pediatr Soc. 2009;45:928–36.
30. Bitzer EM, Lorenz C, Nickel S, Dorning H, Trojan A. Assessing patient-reported outcomes of cholecystectomy in short-stay surgery. Surg Endosc. 2008;22:2712–9.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- STROBEchecklistv4combined1.docx