What is gold standard for Appendicectomy? Open or laparoscopic

Goyal V1, Gupta M2, Rhezhii D3

1Dr. Vikas Goyal, Assistant Professor, Department of Surgery, Affiliated with G.G.S. Medical College, Faridkot(Punjab), India. 2Dr. Monica Gupta, Senior Resident (previously), Department of Anaesthesia, Affiliated with G.G.S. Medical College, Faridkot (Pb), India. 3Dr. Delie Rhezhii, Junior Resident, Department of Surgery, Affiliated with G.G.S. Medical College, Faridkot(Pb), India.

Address for correspondence: Dr. Vikas Goyal, Email: drvikasgoyal2006@yahoo.com

Abstract

Introduction: Appendicectomy is one of the most common acute surgical emergency. Laparoscopic appendicectomy was first reported well before laparoscopic cholecystectomy, the market penetration is very poor. Role of laparoscopic appendicectomy remains controversial even after 30 years of inception. The present study is designed to assess these conflicts.

Methods: 60 patients admitted in department of surgery with diagnosis of acute appendicitis, recurrent appendicitis and those kept for interval appendicectomy were randomly divided into two groups: A and B. The patients in group A were subjected to laparoscopic appendicectomy and patients in group B underwent open appendicectomy.

Results: Mean duration of surgery in LA was 41.78± 13.55 mins, in OA was 61.66± 25.25 and 102± 3.54 mins for converted group. Postoperative pain was significantly less in patients operated with laparoscopic technique (3.18± 1.09) as compared to OA (4.76± 2.03) group as evident by number of analgesic requirement. Mean length of stay was shortest in LA group 2.5 ± 1.07 days, followed by OA 4.833 ± 2.11 days and 8.5 ± 3.54 in converted group. Conclusion: Laparoscopic appendicectomy is having less complications as compared to open appendicectomy. Hence laparoscopic appendicectomy also decreases the morbidity associated with operative procedure, wound infection, paralytic ileus and prolonged hospitalization.

Keywords: Appendicectomy, Laparoscopic, Open.

Introduction

Appendicectomy remains one of the most common acute surgical emergencies. Obstruction of the lumen is the dominant cause of acute obstruction. The first successful appendicectomy was reported by Amyand in 1736 [1]. McBurney advocated early operative intervention and for next 100 years appendicectomy remained the gold standard for patients of acute appendicitis. Till Kurt Semm performed the first laparoscopic appendicectomy in 1983 [2]. Subsequently in 1987 Phillipe Mouret in France performed the first laparoscopic cholecystectomy. Over the last ten years laparoscopic cholecystectomy has become the gold standard for management of cholelithiasis. Considering that laparoscopic appendicectomy was first reported well before laparoscopic cholecystectomy, the market penetration of laparoscopic appendicectomy is very poor. It has been 30 years since its inception, yet the role of laparoscopic appendicectomy remains controversial. Several studies have been performed but no clear consensus has emerged. While some studies document decreased complications in laparoscopic appendicectomy, others show no advantage over open appendicectomy. The present study is designed to assess these conflicts.

Materials and methods

The present study was conducted in department of surgery. It included 60 patients admitted with the diagnosis of acute appendicitis, recurrent appendicitis and those kept for the interval appendicectomy. Patients were randomly divided into two groups: A and B each consisting of 30 patients. The patients in group A were subjected to laparoscopic appendicectomy and patients in group B underwent open appendicectomy. All patients irrespective of age and sex were included in study. Pregnant patients, those having appendicular...
abscess and coagulation disorders were excluded from the study.

A detailed clinical evaluation of each case was done including proper history, physical findings, investigations, pre-operative, operative and post operative findings. Procedure was explained to the patients and in patients of group A, possibility of conversion to open surgery was explained and a separate consent was taken.

Results

In this study of 60 patients, 34 patients were operated for acute appendicitis, 18 for recurrent appendicitis and 8 patients were operated upon as interval appendicectomy. 30 patients underwent open appendicectomy, 28 patients underwent laparoscopic appendicectomy and 2 patients were started laparoscopically but converted to open procedure. The age group was 28\pm 11.05 years of LA and 23.3\pm 9.63 years for OA. The male to female ratio was 1:3, in LA group and 1:0.304 in OA group. Mean duration of surgery in LA was 41.78\pm 13.55 mins, in OA was 61.66\pm 25.25 and 102\pm 3.54 mins for converted group. There is statistical significant difference in the mean duration of surgery between LA and OA. Postoperative pain was significantly less in patients operated with laparoscopic technique (3.18\pm 1.09) as compared to OA (4.76\pm 2.03) group as evident by number of analgesic requirement.

Mean length of stay was shortest in LA group 2.5 \pm 1.07 days, followed by OA 4.833 \pm 2.11 days and 8.5 \pm 3.54 in converted group.

Table-1: Showing preoperative complications/difficulties

| Sr. No. | Complications                      | LA          | OA          | LA          | OA          |
|---------|-----------------------------------|-------------|-------------|-------------|-------------|
| 1.      | Veress needle injury               | Nil         | -           | -           | -           |
| 2.      | Trocar injury                     | Nil         | -           | -           | -           |
| 3.      | Pneumoperitoneum - Hypotension    | Nil         | -           | -           | -           |
| 4.      | Bowel injury                      | Nil         | -           | 1           | 3.3         |
| 5.      | Bleeding                          | 2*          | 6.67        | 3           | 10          |
| 6.      | - Mesoappendix                    | -           | -           | -           | -           |
|         | - Portsite                        | -           | -           | -           | -           |
|         | - Major vessel                    | -           | -           | -           | -           |
| 7.      | Difficulty in locating appendix   | 2*          | 6.67        | 3           | 10          |
| 8.      | Spillage of pus                   | 2           | 6.67        | 2           | 6.67        |
| 9.      | Dislodgement of Faecolith         | 3           | 10          | -           | -           |
| 10.     | Rupture of Appendix               | 1           | 3.3         | 1           | 3.3         |
| 11.     | Extraction of appendix(port replacement/incision enlargement) | 1 | 3.3 | 3 | 10 |

Table-2: Showing Postoperative complications

| Sr. No. | Complications                          | No. of Patients | LA Percentage | OA Percentage |
|---------|----------------------------------------|-----------------|---------------|---------------|
| 1.      | Wound Infection Seroma/Abscess         | LA 1            | 3.5           | 26.67         |
| 2.      | Urinary Retention                      | 0               | -             | 6.67          |
| 3.      | Vomiting                               | 2               | 7.14          | -             |
| 4.      | Chest infection/Sore throat            | 4               | 14.28         | 3.3           |
| 5.      | Paralytic ileus                        | 0               | -             | 3.3           |
| 6.      | Superficial Thrombophlebitis           | 0               | -             | 6.67          |
Wound infections and abscess were more common in open surgery in comparison to laparoscopic appendectomy. 

Table- 3: Showing comparison of postoperative length of stay (in days)

| Group          | No. of Patients | Range | Mean± SD   |
|----------------|-----------------|-------|------------|
| LA             | 28              | 0-4   | 2.5±1.07   |
| OA             | 30              | 1-9   | 4.83±2.12  |
| converted      | 2               | 6-11  | 8.5±3.54   |
| Total          | 30              | 30    |            |

Statistical Analysis

| Comparison | t value | p value | Significance |
|------------|---------|---------|--------------|
| LA vs OA   | 5.245   | <.01    | HS           |

Discussion

Laparoscopic and open appendicectomy have been compared several times, since the introduction of minimally invasive technique as a diagnostic as well as a therapeutic measure, in an effort to establish the supremacy of one above the other while the case has been strong enough for laparoscopic cholecystectomy for its quick and swift take over of the open cholecystectomy as the preferred method of treatment of symptomatic gallstone disease, it has not been same for laparoscopic appendicectomy.

In present study, we had no complication related to veress/ trocar injury. This may be because even after doing more than 2000 laparoscopic procedures by the surgical team, meticulous care was taken while inserting veress needle and first trocar, keeping the direction of veress needle toward the pelvis, in the midline and checking the needle position every time by saline instillation ( going freely) and reaspiration ( no return). Similarly 1st trocar is always inserted keeping its direction toward the air cushion and again exactly in the midline.

In present study, we did not have any side effects of pneumoperitoneum because of adequate hydration, ensuring good urinary output preoperatively, prevention of port slippage and extraperitoneal/ subcutaneous diffusion of CO₂.

Bowel injury can result from thermal injury, wrong trocar placement and from bowel retraction. (Deziel et al, Wolfe et al, Champault et al, Long et al) [8,12,13]. In the present study, we did not experience any bowel injury because of adequate pneumoperitoneum, gastric decompression and judicious use of cautery.

Bleeding can occur from mesoappendix, major vessels, inferior epigastric artery and port site. Linos et al (1999)
reported injury to two patients to inferior epigastric artery in two patients [15]. Brosseauk and Bathe reported two wound haematomas in open appendicectomy [16]. In present study, we experienced bleeding in two patients in LA group and one in OA group from mesoappendix. The bleeding was easily controlled by two methods: (1) No panic reaction, no panic cautery, (2) irrigation and aspiration of bleeding area, then grasp the bleeding vessel.

In the present study, we did not experience any bladder injury because we emptied bladder just before taking the patient to operation theatre. Linos et al reported bladder injury on insertion of suprapubic trocar. In present study, there was rupture of appendix in one patient in LA group and one patient in OA group, because appendix was thickened and friable. Attwood et al reported 4 cases of rupture of appendix [17]. Rupture occurred because of gangrenous and friable appendix.

In the present study there was dislodgement of faecolith in three patients in LA group and one patient in OA group. This occurred during cutting of appendix from base. All the faecoliths were removed carefully to prevent any intraabdominal abscess. Attwood et al used three endoloops, two across base of appendix an third distally to prevent spillage of luminal content of appendix [17].

In the present study, there was difficulty in extraction of appendix in one patient in LA group and 3 in open group. In LA group 5mm canula was replaced by 10mm canula. This was done to prevent contact of appendix with port site to prevent port site infection. Kum et al (1993), Cox et al (1993), Hanson et al (1996), also used plastic bags for retrieval of appendix to decreased wound infection [18,19,20]. In the laparoscopically operated group 28 patients underwent appendicectomy and 2 were converted to open procedure. The conversion rate was 6.67%. The reasons for conversion was non-visualization of appendix. It was 2.8% in study conducted by Merhoff et al and 12% in Hellberg et al study [21,22].

Various studies have reported significant higher operating time in laparoscopic appendicectomy as compared to open appendicectomy. Attwood et al (1992) reported longer period for laparoscopic appendicectomy than open appendicectomy [17]. However Kum et al had not seen much difference in operating time (43 vs 40 minutes) [18]. Duff and Dixon concluded that with significant experience, the operation time in laparoscopic appendicectomy is no longer than open appendicectomy [23]. In the present study, mean duration of surgery was less in laparoscopic group as compared to open appendicectomy because the operating team was experienced enough for such procedures.

Patients operated with laparoscopic technique had less pain postoperatively as compared to those operated by open technique. In studies conducted by Attwood et al, Frazee et al, Nazral et al postoperative pain was more in open technique due to less handling of the tissues, no forceful retraction of wound margins an miniscule incisions [17,24,25]. Also adhesions related complications such as intestinal obstruction and subfertility remain the main source of long term morbidity from open appendicectomy.

Attwood et al noted urinary retention in two patients in open appendicectomy group and none in laparoscopic appendicectomy. Macarulla et al (1997) reported urinary infection in laparoscopic appendicectomy group in two patients and that could be related to urinary indwelling catheter before the procedure [17,26]. In present study urinary retention occurred in two patients in open group none of laparoscopic appendicectomy group. Spinal anesthesia may also lead to urinary retention in open appendicectomy group and no patient was catheterized prior to laparoscopic appendicectomy.

McCall et al, Temple et al, Merhoff et al, Utpal et al concluded fewer wound infection in laparoscopy group than open group [27,28,21,29]. In the present study also wound infection was found to less in laparoscopic group. This may be explained by the extraction of the infected appendix through lumen of the cannula, so the inflamed organ is never in direct contact with the wound. Postoperative intraabdominal abscess is the most serious complication after appendicectomy and despite its low incidence is responsible for significant morbidity (Reid et al) [30] Kazemier et al and Brosseauk et al reported intraabdominal abscess more in open group [31,16]. Hart et al and Long et al reported more intraabdominal abscess in laparoscopic group [14,32]. Attwood et al had stressed the importance of aspiration of blood or fluid collection in the pelvis and subdiaphragmatic spaces because fluid may shift away from operative area while patient is in Trendelenburg position [17]. In the present study, no incidence of intraabdominal abscess was noted. This may be because we had given I/V antibiotics prior to surgery in both the
groups and no residual fluid was left in the peritoneal cavity on completion of surgery.

Paralytic ileus was also found to be significantly more in open appendicectomy as compared to laparoscopic appendicectomy group in the present study. Similarly in other study conducted by Rohr et al showed same results [33].

Conclusion

It is concluded that laparoscopic appendicectomy is a better alternative to open appendicectomy as it decreases wound infection and paralytic ileus. The postoperative pain is also less in case of laparoscopic appendicectomy. Laparoscopic appendicectomy also decreases the hospital stay. Laparoscopic appendicectomy is having less complications as compared to open appendicectomy. Hence laparoscopic appendicectomy also decreases the morbidity associated with operative procedure, wound infection, paralytic ileus and prolonged hospitalization.

Conflict of interest: None declared.

Funding: Nil, Permission from IRB: Yes

References

1. Amyand C. Of an inguinal rupture with a pin in the appendix caecii encrusted with stone: some observations on wounds in the guts. Philosoph Trans R Soc Land 1736;39:329-42.

2. Semm K. Endoscopic appendectomy. Endoscopy 1983 Mar;15(2):59-64.

3. Lee VS, Chari RS, Cucchiar G , Meyers WC. Complications of Laparoscopic cholecystectomy. Am J Surg.1993 Apr;165(4):527-32.

4. Addiss DG, Shaffer N, Fowler BS and BS and Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. Am J Epidemiol 1990:132: 910-25.

5. Bailey RW, Zucker KA, Flowers JL, Scovill WA, Graham SM, Imbembo AL. Laparoscopic cholecystectomy. Experience with 375 consecutive patients. Ann Surg. 1991 Oct;214(4):531–541.

6. The Southern Surgeons Club. A prospective analysis of 1518 laparoscopic cholecystectomies. N Engl J Med. 1991 Apr 18;324(16):1073-8; 324(16): 1073-8.

7. Schirmer BD, Edge SB, Dix J, Hyser MJ, Hanks JB, Jones RS. Laparoscopic cholecystectomy: treatment of choice for symptomatic cholelithiasis. Ann Surg. 1991 Jun;213(6):665-77.

8. Deziel DJ, Millikan KW, Economou SG, Doolas A, Ko ST, Airan MC. Complications of laparoscopic cholecystectomy : a national survey of 4292 hospital and an analysis of 77604 cases. Am J Surg. 1993 Jan;165(1):9-14.

9. Nuzzo G, Giulianite F, Tebala GD, Vellone M, Cavicchioni C. Routine use of open technique in laparoscopic operations. J Am Coll Surg. 1997 Jan;184: 58-62.

10. Molly D, Kalloo PD, Cooper M. Laparoscopic entry: a literature review and analysis of techniques and complications of port entry: Aus NZJ Obstet Gynaecol 2002;14:365-74.

11. Vernon AH and Hunter JG. Fundamentals of Laparoscopic surgery in Zinner MJ, Ashley SW, Editors: Maingot s Abdominal Operations. 11th Ed. USA : McGraw- Hill, 2007;44:1099-1111.

12. Wolfe BM, Gardiner BN, Leary BF, Frey CF. Endoscopic cholecystectomy. An analysis of complications. Arch Surg. 1991 Oct; 126(10): 1192-6.

13. Champault G, Cazacu F, Taffinder N. Serious trocar accidents in laparoscopic surgery: a French survey of 103,852 operations. Surg Laparosc Endosc. 1996 Oct; 6(5):367-70.

14. Long KH, Bannon MP, Zietlow SP, Helgeson ER, Harmsen WS, Smith CD, Istrup DM, Baerga- Varela Y and Sarr MG. A prospective randomized comparison of laparoscopic appendectomy with open appendectomy. Clinical and economic analysis.. Surgery 2001;129(4):390-400.

15. Linos DA, Vlitaki M, Peppas G and Tsakayannis D. Laparoscopy in the context of lower abdominal pain in young women. Journal of Laparoendoscopic and advanced surgical techniques. 1999;9(1) 39-43.
16. Brosseuk DT and Bathe OF. Day-care laparoscopic appendectomies. Can J Surg 1999 Apr;42(2):138-42.

17. Attwood SE, Hill AD, Murphy PG. A prospective randomized trial of laparoscopic versus open appendectomy. Surgery 1992 Sep;112(3):497-501.

18. Kum CK, Ngoi SS, Goh PMY, Tekant Y and Issac JR. Randomized controlled trial comparing laparoscopic and open appendicectomy. Br J Surg 1993 Dec;80:1599-1600.

19. Cox MR, McCall JL, Wilson TG, Toouli J. Laparoscopic appendicectomy: A prospective analysis. Aust NZ J Surg 1993 Nov;63(11):840-47.

20. Hansen JB, Smithers BM, Shahe D, Wall DR, Miller BJ and Menzies BL. Laparoscopic versus open appendectomy: prospective randomized trial. World J Surg 1996;20:17-21.

21. Merhoff AM, Merhoff GC and Franklin ME. Laparoscopic versus open appendectomy. Am J Surg 2000 May; 179(5):375-8.

22. Hellberg A, Rudgberg C, Kullman E, Enochsson L, Fenyo G, Graffner H, Hailerback B, Johonsson B, Anderberg B, Wenner J et al. Prospective randomized multicenter study of laparoscopic versus open appendicectomy. Br J Surg 1999;86(1):48-53.

23. Duff SE and Dixon AR. Laparoscopic appendicectomy: Safe and useful for training. Ann R Coll Surg Engl 2000 Nov; 82 (6): 388-91.

24. Frazee RC, Roberts JW, Symmonds RE, Snyder SK, Hendricks JC, Smith RW et al. A prospective randomized trial comparing open versus laparoscopic appendectomy. Ann Surg 1994 Jun; 219(6):725-31.

25. Nazzal M, Ali MA, Turfah F, Kaidi A, Saba A, Pleatman and Silva Y. Laparoscopic appendectomy. A viable alternative approach. Journal of Laparoendoscopic and Advanced Surgical Techniques 1997;7(1):1-6.

26. Macarulla E, Vallet J, Abad JM, Hussein H, Fernandez E and Nieto B. Laparoscopic versus open appendectomy: A Prospective and Randomized Trial. Surgical Laparoscopy and Endoscopy 1997 ; 7 (4): 335-9.

27. McCall JL, Sharples K and Jadallah F. Systematic review of randomized controlled trials comparing laparoscopic with open appendicectomy. Br J Surg 1997 Aug; 84 : 1045-50.

28. Temple LK, Litwin DE, Mcleod RS. A meta-analysis of laparoscopic versus open appendicectomy in patients suspected of having acute appendicitis. Can J Surg 1999 Oct;42:377-83.

29. DeUtpal. Laparoscopic versus open appendicectomy: An Indian perspective. Journal of Minimal Access Surgery 2005;1(1):15-20.

30. Reid RI, Dobbs BR and Frizelle FA. Risk factors for post appendicectomy intraabdominal abscess. Aust NZ J Surg 1999 May;69 (5):373-4.

31. Kazemier G, De Zeeuw GR, Lange JF, Hop WC, and Bonjer HJ. Laparoscopic vs open appendectomy: a randomized clinical trial. Surg Endosc 1997 Apr;11:336-40.

32. Hart R, Rajgopal C, Plewes A, Sweeney J, Davies W, Gray D et al. Laparoscopic versus open appendectomy: a prospective randomized trial of 81 patients. Can J Surg 1996;39:457-62.

33. Rohr S, Thirty CL, De Manzini N, Perraud V, and Meyer C. Laparoscopic versus open appendicectomy: prospective randomized study. Br J Surg 1994;81:133-5.

How to cite this article?

Goyal V, Gupta M, Riezhih D. What is gold standard for Appendicectomy? Open or laparoscopic. Int J Med Res Rev 2015;3(9):1090-1095. doi: 10.17511/ijmrr.2015.i9.198.