Original Article

Comparison of laparoscopic appendectomy versus open appendectomy in acute appendicitis in obese diabetic patients

Mohammuddunnobi[a], Jahan T[b], Al-Amin A[c]

Abstract

Background: *Acute appendicitis (AC) is a common surgical problem requiring emergency hospitalization for urgent appendectomy. In case of diabetic patients, the incidence of developing acute appendicitis including its complications like abscess, gangrene and perforation is higher than non-diabetic. Day by day, laparoscopic appendectomy is having an improved outcome in non-diabetic and non-obese patients. The aim of this study was to compare the outcomes of laparoscopic appendectomy versus open appendectomy in acute appendicitis of obese diabetic patients.*

Methods: *A comparative study was carried out in a tertiary care hospital in Dhaka City. Hospitalized obese diabetic patients with a diagnosis of acute appendicitis, who underwent appendectomy, were considered as study population. Obesity was defined as body mass index (BMI) greater than 30 kg/m^2 according to World Health Organization and American Obesity Association guidelines. Patients were divided into two groups according to type of appendectomy; 50 patients by laparoscopic appendectomy as group LA and 50 patients by open appendectomy as group OA.*

Results: *Most patients were obese I (30.0-34.9 kg/m^2) in group LA and OA (92.0% and 86.0%, respectively, p<0.05). Uncontrolled diabetes mellitus was detected in most of the patients of both group LA (96.0%) and OA (98.0%). Mean operation time, mean duration of post-operation ileus, mean hospital stay and post-operation complications were less in group LA than group OA which is statistically significant (p< 0.05). No patient developed wound infection after laparoscopic appendectomy; whereas, 8.0% patients had wound infection in open appendectomy (p<0.05).*

Conclusion: *In this study, laparoscopic appendectomy had good outcome over its open counterpart regarding shorter operating time, hospital stay, less wound infection, postoperative pain and time to return to usual activities.*

Key words: *diabetes mellitus, laparoscopic appendicectomy, obesity.*

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Introduction

Appendectomy is one of the most frequent emergency surgical procedures. In spite of a growing body of literature comparing the results of laparoscopic and open approaches, data has revealed inconclusive and often contradictory results.[1] According to the literature, approximately 7% of the population develops appendicitis in their life time, with peak occurrence between the ages of 10 and 30 years, thus making appendectomy the most commonly performed abdominal operation.[2]

Open appendectomy (OA) has been a safe and successful operation for acute appendicitis for more than a century. Since the advent, laparoscopic appendectomy (LA) has struggled over the open technique to prove its advantage by minimal incision, better view of peritoneal cavity and safe exploration Hence, LA proponents also claim that the operation yields improved wound healing, reduced postoperative pain and earlier discharge from the hospital with an earlier return to normal activities.[3] So, this study was designed to compare the outcomes of LA and OA in acute appendicitis among obese diabetic patients.

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Methods

A comparative study was carried out in BIRDEM General Hospital, Dhaka, Bangladesh between January 2017 and December 2018. Hospitalized obese diabetic patients with a diagnosis of acute appendicitis who underwent appendectomy were considered as study population. Obesity was defined as body mass index (BMI) greater than 30 kg/m^2 according to World Health Organization and American Obesity Association guidelines. The Patients were divided into two groups according to type of appendectomy; 50 patients by LA as Group LA and 50 patients by OA as Group OA.

Primary outcomes were days of hospital stay, surgical procedure time and post-operative complication rate. Secondary outcomes were wound infection and intra-abdominal abscesses formation rate, hospital charges. Since LA to OA conversion rate was not always available, data were treated as an intention-to-treat analysis: values regarding converted LA were pooled with those of laparoscopic procedures.

Results

No statistically significant difference was found regarding age and sex between group LA and OA. Most patients were obese I (30.0-34.9 kg/m^2) in both group LA and OA (92.0% and 86.0%, respectively, p<0.05). Uncontrolled diabetes mellitus was detected in most of the patients of both group LA (96.0%) and OA (98.0 %) (Table I).

Mean operation time was 32.7±6.2 minutes in group LA and 36.2±6.1 minutes in group OA. Mean duration of post-operation ileus was 1.3±0.4 days in group LA and 1.6±0.2 days in group OA. Mean hospital stay was 3.4±0.7 days in group LA and 4.7±0.8 days in group OA. All the outcome variables of group LA was statistically less than group OA (p < 0.05) (Table II).

Post-operation complications were found in 4.0% in group LA and 16.0% in group OA (Table II). The difference were statistically significant (p<0.05) between two groups. Four (8.0%) patients had wound infection in group OA and none found in group LA, which was statistically significant (p<0.05) but other post-operative complications were not statistically significant (p>0.05) between the two groups (Table III).

Table I Demographic and clinical characteristics of the study patients

	Group LA(n=50)	Group OA(n=50)	P value
Mean age (years)	25.7±6.2	26.6±6.4	[a]0.476[ns]
Sex			
Male	28 (56.0%)	26 (52.0%)	[b]0.688[ns]
Female	22 (44.0%)	24 (48.0%)	
ASA risk score			
II	17 (34.0%)	15 (30.0%)	[b]0.668[ns]
III	33 (66.0%)	35 (70.0%)	
Mean WBC count (n x 10^3/mL)	12.3±3.2	12.6±2.4	[a]0.597[ns]
Mean duration of symptoms (days)	2.20±0.87	2.27±0.91	[a]0.695[ns]
Previous abdominal operations	4 (8.0%)	3 (6.0%)	[b]0.695[ns]
Complicated appendicitis	7 (14.0%)	9 (18.0%)	[b]0.585[ns]
BMI (kg/m^2)			
Obese I (30.0-34.9 kg/m^2)	46 (92.0%)	43 (86.0%)	[b]0.337[ns]
Obese II (35.0-39.9 kg/m^2)	4 (8.0%)	7 (14.0%)	
DM			
Controlled	2 (4.0%)	1 (2.0%)	
Uncontrolled	48 (96.0%)	49 (98.0%)	[b]0.557[ns]

ns= not significant
[a]P value reached from unpaired t-test
[b]P value reached from chi square test
Group LA= Laparoscopic appendectomy
Group OA= Open appendectomy

Table II Outcome comparison of the study patients

	Group LA(n=50)	Group OA(n=50)	P value
Mean operation time (minutes)	32.7±6.2	36.2±6.1	[a]0.005[s]
Post-operation complications	2 (4.0%)	8 (16.0%)	[b]0.045[s]
Mean duration of post-operation ileus (days)	1.3±0.4	1.6±0.2	[a]0.001[s]
Mean hospital stay (days)	3.4±0.7	4.7±0.8	[a]0.001[s]

s= significant
[a]P value reached from unpaired t-test
[b]P value reached from chi square test

Table III Post-operative complications of the study patients

	Group LA(n=50)	Group OA(n=50)	P value
Wound infection	0 (0.0%)	4 (8.0%)	0.041[s]
Intra-abdominal abscess	1 (2.0%)	1 (2.0%)	1.000[ns]
Diarrhea	1 (2.0%)	2 (4.0%)	0.557[ns]
Prolonged ileus	1 (2.0%)	2 (4.0%)	0.557[ns]
Urinary tract infection	1 (2.0%)	0 (0.0%)	0.314[ns]

s= significant, ns= not significant
P value reached from chi square test

Discussion

In this study, it was observed that age, sex, American Society of Anaesthesiologists (ASA) risk, mean white blood cell (WBC) count, mean duration of symptoms, previous abdominal operations and complicated appendicitis were not statistically significant between two groups. Minutolo et al.[4] performed LA approach in 139 patients and OA in 91 patients. The two groups were comparable for demographic data (age, gender), comorbidities (ASA risk score), previous abdominal surgery and clinical severity of the disease quantified by duration of symptoms, WBC value upon admission and rate of complicated appendicitis. The rate of LA between 1998 and 2008 increased from 20.6% to 70.8%, becoming the prevalent approach to treat acute appendicitis since 2005.[5] In addition to the clinical benefits described in several studies, the laparoscopic approach allows a full exploration of the peritoneal cavity[6] thus representing an important diagnostic tool in case there is only suspicion of acute appendicitis.

This study showed that 92.0% patients were obese I in group LA and 86.0% in group OA. Ninety six percent patients were having uncontrolled diabetes in group LA and 98.0% in group OA. The difference were not statistically significant (p>0.05) between two groups. However, it was observed that mean operation time, post-operative ileus and hospital stay were lower in LA group. Post-operation complications were also low in LA group. Minutolo et al.[4] found that the mean operative time was 52.2 min for the LA group and 49.3 min for the OA group, with no statistically significant difference (p value 0.476). A postoperative complication occurred in 4 patients (2.9%) of the LA group and in 12 patients (13.2%) of the OA group, with a statistically significant difference in favor of the LA group (p value 0.0061). Mean hospital stay was found to be significantly shorter (p value 0.011) in the LA group, 2.75 days compared to the OA group, 3.87 days. A worldwide spread of training in laparoscopic techniques lead to a significant reduction in difference of operative time compared to open procedures after 2000, as evidenced by several meta-analyses.[7,8] Sauerland et al.[9] reported a lower rate of postoperative complications, especially surgical wound infection rate after LA. Our result is comparable to the results of the meta-analysis by Wei et al.[10], which also showed that patients undergoing LA return earlier to

work and to normal daily activities. Although the cost of the laparoscopic approach can be higher than cost of open approach because of the use of disposable instruments and ports, the difference in total costs between the two procedures is decreased by the shorter length of stay experienced by patients who underwent LA.[11] Ciarrocchi and Amicucci[1] study demonstrated instead a significant decrease of surgical time in the LA group (p=0.018). After exclusion of a paper at high-risk of bias[12] there was a significant decrease of postoperative complications in the LA group (P <0.001). Islam et al.[2] reported that the post operative hospital stay was 4.4 days in OA and 3.2 in LA.

In this current study, it was observed that, 4 (8.0%) patients had wound infection in group OA and none found in group LA. But other post-operative complications were not statistically significant between two groups. Minutolo et al.[4] found that there were five wound infections (all in the OA group), 3 intra-abdominal abscesses, all treated conservatively (2 in the OA and 1 in the LA group), 2 cases of prolonged diarrhea (1 in the OA group and 1 in the LA group), 4 cases of prolonged ileus (1 in the LA group, 3 in the OA group), 1 case of pleurisy (OA group), 1 case of urinary tract infection (group LA). There were significant less wound infections in the LA group (p value 0.009). There was no statistically significant difference between the two groups in the rate of intra-abdominal abscess (p value 0.563), prolonged diarrhea (p Value 1.000), prolonged ileus (p value 0.303), pleurisy (p value 0.395) and urinary tract infection (p value 1.000). The reduction of wound infection rate is a significant advantage of LA.[8] Several meta-analyzes of randomized controlled trials (RCT) published in recent years[7-9,13] have shown an increased risk of intra-abdominal abscesses after LA. However, the most recent meta-analysis of RCT published shows a low incidence of intra-abdominal infections, with no significant difference between the laparoscopic and the open approach.

Conclusion

Appendectomy in the absence of generalized peritonitis is a safe procedure, regardless of the technique performed. LA has advantages over its open counterpart, in terms of postoperative pain, duration of hospital stay and time to return to usual activities. There was no significant difference in operating time between the two techniques. Rather, LA may take much longer in the learning curve.

Conflict of interest: Nothing to declare.

References

1. Ciarrocchi A, Amicucci G. Laparoscopic versus open appendectomy in obese patients: A meta-analysis of prospective and retrospective studies. J Min Access Surg 2014; 10: 4-9.
2. Islam SR, Pasha K, Rahman S, Nasir E, Hanif E, Barman A. Laparoscopic vs Open Appendectomy: A Comparative Study. Bangladesh Journal of Endossurgery 2014; 2: 5-8.
3. Dai L, Shuai J. Laparoscopic versus open appendectomy in adults and children: a meta-analysis of randomized controlled trials. United European Gastroenterol J 2016; 5:542–553.
4. Minutolo V, Licciardello A, Di Stefano B, Arena M, Arena G, Antonacci V. Outcomes and cost analysis of laparoscopic versus open appendectomy for treatment of acute appendicitis: 4-years experience in a district hospital. BMC Surgery 2014; 14:14
5. McGrath B, Buckius MT, Grim R, Bell T, Ahuja V. Economics of appendicitis: cost trend analysis of laparoscopic versus open appendectomy from 1998 to 2008. J Surg Res 2011; 171: e161-68.
6. Loh A, Taylor RS. Laparoscopic appendectomy. Br J Surg 1992; 27: 289-90.
7. Bennett J, Boddy A, Rhodes M. Choice of approach for appendicectomy: a meta-analysis of open versus laparoscopic appendicectomy. Surg Laparosc Endosc Percutan Tech 2007; 17: 245-55.
8. Li X, Zhang J, Sang L, Zhang W, Chu Z, Li X, et al. Laparoscopic versus conventional appendectomy - a meta-analysis of randomized controlled trials. BMC Gastroenterol 2010; 10: 129.
9. Sauerland S, Lefering R, Neugebauer EA. Laparoscopic versus open surgery for suspected appendicitis. Cochrane Database Syst Rev 2010; 10: CD001546.
10. 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: 1199–08.
11. Kurtz RJ, Heimann TM. Comparison of open and laparoscopic treatment of acute appendicitis. Am J Surg 2001; 182: 211–14.
12. Tan-Tam C, Yorke E, Wasdell M, Barcan C, Konkin D, Blair P. The benefits of laparoscopic appendectomies in obese patients. Am J Surg 2012; 203: 609-12.
13. Sauerland S, Lefering R, Neugebauer E. Laparoscopic versus open surgery for suspected appendicitis (review). Cochrane Database Syst Rev 2004; 4: CD001546.