ORIGINAL ARTICLE DOI: https://doi.org/10.52206/jsmc.2024.14.2.782 OPEN ACCESS

Appendectomy Open Versus Laparoscopic in Developing World Scenario

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ABSTRACT

Background: Laparoscopic surgery is an expanding field which is recognized as gold standard for cholecystectomy, it is being increasingly used by many surgical subspecialties with advantage of being minimal invasive and being both diagnostic and therapeutic.

Objectives: This study was done to evaluate the feasibility of laparoscopic appendectomy in a developing world scenario.

Material and Methods: This observational cross-sectional study was conducted under department of general surgery from September 2019 to August 2021. The patients presenting to the ER department were evaluated based on Alvarado score. Alternate patients underwent laparoscopic appendectomy (LA) and open appendectomy (OA). Based upon clinical and imaging signs of acute appendicitis (i.e. Alvarado score of 7 or more) and consent to be the part of study, were used as inclusion criteria, while pregnancy, patients who could not tolerate increased intra-abdominal pressure/prolonged anesthesia, patients under 10 years of age and patients with evidence of appendicular mass formation were excluded from the study. The standard surgical techniques were performed for both groups and the patients were followed up in immediate post-operative period, at 6 months and one year.

Results: The parameters observed were duration of surgery average 25 minutes (range 15-50 mins) for OA and 70 minutes (range 40-90 mins) for LA (P-Value 1.41E-70), return to preoperative activity level was 13 days (range 10-17 days) for OA and 10 days (range 9-14 days) for LA (P-Value 6.69034E-22), and average cost for OA was PKR 35279.00 while for LA was PKR 72168.00 (P-Value 1.24442E-60). Remaining parameters were not significantly different.

Conclusion: The evidence available clearly demonstrates that laparoscopic appendectomy is superior to open appendectomy in terms of hospital stay, post-operative pain and return to work, however in a few situations the procedure needs to be converted therefore the surgeon must be conversant with open appendectomy for complicated case. Moreover, cost is a major factor determining the choice of procedure specially in the developing countries.

Keywords: Appendectomy, Developing world, Laparoscopic Appendectomy, Open versus Laparoscopic Appendectomy, Pakistan,

This article may be cited as: Awan SD, Awan AN, Haleem N, Faiz H. Appendectomy Open Versus Laparoscopic in Developing World Scenario. J Saidu Med Coll Swat 2024;14(2):84-92. DOI: https://doi.org/10.52206/jsmc.2024.14.2.782

INTRODUCTION

Appendicitis is the most common cause of surgical abdomen requiring surgical intervention in all age groups.[1,2] Nearly 710 % of the general population suffers acute appendicitis is commonly observed in the second and third decades of life with peak incidence in the 15-19-year age group.[3]

Laparoscopic surgery is an expanding field and with development of newer laparoscopic instruments and advances techniques[4,5] more and more surgeries are coming in the domain of this minimally invasive approach. Already it is considered as gold standard for cholecystectomy and is increasingly being used by urology and obstetrics other than general surgery. It has an advantage that the surgeon gets an overview of the entire abdominal cavity (diagnostic) and at times may diagnose a sinister pathology in its early stage, it is also used in treating the disease as well (therapeutic).[5] Laparoscopy is the preferred approach in immunocompromised, obese and elderly patients with comorbidities.

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Received: March 30th, 2023 - 1st Revision: August 24th 2023
2nd Revision: January 24th 2024 - 3rd Revision: February 06th 2024
4th Revision: March 21st 2024 - Accepted: March 24th, 2024

Laparoscopy is a very useful tool for elective and semi-emergency surgical management like treatment of appendicitis or perforated peptic ulcer, moreover it is being currently recognized and evaluated in the trauma[6-8] and emergency situations, in that it is being debated that it gives an overview of the intra-abdominal injuries with minimal additional trauma caused by the patient undergoing full diagnostic laparotomy, ending up with a long scar 'insult over injury', and having an additional advantage of short time and conversion to open to address the specific pathology,[9] thus saving additional time, which is otherwise critical in emergency situations, however, keeping aside other advantages the operation time slot is not significantly different.[10,11] Furthermore, the management of various pathologies are now increasingly being managed by laparoscopy, especially during the COVID-19 pandemic as it has a lower chance of disease transmission.[12] The future holds a lot of promise as laparoscopic surgery is opening new door to the robotic surgery, which is even more safe with advantage in managing more complex case.[13]

Laparoscopy is gradually becoming the procedure of choice in management of many surgical diseases due to the accumulative experience being gained by the surgeons, development of newer and more user-friendly instruments, the availability of magnification with better recognition of anatomy and accessing

difficult to reach areas. Single port appendectomy is also under development and evaluation.[14] These recompenses are being utilized in the management of appendicular pathologies the world over, however, our observation was not in harmony with the literature. We had a feeling that somehow we are lagging behind in this aspect of management and providing this superior facility to our patients.

Although we are doing most of the cholecystectomies laparoscopically but the use of laparoscopic surgery for acute appendicitis was very limited in our setup despite it having so many advantages as short hospital stay, less pain, early return to work, lower incidence if incisional hernia.[3,15] Therefore, we planned to conduct this study to ascertain the reasons for the limited use of laparoscopy for appendectomy and to evaluate whether it was worthwhile, in our settings as a developing country, compared to open appendectomy. Moreover, we wanted to set forth a road map to introduce and incorporate this amazing technology into our daily medical practice for the management of acute appendicitis. For this purpose, we performed appendectomies by open and laparoscopic techniques alternately on 200 consecutive patients and followed them for up to 1-year post procedure.

MATERIAL AND METHODS

This observational cross-sectional study was conducted in the Department of general surgery of our hospital, located in the city of Abbottabad, over a period of 2 years (from 3rd September 2019 to 20th August 2021, with follow up for 1 year post surgery), with a study group of 200 consecutive patients of acute appendicitis, as per inclusion/exclusion criteria, was determined using online Open Epi (OpenEpi.com) sample size calculator, and were assigned alternatively to laparoscopic and open surgery, after approval of the study by the hospital ethical committee.

Inclusion criteria: All patients presenting with complaints of central abdominal pain which shifted to right lower abdomen with clinical and sonographical diagnosis of acute appendicitis, (i.e. free fluid in right iliac fossa, non-compressible tubular structure, occasionally a visible faecolith), were included in the study. The modified Alvarado score[16,17] for the patients was calculated in A&E department and those with score of 7 or above and having consented to be the part of the study, were included in the study.

Exclusion criteria: The patients with pregnancy, patients having severe chronic illnesses who would not tolerate increased intra-abdominal pressure or prolonged anesthesia time and patients with age less than 10 years (being managed by pediatric surgery department) were not included in the study, however, these patients underwent open appendectomy as per hospital protocols. Moreover, patients who had their symptoms for over 7 days and evidence of appendicular mass formation were excluded from the study. The patients not willing to be included in the study were also excluded.

Patients assessment: The patients who presented with complaints of pain lower abdomen and consented to be included in the study, were assessed by a comprehensive clinical history including duration of symptoms, shifting pain, nausea vomiting and anorexia, associated fever, diarrhea, and history of any similar episodes in the past. History of burning micturition, any history of Urolithiasis and for females last menstrual period (LMP) was documented. Moreover, history of using any medication for the current episode was also documented.

The patients then underwent physical examination, which included recording of vital signs, and abdominal examination specifically eliciting and documenting tenderness, guarding and rigidity in the right iliac fossa, rebound tenderness, Rovsing, obturator sign. Cope's psoas, Dunphy sign (whether present or not). Clinical attempt was made to exclude any evidence of mass formation. Other than this, examination of throat, back with right renal punch, suprapubic and per-rectal examinations were also performed and documented.

Basic laboratory investigations were done including complete blood counts, serum electrolytes, urine complete examination, coagulation profile, screening for hepatitis B Hepatitis C and HIV. Blood grouping, and chest X-Ray (for patients over 40 years of age) were performed, as anesthesia prerequisite. Informed pregnancy test for females of child bearing age was also done.

The patients were then subjected to abdominal ultrasound, to look for signs of acute appendicitis. Following points were commented upon. If the appendix could be visualized or not, its wall thickness, any free fluid collection in right iliac fossa, compressibility of the appendix, mass formation or pus collection and obvious mesenteric lymphnodes. Moreover, any ureteric or renal calculi or back pressure effects (hydronephrosis) and Ovarian cyst, ectopic pregnancy (in female patients) and gall stones were also commented upon.

Alvarado score (Fig 01) was calculated for the patients and those having a score of seven or more were offered to be included in the study, based on validation of the score for patients attending accidents and emergency (A&E) unit by Eszter Mán et.al,[16] and McKay R et.al.[17] Those having a score of 5-6 (who could not be confidently excluded of having acute appendicitis on clinical grounds and laboratory investigations) were subjected to Computerized tomographic (CT) scan for confirmation to reduce negative laparoscopies for acute appendicitis.[18] CT scan was also performed if the patients were considered for conservative

management due to a long history and possibility of inflammatory reaction causing the tissue to become more friable or having mass formation.

Surgical procedure: The patients were admitted, optimized and a fully informed, written consent was taken for the selected procedure also mentioning their participation in the study and need for follow up which may extend up to 1 year and that their data would be used for study purpose. Once the investigations were available and pre-anesthesia assessment was done the patients were shifted to the operating room for surgical procedure. The patients were given prophylactic antibiotics at induction of anesthesia, as per protocol.

Open appendectomy was performed through either standard Grid-Iron incision or Lanz's incision both placed at the McBurney point. Whereas laparoscopic appendectomy was performed using 3 ports technique. Pneumoperitoneum was created by Veress needle or open Hasson's technique. The 3-ports were placed using the conventional technique, camera port (10 mm) was placed infra umbilical while two working ports (both 5 mm) were place one in left iliac fossa and one supra pubic midline.[19] However, in some patients the suprapubic port was exchanged for right upper quadrant port. The appendix was extracted from the camera port using endo-bag and replacing a smaller telescope through 5mm port. The surgical wounds were washed with saline, as per protocol, before skin closure in both groups. The patients were kept hospitalized till they tolerated orally. Analgesic and Antibiotic (third generation cephalosporin) cover was given to both groups.

Follow up: Following parameters were observed and the data collected was analyzed using SPSS 17. The first follow up visit was arranged after one-week post procedure, to see the healing process of the surgical wounds and the findings were recorded in Microsoft Excel sheet and the patient's hospital documents. The patients were contacted on telephone or recalled for follow up at six months and one year to assess the scar quality, incision / port site hernia and to inquire about patient satisfaction in terms of cosmetic results. The patients were questioned for cosmetic satisfaction for the scar, the answer was taken as a “Yes/No” value, and p value was calculated accordingly. All the parameters being studied were analyzed for significance by calculating p-value.

RESULTS

Two hundred consecutive patients of acute appendicitis, fulfilling the inclusion criteria, were included in the study and alternatively underwent laparoscopic and open appendectomy. Significance of various parameters observed was assessed (from here onwards 'Open Appendectomy' would be referred to as (OA) whereas 'Laparoscopic Appendectomy' as (LA). The summary of the results is shown in 'Table 01'.

Duration of surgery: It was calculated in minutes. The average time for OA was 25 minutes (range 15 to 50 minutes). Whereas LA took an average time of around 70 minutes (range 40 to 90 minutes); (P-Value 1.41E-70). The surgery time was calculated form skin incision to closure, anesthesia time was not included. (Graph 01)

Incision size: It was measured in 0.5 cm increments at the end of surgery. Average size of incision for OA was 3.5 cm (range 3 to 8 cm), whereas that for LA was 3 cm (range 3 to 9 cm); (P-Value 0.00025799).

Hospital stay: It was measured in hours from the time of admission to the decision of discharge. Average hospital stay for OA was 38 hours (range 20 to 72 hours) while that for LA was 34 hours (range 21 to 60 hours); (P-Value 0.004011). (Graph 2)

Pain: It was measured using 1 to 10 pain score scale Fig 02. There was no significant difference in the post-operative pain on the pain chart (1-10). The average pain claimed by the patients of OA was 6 (range 4-8) while that of the LA was also 6 (range 5 to 8); (P-Value 1).

Cosmetic results and patient satisfaction: The surgical scar was assessed between 6 months to 1 year following surgery. The overall satisfaction of the patient cosmetically was more for LA (93 out of 100) while 88 out of 100 were satisfied from the cosmetic outcome; (P-Value 0.230064).

Conversion from lap to open: Four patients undergoing LA had to be converted to open for various reasons which constitutes 4 percent of the total LA cases. Although the surgery was completed by open technique it was still counted in laparoscopic group as it was started as a laparoscopic surgery case. However, conversion to OA increased the duration of surgery and incision size markedly for the LA group. This parameter did not apply to the OA due to the nature of the technique.

Complications: They were recognized as any deviation from the expected course of recovery.[20] No major complications were observed in both the groups however surgical site infection (SSI) was seen in 6 patients undergoing OA and 3 undergoing LA. No incisional hernia was observed in OA or LA limbs of the study. Bleeding was not an issue in both and the amount was as per expectations i.e. 5-10 mls in OA and about 5 mls in LA. No fecal fistula was observed; no Thrombophlebitis of the Porto-mesenteric Veins was observed; (P-Value 0.308703). (Graph 03)

Return to work: It was considered as the start of normal/routine daily activities. The average time taken by the patients to return to work, was around 13 days (range 10 to 17 says) for OA and 10 days (range 9 to 14 days) for LA; (P-Value 6.69034E-22).

Cost: The cost of laparoscopic surgery was way more than the open surgery. The average cost incurred by the patients undergoing OA was PKR 35279.00 while those undergoing LA was around PKR 72168.00 (both limbs of the study were subsidized for the disposable, but the cost calculated was inclusive for the purpose of a realistic result); (P-Value 1.24442E-60). (Graph 04)

Criteria	Score
Signs	
Right lower quardrant tenderness	2
Elevate temperature (> 99.1°F)	1
Rebound ternderness	1
Symptoms	
Anorexia	1
Nausea or vomiting	1
Migration of pain to right lower quardrant	1
Laboratory Values	
Leukocytosis (WBC >10,000)	2
Left shift (neutrophils > 75%)	1
Total Score	**10**

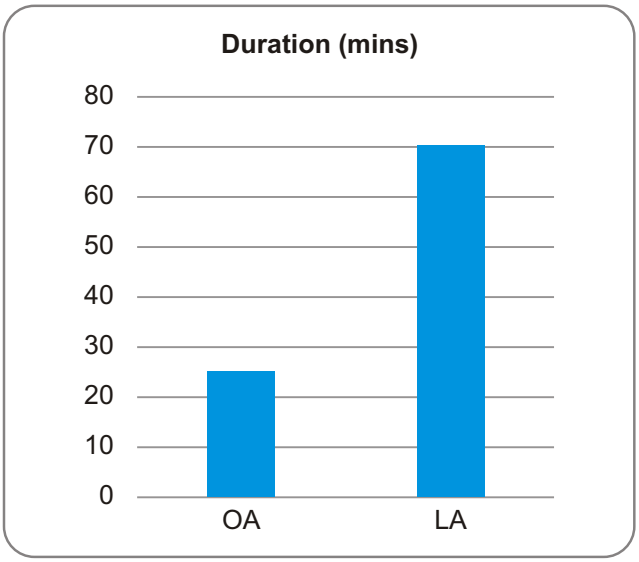
Figure 01. Alvarado Score: Interpretation, **a score of 1-4 rule-out the diagnosis of acuteappendicitis, and a score of 7 or more confirms the diagnosis.** A score of 5-6 the patient can be observed and may need additional studies.



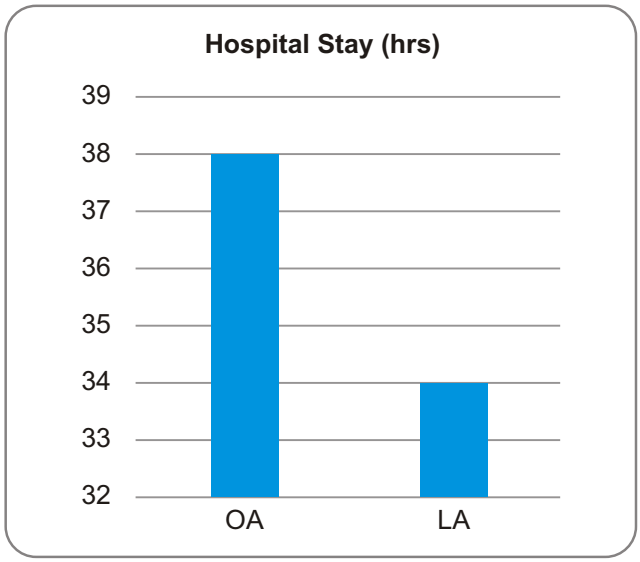
Figure 02. Pain Score:
1 = no Pain, 1-3 = Mild Pain, 4-6 = Moderate Pain, 7-9 = Severe Pain, 10 = Very Severe Pain

Table 01. Summary of the results

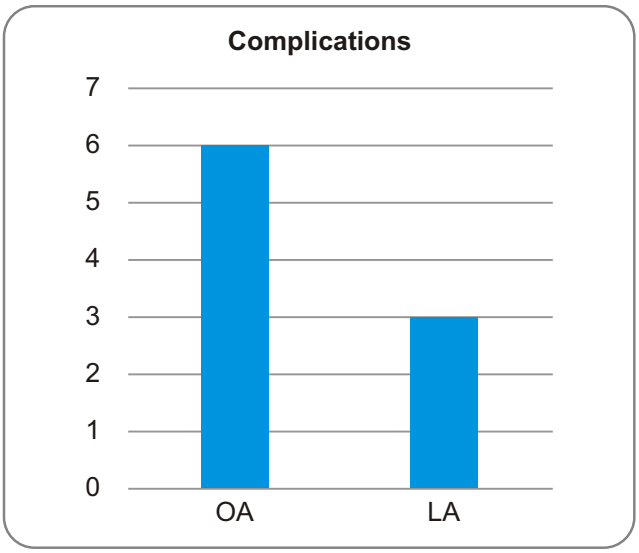
Parameters	Open Appendectomy	Laparoscopic Appendectomy	P-Value
Duration of Surgery (minutes)	25	70	1.41E-70
Incision size (cm)	3.5	3	0.0002579
Hospital stay (hours)	38	34	0.0040119
Pain score scale (1-10)	6	6	1
Patient satisfaction (cosmetics)	88	93	0.230064
Return to work (days)	13	10	6.59034E-22



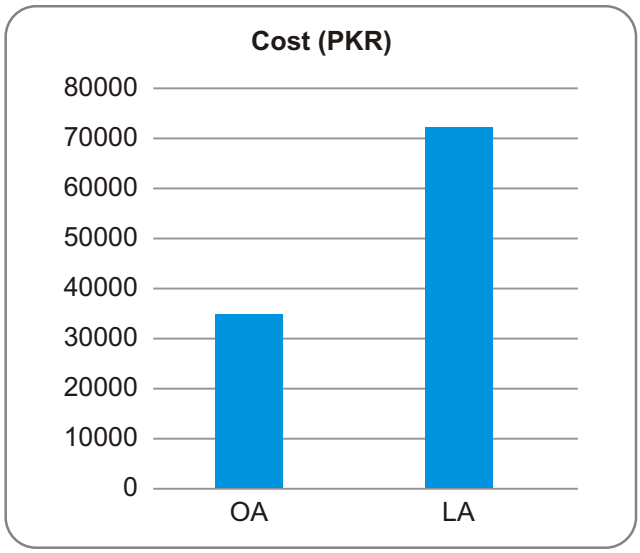
Graph 01. Duration in minutes
OA = Open Appendectomy
LA = Laparoscopic Appendectomy
P-Value = 1.41E-70



Graph 02. Hospital Stay in hours
OA = Open Appendectomy
LA = Laparoscopic Appendectomy
P-Value = 0.004



Graph 03. Complications
OA = Open Appendectomy
LA = Laparoscopic Appendectomy
P-Value = 0.3087



Graph 04. Cost in PKR
OA = Open Appendectomy
LA = Laparoscopic Appendectomy
P-Value = 1.24442E-60

DISCUSSION

Laparoscopic Cholecystectomy is considered as the treatment of choice for surgical management of gall stones,[21,22] but laparoscopy for Appendectomy is still under critical discussion with regards Cost-effectiveness for initial non-operative management and emergency laparoscopic appendectomy.[23] The development of newer laparoscopic instruments and techniques are bringing more and more surgical procedures under the domain of laparoscopic surgery. This study was conducted to scientifically analyze whether laparoscopic appendectomy had any advantage over open appendectomy in a developing world scenario, despite its advantage in post-operative pain, need for analgesics, shorter hospital stays and early return to work. Moreover, Basukala S et.al. have also concluded that laparoscopic approach is a better option for uncomplicated appendicitis due to less postoperative pain and shorter duration of hospital stay.[24] This study was carried out over a period of 2 years from September 2019 to August 2021. However, the patients were followed up for 1-year post-operative by telephone or in a few cases by follow-up hospital visit.

The duration of surgery in our study was 25 minutes (range 15 to 50 minutes) for OA whereas LA took around 70 minutes (range 40 to 90 minutes) on an average. Bludevich BM et al. in their publication also have a similar operative time for LA (39 mins in uncomplicated and 90 mins in complicated),[25] and Tarnoff M. et al, in their study have a 53 minutes' average duration of surgery for OA and 72 minutes for LA.[26] The reason for this difference may be due to the additional time taken for the LA in creating pneumoperitoneum/port placement compared to directly making skin incision and reaching the appendix in OA. There is also the surgeon factor, the level at which he is on the learning curve, a lot more time is taken during the earlier part of the curve. The duration of surgery also depends upon the complexity of the case. If it is simple straight forward, in a thin lean person, it is completed in a shorter time, whereas, a complicated case specially retrocecal, subserosal or sub hepatic appendicular position, adhesions (in cases of previous surgery or recurrent attacks) and appendicular mass formation etc. requires significantly more time. In our case, members of our team were not routinely performing LA therefore the duration of surgery was long.

Although the surgical incisions placed as a single incision or as multiple small incisions at different location technically do not sum up to be the same as indicated by Thane Blinman,[27] but for the purpose of comparison we measured the incision size. In a thin, lean, young patient with uncomplicated appendix the incision of 2 cm can suffice where as an obese patient require a longer incision, which, if the appendix is also complicated may require extension. One of our patients ended up with and incision of 8 cm when it was found that the appendix was subserosal and retrocecal in position and the cecum was also plastered to the posterior abdominal wall due to recurrent attacks. We observed an average size of 3.5 cm (range 3 to 8 cm) for incision in OA and that for LA 3 cm (range 3 to 9 cm). The extraordinarily long incisions were measured in patients who had to be converted to OA, thus they had a long incision in right iliac fossa and three small incisions used for laparoscopic surgery.

The duration of surgery was significantly longer for LA compared to OA (P-Value 1.41E-70). However, the length of hospital stay observed was the same in our study. Kovler ML et al. observed an average stay was significantly extended hospital length of satay ($P < 0.05$) due to delay and post-operative complications.[28] Our study showed that the duration of hospital stay was shorter in the LA group but it was dependent upon the complicated appendicitis, in such cases the hospital stay became equal to and even longer than the average stay for OA, thus, we did not observe a significant difference in the average hospital stay of patients in both groups, which was on an average 38 hours (range 20 to 72 hours) for OA and 34 hours (range 21 to 60 hours) for LA, which is in line with the findings of Tarnoff M. et al.[26] Both groups were administered parenteral antibiotics and observed as indoor cases till the time gut motility returned and the patient started tolerating orally. The duration of Paralytic ileus observed was longer in patients who underwent OA, which may be the cause for a slight increase in the stay.

Similarly, no significant difference was appreciated in post-operative pain recorded using pain score chart (1-10) (Fig 02). The average pain claimed by the patients of OA was 6 (range 4-8) while that of the LA was also 6 (range 5 to 8). Moreover, there was no requirement of narcotic analgesics in both groups, they were managed with simple routine postoperative analgesics during their stay in the hospital. The analgesics were continued for up to total of 3 to 5 days post-operative. Both groups had patients with low threshold for pain requiring more frequent dosing of analgesic for longer duration. This was also in line with other studies.[23]

On an average the patient undergoing OA returned to work at 13th (range 10-17 days) post-operative day, while the patients undergoing LA resumed normal daily activities by 10th (range 9-14) post-operative day. In our observation, the return to work also had social factors rather than only surgical. The patients who were self-employed started normal activities early while those who were employed demanded more leave of convalescence and for this purpose gave many reasons which could not be verified clinically. Kouhia ST et al. in their study also concluded that LA group returned earlier to work (median 13 d for OA *vs* 8 d for LA).[29]

Although we performed adhessiolysis in quite a few patients with intra peritoneal adhesions and progressed to completion of procedure laparoscopically but four patients undergoing LA had to be converted to OA. These adhesions were due to previous recurrent attacks of acute appendicitis which were being managed conservatively in private clinics, seen in two patients. Adhesions due to previous surgery was also a reason for conversion in one patient. One patient had an inflamed, plastered cecum with reterocecal appendix which was considered dangerous to proceed laparoscopically and was converted to open.

No major complications were observed in both the groups however surgical site infection (SSI) was seen in 6 patients undergoing OA and 3 undergoing LA. These infections were observed in patients who had complicated appendix (either perforated or pre-gangrenous) despite special precautions taken as per local infection control protocols. In 2 patients the wound had to be opened to allow free drainage of pus which was followed by secondary suturing once infection was controlled. The good thing is that all patients were recognized and managed as outpatient and responded well to the treatment. Blood loss encountered in all patients was around 5 to 10 mls in OA and about 5 mls

for LA. No patient developed fecal fistula in both groups. Swank HA et al. observed an incidence of incisional hernia of 0.7% in OA group *vs* 1% in LA,[30] however we didn't detect any case of incisional hernia in both limbs, till the planned 1 year follow up. Kouhia ST et al. in their study demonstrated that LA group had fewer complications (median 13 d for OA *vs* 8 d for LA).[23]

The patients undergoing OA were more satisfied by the cosmetic results following Lanz incision then grid iron, while patients undergoing LA were, overall, more satisfied form the cosmetic outcome. There were a few who were not fully satisfied due to conversion and thus having multiple incisions following LA. Moreover, the satisfactions level of young females was also low in both groups. Most of the remaining patients were least concerned about the cosmetic results of the surgery, the probable reason being our conservative culture in which exposing your body is not acceptable. However, assessment at our end showed that the laparoscopic surgery had a better cosmetic outcome with minimal incision size which became inconspicuous after 6 months of surgery, our study showed an overall cosmetic satisfaction for OA was 88% and 93% for LA. While the patients having surgical site infection didn't have a good cosmetic result although the patients didn't complaint. While Kapischke M et al. confirm in their studies that LA is more cosmetically satisfying for the patients.[31]

In our study the average cost incurred by the patients undergoing OA was 35279.00 PKR while those undergoing LA was around 72168.00 PKR. Cost turned out to be the most important parameter of the study dictating the choice of procedure by the patient. The patients, included in our study, were mostly from the middle and lower middle class families. Although the cost of the procedures was subsidized by the hospital. The cost estimates were made for the surgery, hospital stay and medication used were included in the calculations for a realistic result, however the lost working hours of the patient were not taken in to account. The study clearly shows that the cost of LA is more than double to that of OA. Internationally also the cost of LA exceeds that of OA which was observed by Moore DE et al,[32] however, the opinion of Guevara-Cuellar et al. in their recent article, Cost-effectiveness analysis of non-operative management versus open and laparoscopic surgery for uncomplicated acute appendicitis in Colombia., concluded that LA is a cost-effectiveness alternative in the management of patients with uncomplicated appendicitis due to shorter hospital stay and early return to work for LA.[33]

According to United Nations Population Fund, Pakistan had a midyear population of 229.5 million in 2022,[34] with an average monthly wages of employees being Rs.24028.00 per month.[35] The social system of our society is a joint family system, with usually one or two members being the bread winners. According to Global Data Lab, the average family size of Pakistani families wss 8.45 in 2018.[36] There is no comprehensive system of health insurance for general public and the government health care system is overburdened due to increasing population and lack of resources therefore, the health care system cannot provide medical treatment to all the patients. This gap is being filled by the private hospitals and clinics which are, for all practical purposes, a business setup which is not affordable by the majority of population. During the last couple of years, a health card was introduced to help the low income population but due to financial situation the government had to discontinue it. Keeping in view this special perspective, the cost of surgical treatment is so high that it pushes the patient's family to the edge and it may even plunge lower middle class below the poverty line.

The charity system is well developed, Pakistanis being estimated to give 1-5% of GDP in charity, which according to estimates is around PKR 240 billion (more than $2 billion) annually.[37] More over the doctors and hospitals also take into consideration the paying capacity of the patient and help them as much as they can. Thus the low affordability of majority of population has led to slow induction of newer technology into the medical field. The availability of laparoscopic equipment is limited specially in the peripheral regions of the country the reason being that it is expensive to purchase, maintain and to operate, and the setups which do have are forced to use reusable instruments as the disposables make the cost too high. Most of the patients after becoming aware of the cost prefer to go with the open technique, accepting surgical scar over the cost. Sporn E et al. recommends that OA should be the standard for management of acute appendicitis, reserving LA only for special categories of patients.[23]

CONCLUSION

Our study clearly shows that laparoscopic appendectomy is far better of the two techniques as it provides a chance of diagnostic look at other intra-abdominal organs along with being therapeutic for the appendicitis. Most of the complications can be dealt with without increasing the 'incision size' as required for open appendectomy, which is of great benefit in obese patients. Return to work and cosmetic results are also much better, however, the cost of LA overshadows all its benefits. Therefore, we recommend that OA should be used as the primary modality for managing acute appendicitis but at the same time giving the option of LA to the patient for an informed and combined decision making, in developing world. Once the cost of LA /disposable reduces it should be offered used as preferred option.

Acknowledgments

I am extremely thankful to Dr. Ayesha Naureen Awan and Dr. Nadia Haleem for their comprehensive help in write-up and data analysis, Dr. Hina Fiaz for her tireless commitment in operating and assisting in surgeries, Mr. Shahab Ud Din Awan and Miss Fatima Awan (final year

medical students) for doing the work of foot soldiers in collect and organizing the data and entering it in the spread sheets and also for their valuable assistance in patient preparation for surgeries.

Ethical Consideration

This study was approved by the ethical board of MTI, Ayub Teaching Hospital, Abbottabad, Pakistan.

Funding

There is no role of any funding agency in this study.

Conflict of Interest

Authors declared no conflict of interest

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

AUTHORS' CONTRIBUTION

The following authors fullfill authorship criteria as per ICMJE guidelines;

Awan SD:	Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Awan AN:	Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Haleem N:	Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Faiz H:	Analysis and interpretation of data, critical revision,final approval, agreed to be accountable for all the work.

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