Original Research Article

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Evaluation of preoperative predictive factors that determine difficult laparoscopic interval appendectomy

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ABSTRACT

Background: Appendicitis is one of the most widely recognised causes of acute abdominal pain. A wide range of treatment from medical management using antibiotics to a minimal invasive surgery can be done for appendicitis. The usual classical open approach of appendectomy is time tested treatment. However laparoscopic appendectomy is being increasingly preferred these days over classical open approach in majority of patients suffering from appendicitis. This study was undertaken to evaluate preoperative data that can serve as predictors of difficult laparoscopic appendectomy and help in planning of surgery.

Methods: This was a prospective observational study that was done at department of surgery, government medical college, Srinagar for a period of three years. A total of 50 consecutive patients who underwent laparoscopic interval appendectomy were enrolled in this study. Various preoperative factors such as age, gender, body mass index, history of recurrent episodes, history of previous surgery, ultrasonographic findings and a few investigation results were studied to find their association with the difficulty in performing laparoscopic appendectomy and results were tabulated and analysed.

Results: This study found a significant relation between body mass index, history of previous surgery, history of multiple episodes, C reactive proteins and difficulty in doing a laparoscopic interval appendectomy. However, we didn't find any significant relationship between age, gender, ultrasonographic findings, serum bilirubin, transaminase levels, WBC counts and difficult laparoscopic interval appendectomy.

Conclusions: Knowledge of these positive factors for difficult laparoscopic appendectomy could help surgeons during pre-operative assessment and take necessary precautions during laparoscopic appendectomy.

Keywords: Laparoscopic appendectomy, Morbidity, Preoperative factors

INTRODUCTION

Appendicitis is one of the most widely recognised causes of acute abdominal pain. Appendicitis has a lifetime risk of 6.7% and 8.6% in females and males respectively. Appendicitis encompasses a wide clinical picture from catarrhal appendicitis to a full-blown peritonitis due to wall perforation. Various causes such as faecolith and food bolus leading to luminal obstruction which cause an increment in mucus production and bacterial proliferation. This in turn causes an increased wall tension that eventually leads to necrosis and perforation.

A wide range of treatment from medical management using antibiotics to a minimal invasive surgery can be done for appendicitis. The usual classical open approach of appendectomy is time tested treatment. However laparoscopic appendectomy is being increasingly preferred these days over classical open approach in majority of patients suffering from appendicitis.³

Laparoscopic appendectomy has certain advantages over open appendectomy. These include less postoperative pain, earlier return to bowel functions, shorter length of hospital stays, better cosmetic outcome, earlier return to full activity, and decreased overall cost.⁴ Laparoscopic

appendectomy is associated with better preservation of immune function and a reduction of the inflammatory response compared with open surgery. The rate of postoperative infections by all accounts seems to be lower.5 Laparoscopic appendectomy has become the gold standard in the treatment of appendicitis and is replacing appendectomy. However laparoscopic open appendectomy has still a significant rate of conversion to open surgery and conversion is followed by more postoperative complications compared to laparoscopy and open surgery. Hence it is necessary to study the predictive factors for difficult laparoscopic appendectomy. This study was undertaken to evaluate preoperative data that can serve as predictors of difficult laparoscopic appendectomy and help in planning of surgery.

Aims and objectives

The objective of this study was to identify pre-operative parameters for anticipating a difficult cholecystectomy.

METHODS

Type of study

This was a prospective observational study

Duration of study

We conducted this study over a period of 3 years from January 2017 to December 2019.

Place of study

This study was done at department of surgery, government medical college, Srinagar

Sample size

This study consisted of first 50 patients that were posted for laparoscopic interval appendectomy.

Inclusion criteria

All those patients who were above 16 years of age and were diagnosed with appendicitis were included in study.

Exclusion criteria

Those patients who were less than 16 years of age, patients having coagulopathy due to some reasons and pregnant females having appendicitis were excluded from the study.

Methodology used

A detailed history and meticulous clinical examination was done in all patient who were enrolled in this study. The diagnosis of appendicitis was confirmed by an ultrasonography and in some cases by computed tomography. Patients had their baseline investigations done which were necessary for the surgery or anaesthesia.

Age and body habitus were evaluated as dichotomous variables, i.e., >60 years and <60 years and obese (BMI >30 kg/m²) and non-obese (BMI <30 kg/m²) respectively. Previous abdominal surgery was categorized as having no previous abdominal surgery and having undergone previous intra-abdominal surgery. History of any previous episode and number of such episodes of acute appendicitis was taken into account. On Ultrasonography, the diameter of appendix was taken into account along with the presence or absence of peri appendicular collection.

All the surgeries in this study were done by surgeons who had an experience of at least 30 laparoscopic appendectomies. The time of surgery was calculated from the time of insertion of Verres needle to the removal of last trocar and cannula. The procedure which took more than 120 minutes or which were converted to open procedure due to some reasons were considered as a difficult laparoscopic appendectomy. A blood loss of more than 100 ml was also considered a factor of difficult appendectomy. Various Preoperative variables were studied in such cases and data tabulated. All the cases which were technically difficult or converted to open appendectomy were grouped into the category of cases with intra-operative difficulty during laparoscopic appendectomy and the cases where no significant technical difficulty was encountered were grouped separately as cases with no intra-operative difficulty. The ultrasonographic finding recorded preoperatively were also confirmed during operative surgery.

Statistical method

All the data collected in proforma were entered in Microsoft excel sheet and SPSS software version 21 was used for statistical calculations. Chi-square test with Fischer exact was used to calculate p value and find the significant association of findings of preoperative score with preoperative outcome.

RESULTS

This was an prospective observational study that was done at Department of Surgery, Government Medical College, Srinagar for a period of three year from January 2017 to December 2019. A total of 50 consecutive patients were enrolled in this study which included 18 males and 32 females. The youngest patient in this study was an 16 year old boy while the eldest was an 71 years old male. The commonest age group to be operated upon was that between 16-25 years of age. The various preoperative factors are shown in the Table 1 below.

Table 1: Pre-operative variables.

Preoperative variables	Number
Age (>60 years)	4
Males/ females	18/32
Body mass index (>30 kg/m ²)	16
History of previous abdominal surgery	07
History of multiple attacks (>2 episodes)	11
Appendicular diameter (> 1 cm)	18
Impacted fecalith	21

In this study, only 4 patients were above the age of 60 years. There were 16 patients with body mass index of greater than 30 kg/m², 11 patients had prior history of acute appendicitis while 7 had history of previous lower abdominal surgery. On pre-operative ultrasonography, 18 patients were shown to have an appendicular diameter of more than 1 cm and in 21 patients, ultrasonography revealed an impacted appendicolith.

Difficult cholecystectomy was seen in 16 patients. No significant association was found between the age, gender of the patients, and intra-operative difficulty during laparoscopic cholecystectomy in our study group.

However, we found a significant relation between increased body mass index (>30 kg/m²), previous recurrent episode of acute appendicitis and intraoperative difficulty during interval laparoscopic appendectomy with p=0.04 and 0.004 respectively. However, a single episode of acute appendicitis didn't confer any difficulty in doing a laparoscopic appendectomy. Also, there was a significant relation between previous lower abdominal surgery and difficulty in laparoscopic interval appendectomy (p=0.05) (Table 2).

On comparing the various laboratory characteristics, we found that C-reactive proteins did have a statistical relevance (p=0.05) as far as difficulty of laparoscopic appendectomy is concerned. However other laboratory parameters such as total leucocyte count, total neutrophil count total bilirubin and levels of transaminases didn't have a statistical relevance to difficulty of appendicitis (Table 3).

We didn't find significant relation between intraoperative difficulty during laparoscopic appendectomy and presence of peri-appendicular collection (p=0.24) or increased appendicular diameter (p=0.77).

Table 2: Demographic factors and history and difficult laparoscopic appendectomy.

Parameters	Number	Simple cholecystectomy	Difficult cholecystectomy	P value
Age (years)				
>60	04	02	02	0.6
<60	46	32	14	
Gender				
Male	18	13	05	1.0
Female	32	21	11	1.0
BMI (kg/m²)				
<30	34	28	06	0.04
>30	16	06	10	
History of				
Previous operation	7	01	06	0.05
No previous surgery	43	33	10	
Multiple episodes	11	01	10	0.004
Single episode	39	33	06	0.004

Table 3: Laboratory parameters and difficult laparoscopic appendectomy.

Laboratory parameters	Number	Simple cholecystectomy	Difficult cholecystectomy	P value
Total leucocyte count (>11000)	28	18	10	0.77
Total neutrophil count (>80%)	21	12	09	0.39
Total bilirubin levels (>1.5)	17	14	03	0.35
AST levels (>250)	14	11	05	1.0
ALT levels (>250)	15	09	06	0.76
Increased CRP	09	03	07	0.05

Table 4: Ultrasonographic findings and difficult appendectomy.

Intra-operative details	Number	Simple cholecystectomy	Difficult cholecystectomy	P value
Appendicular diameter (>1 cm)	31	20	11	0.77
Appendicular diameter (<1cm)	19	14	05	0.77
Peri appendicular collection	18	09	09	0.24

Eleven patients took more than 120 minutes intraoperative time to undergo laparoscopic appendectomy, difficult anatomy was encountered in 08 patients, bleeding (>100 ml) occurred in 05 patients, adhesions with subsequent adhesiolysis were performed in 13 patients, and conversion to open appendectomy happened in 4 cases.

DISCUSSION

Laparoscopic appendectomy is considered as the gold standard for the treatment of appendicitis. Various criteria have been identified in the past for predicting a difficult laparoscopic appendectomy like male gender, obesity, geriatric patients, recurrent episodes of acute appendicitis in past, thickened appendicular wall, appendicular lump etc.⁶

We found no association between age or gender with intra-operative difficulty during interval laparoscopic appendectomy in our study. However earlier studies by authors such as Pozzi et al have shown a significant correlation between difficulty in laparoscopic appendectomy and old age. This can be due to the small sample size of geriatric patients in this study.⁷

A significant relation was found by us between previous multiple episodes of acute appendicitis and intraoperative difficulty during laparoscopic appendectomy. Similar findings have been corroborated by various authors in literature. While some authors have reported no significant relation between appendicular diameter and a difficult laparoscopic appendectomy whilst others have reported it to be significant. Present study found this relation to be statistically insignificant. Also, there was no statistically significant relation between periappendicular collection and difficulty during laparoscopic appendectomy. However, some studies in literature have found a statistically significant relation between periappendicular collection and difficult laparoscopic surgery. §

It was also seen in this study that a history of previous lower abdominal surgery did increase the difficulty in laparoscopic appendectomy. This may be due to the fact that previous surgery leads to increase adhesions and altered anatomy which may lead to increased operative time and difficulty in dissection especially during laparoscopic procedures. However, authors such as Wu et al have concluded that previous abdominal surgery, whether upper or lower abdominal, has no significant impact on laparoscopic appendectomy for acute appendicitis.⁹

Patients having BMI more than 30 was significantly related to difficult appendectomy, the difficulty arose while gaining intra-peritoneal access, dissecting at mesoappendix due to excess fat and while extracting the appendix from the peritoneal cavity. Various authors have reported similar findings.^{8,10}

Also, we found that C reactive protein bears a significant relation with difficulty in laparoscopic appendectomy. This has been seen in the previous studies done by many authors such as Fujiwara et al.¹¹ However, rest of the laboratory investigations such as WBC count, serum bilirubin, and transaminases didn't show a significant correlation with difficulty in interval laparoscopic appendectomy.

Limitations

This study suffers from few limitations one of which include small sample size. Also, different surgeons operated upon the patients. Although all of them had the required minimal qualification, there are still chances of bias due to different surgeons involved. Also, this was a single center study, so it leads to increased chances of type I statistical errors.

CONCLUSION

Thus, the factors which we found statistically significant in predicting difficult laparoscopic appendectomy may be useful in prediction of difficulty that may occur in laparoscopic appendectomy. Knowledge of these factors for difficult laparoscopic appendectomy could help surgeons during pre-operative assessment and take necessary precautions during laparoscopic appendectomy.

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Institutional Ethics Committee

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