

The risk factors for conversion of laparoscopic appendicectomy to open appendicectomy

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Abstract:Laparoscopic appendicectomy is one of commonest emergency surgery in most of the tertiary hospitals. Certain factors decide the conversion of laparoscopic appendicectomy surgery to open appendicectomy. Our aim is to identify these risk factors for conversion of laparoscopic appendicectomy and to predict the possibility of converting to open surgery. In retrospective collection of laparoscopic appendicectomy cases from 2008-2013 from sri ramachandra medical university hospital was used for study. Totally 780 patients were operated by laparoscopic surgery. Among these patients interval appendicectomy was 30 patients. It was excluded from the study. In the rest of 750 cases, converted to open appendicectomy cases were 50 and successfully completed with laparoscopic procedure were 700 .The conversion rate is 6.6%. Laparoscopic appendicectomy patients were significantly younger than converted appendicectomy. (34+/-14 VS 48+/-16).In converted appendicectomy patients male to female ratio is 3:2. In CT scan reports, abscess formation and CT grade of (4-5) are high in converted appendicectomy, which is statistically significant. WBC counts are high in converted appendicectomy (16380+/-1015) than laparoscopic appendicectomy (12412+/-1022), which is statistically significant. In conclusion surgeon can initiate open appendicectomy or aim to have a low threshold of conversion if any of the above mention risk factors present in combination.

Keyword:Laparoscopic appendicectomy,Converted open appendicectomy,Risk factors in laparoscopic appendicectomy,Appendicectomy and risk factors

I. Introduction

Appendicitis is a very common abdominal emergency. The overall incidence of this condition is approximately 11 cases per 10,000 populations per year. Acute appendicitis may occur at any age, although it is relatively rare at the extremes of age. Open Appendicectomy was a traditional method with its attendant complications. With the advent of laparoscopic surgeries, laparoscopic appendicectomy has become one of the most commonly performed surgeries today. Laparoscopic appendicectomy has its own advantages like less morbidity, a shorter hospital stay and fast recovery. Laparoscopic appendicectomy has been increasingly adopted for its own advantages over the open method. Similar to other laparoscopic surgeries, laparoscopic appendicectomy has several advantages, including the use of small incisions to obtain good quality of panoramic vision with good access to abdominal cavity. There have been several randomized trials and Meta analyses to compare advantages and disadvantages of laparoscopic appendicectomy versus open appendicectomy. Yet there is no definitive superiority proved that laparoscopic appendicectomy is better than open appendicectomy. Even open appendicectomy is already considered a minimally invasive method with a shorter operative time.

Basically acute appendicitis is divided into simple appendicitis, appendicitis with peritonitis,appendicitis with abscess,perforated appendicitis and appendicitis with mass formation. Among these types simple appendicitis is the commonest type, which can be managed easily with laparoscopic appendicectomy. In patients with appendicitis associated with abscess,gangrenous appendicitis and perforated appendicitis, there is no clear evidence to support laparoscopic appendicectomy as a primary choice. These types of appendicitis the conversion rate is high.

In fact one of the study shows The laparoscopic approach to appendicectomy in patients with uncomplicated appendicitis does not offer a significant advantage over the open approach in terms of length of hospital stay, postoperative pain score, or quality of life, which are considered the major advantages of minimally invasive surgery [1]. Surgeons should take into account that presence of peri-appendicular abscess and diffuse peritonitis are both independently related not only to higher rate of conversion but also to higher risk of postoperative complication [2].

It is well known that laparoscopic surgery conversion to open will increase the medical cost, operative time and complication rate. Presence of co-morbidities is the independent factor related to conversion during laparoscopic appendicectomy [2]. To avoid this conversion rate, identification of risk factors associated with conversion of laparoscopic appendicectomy is essential. Identification of risk factors before surgery is very

essential for planning the management in pre operative, operative and postoperative period. In one of the study shows Procalcitonin values can be used as a prognostic marker and predictor of infectious complications following appendicectomy surgery and it can help to carry out timely surgical intervention which is highly recommended in patients with PCT values more than 0.5ng/ml [3]. So identification of Risk factors can change the outcome of the treatment.

Our aim is to identify these risk factors for conversion of laparoscopic appendicectomy and to predict the possibilities of conversion.

II. Materials And Methods

In retrospective collection of laparoscopic appendicectomy cases from 2008-2013 from Sri Ramachandra medical university hospital was used for study. Totally 780 patients were underwent laparoscopic appendicectomy. Among these patients interval appendicectomy was 30 patients, which was excluded from the study. In the rest of 750 cases, converted to open appendicectomy cases were 50. Successfully completed with laparoscopic procedure were 700 cases. Direct open appendicectomy cases were excluded from the study.

The following data were collected for analysis:

1. Patient's background like age, sex and previous history of abdominal surgery.
2. Laboratory data
3. CT scan findings
4. Duration of symptoms before surgery
5. Intra operative findings

These data were analyzed between laparoscopic appendicectomy and converted appendicectomy cases. For analysis the Mann-Whitney U test was used. Parametric data were presented in mean \pm SEM. By using Fisher exact test, the P-value is calculated and value less than 0.05 was considered as significant. The P-value less than 0.01 is considered as highly significant.

III. Results

TABLE 1: Patient demography

| Variable | Laparoscopic appendicectomy | Converted Open appendicectomy | P-Value |
|-------------------------------|-----------------------------|-------------------------------|---------|
| 1) Number of patients | 700 | 50 | |
| 2) Age | 34 \pm 14 | 48 \pm 16 | <0.01 |
| 3) Male/Female | 340/360 | 30/20 | <0.05 |
| 4) Previous abdominal surgery | 8 | 4 | >0.05 |
| 5) Symptoms | | | |
| A) Fever | 400 | 32 | >0.05 |
| B) Vomiting | 320 | 28 | >0.05 |
| C) Diarrhea | 20 | 16 | <0.05 |

Out of 750 patients to underwent laparoscopic appendicectomy, 50 patients were converted to open surgery (6.6%). 700 patients were completed the laparoscopic appendicectomy (93%). The overall age was 35.2 \pm 16 years with a range from 15 -80 years. Laparoscopic appendicectomy patients were significantly younger than converted appendicectomy (34 \pm 14 VS 48 \pm 16) which is statistically significant (P-Value <0.01). Laparoscopic appendicectomy completed without conversion in 340 male patients and in 360 female patients. The ratio is almost 1:1. But in converted appendicectomy patients male to female ratio is 3:2 which is statistically significant (P-Value <0.05).

Previous history of abdominal surgery in laparoscopic appendicectomy is 8/700 patients but in converted appendicectomy it is 4/50 patients. On comparing the clinical presentation in appendicitis, fever is the common symptom followed by vomiting and diarrhea in both groups. The diarrhea symptom is significantly high in converted appendicectomy but there is no significant difference for vomiting and fever

Table 2 :Other Risk Factors

| Variable | Laparoscopic appendicectomy (700) | Converted Open appendicectomy (50) | P-Value |
|---|-----------------------------------|------------------------------------|---------|
| 1) Duration of symptoms before surgery in hours | 16+/- 6 | 40+/- 6 | <0.05 |
| 2) Laboratory findings: | | | |
| A) WBC counts | 12412+/-1022 | 16380+/- 1015 | <0.01 |
| B) Neutrophil counts | 75+/-6 | 82+/-2 | >0.05 |
| 3) Intra operative findings: | | | |
| A) Gangrenous appendix | 6 | 12 | <0.05 |
| B) Perforation | 14 | 16 | <0.05 |
| C) Abscess | 12 | 14 | <0.05 |
| 5) CT findings: | | | |
| A) Appendicololith | 102 | 6 | >0.05 |
| B) Abscess | 21 | 20 | <0.05 |
| C) Caecal thickening | 32 | 4 | >0.05 |
| D) CT grade (4-5) | 40 | 38 | >0.01 |

In comparison of CT findings appendicolith in laparoscopic appendicectomy is 102/700 whereas in converted appendicectomy is 6/50 which is statistically insignificant. Caecal thickening also statistically insignificant. But abscess formation and CT grade of (4-5) is also high in converted appendicectomy which is statistically significant.

WBC counts are high in converted appendicectomy (16380+/-1015) than laparoscopic appendicectomy (12412+/-1022), which is statistically significant. But raised neutrophilic counts in laparoscopic appendicectomy (75+/-6) and converted appendicectomy (82+/-2), which is statistically insignificant.

Intra operative findings like gangrenous appendicitis, perforated appendicitis and abscess rate is high in converted appendicectomy, which is statistically significant.

Duration of symptoms before surgery in laparoscopic appendicectomy is 40+/-6 hours and in converted appendicectomy it is 16+/-6 hours, which is statistically significant.

IV. Discussion

Introduction of laparoscopic appendicectomy changed the postoperative outcome in appendicitis patients by reduced postoperative pain, less wound infection, less hospital stay and faster recovery to work. However in some patients laparoscopic approach will be difficult and it makes the surgeon who convert to open surgery. In order to avoid conversion we need to screen the patients to identify suitable patients for laparoscopic appendicectomy.

In our study we have collected totally 750 cases of laparoscopic appendicectomy. The overall conversion rate is 6.6%. Better selection of patients can reduce the conversion rate and we can precede directly open surgeries in patients with specific criteria.

We identified certain clinical findings would predict the conversion from laparoscopic appendicectomy to open appendicectomy. We found that a disproportionate number of patients with appendicitis had some combination of risk factors. Age more than 48 is one of the risk factor. In young patient conversion rate is less. Being male patient, symptoms more than 2 days and WBC counts more than 16000 are the risk factors for conversion. CT scan findings like abscess and CT grade (4-5) are significant findings to show ruptured appendix or phlegmonous inflammatory reactions to the appendix. This seems to predict abnormal intra operative findings, which makes difficult laparoscopic procedures. It makes the surgeon to convert the surgery to open procedure. Intra operative findings like gangrenous appendix, perforated appendix and abscess are significantly associated with converted cases. Surprisingly previous history of surgery is not a predictive factor for conversion. Presence of fever and vomiting are not predictive factors for converted appendicectomy. On the other hand diarrhea is a significant symptom associated with converted appendicectomy.

We found some limitation of our study, which includes:

1. It is a retrospective study
2. We collected data from operative notes. This may be associated with selection bias as surgeon justifies the decision to convert laparoscopic appendicectomy
3. The decision of whether primary laparoscopic appendicectomy or open appendicectomy was made by attending surgeon, not by a criteria base decision
4. There will be verification bias by choosing only those patients in whom laparoscopic appendicectomy was attempted.

In review of literature Tomoyuki Abe et al shows CT inflammation grade 4 or 5, complicated appendicitis, higher preoperative CRP level and diffuse peritonitis associated with converted appendicectomy [4]. Liu SI et al shows Identifying the potential factors for conversion preoperative may assist the surgeons in making decisions concerning the management of patients with appendicitis and in the judicious use of LA[5].

Sakpal SV et al shows older patients have a higher likelihood of conversion with severe acute inflammation being the most common reason for conversion [6].

V. Conclusion

In our study we identified 6 independent risk factor for conversion of laparoscopic appendicectomy

- 1.Old age more than 48 years
- 2.WBC counts more than 16000
- 3.Male patients
- 4.Symptoms more than 2 days before surgery
- 5.History of diarrhea
- 6.CT findings - abscess or CT grade (4-5)

Based on this data surgeon can initiate open appendicectomy or aim to have a low threshold of conversion if any of the above mention risk factors present in combination.

Conflict of interest:

All authors declare no conflict of interest.

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