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Role of Minimal Invasive Surgery in Appendicular Mass

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I. Introduction

Initial non-operative regimen with selective interval appendicectomy is the standard management of appendiceal mass in children. This approach has recently been questioned due to its failure in 10-20% cases, leading to complications such as abscess and perforation peritonitis, which are more difficult to manage and have higher morbidity.[1] It is also associated with the need for longer hospitalisation, increased cost of treatment and loss of school days in children.[2] These patients may need second admission for interval appendicectomy, and often tend to delay their surgery and need readmission for another acute episode. Another disadvantage of non-operative management is the increased chance of misdiagnosis, such as intussusceptions, typhoid perforation or Meckel's diverticulum, which may be inappropriately treated, adding considerable morbidity.[3].

Early surgical intervention has been known to be an effective alternative to conservative therapy for a long time, as it considerably reduces the morbidity and total hospital stay, and obviates the need for a second admission.[4]Thus early surgery has an advantage of being curative in the index admission and ensuring early return to school, providing higher compliance at a lower expense. Early appendicectomy has been found to be a safe and better alternative for management of appendicular mass in various studies in adults, while very few studies report such advantages in the paediatric population.[5] This controversy is not only confined to the management approach, but also extends to the technique, that is, laparoscopy versus open, with regard to their feasibility and safety. While laparoscopy has become the standard mode of intervention for simple appendicitis in children, its role in complicated appendicitis is still controversial.[6] We conducted this study to assess the safety, efficacy and need of early laparoscopic appendicectomy (ELA) in child patients with appendicular mass.

II. Materials And Methods

All the patients with appendicular mass who underwent ELA at our institute between September 2011 and August 2014 were retrospectively reviewed. Appendicular mass was defined as a right iliac fossa mass in a case of acute appendicitis, diagnosed by clinical, laboratory and radiological evaluation, and palpation under anaesthesia. All the cases of appendicular mass were initially treated with hydration, nasogastric aspiration, intravenous antibiotics and analgesic before ELA. Laboratory evaluation included complete hemogram, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) level. Routine radiological evaluation included a scout film of the abdomen and ultrasound examination with a 10 MHz transducer in all the patients. All the operations were performed using the three-trocar technique. An optical port (5 mm, 30°) was placed at the umbilicus by open technique, along with two 5- or 3-mm working ports according to the size of the patient, in the suprapubic and right paraumbilical regions. The appendiceal stump was left unburied after transfixation by intracorporealendosuturing with 3-0 polyglactin 910 suture. In patients who were found to have evidence of pus, the areas of intra-abdominal collection were sucked out and rinsed with normal saline along with tube drainage. Data pertaining to sex, age, duration of symptoms, operative time, operative findings, gross appendiceal finding, difficulties encountered during surgery, complications, length of hospital stay, and pathological results were reviewed. Appendicular complication was defined as laparoscopic gross identification of gangrenous, perforated or sloughed-out appendix, and appendicular abscess.

III. Results

During the study period, 52 patients were diagnosed with appendicular mass, of whom 4 had had misdiagnosis. These included singular cases of ileal perforation, tubercular lymphadenitis, ileocolic intussusception, and gangrenous Meckel's diverticulum, which were managed with laparoscopic repair, laparoscopic biopsy, open reduction with resection, and open resection anastomosis, respectively. The remaining 48 patients were confirmed to have appendicular mass intraoperatively and were included in the analysis. There were 30 males and 18 females, with ages ranging 7-13 years (mean 9 years). The duration of treatment received elsewhere, before admission to our institute, ranged 3-7 days (mean 4 days). Forty-seven

patients (97.91%) had leukocytosis of greater than 11,000 per mm3, while 42 (87.5%) had raised ESR (mean 60) and CRP (>3 mg/L). Clinically palpable mass in right iliac fossa was identified preoperatively in 41 (85.41%) patients and confirmed on ultrasound, while the rest were diagnosed under anaesthesia. The average operative time was 72 min (range 45-93 min). The post-operative analgesia requirement was not more than three doses per day of rectal acetaminophen for the initial 2 days. The average time to ambulation, time to resumption of diet and length of hospital stay were 10 (range 6-11) h; 2 (range 1-3) days and 3 (range 1-6) days, respectively. There were no major intraoperative complications [Table 1]. The findings at surgery are listed in [Table 1]. In the present study, gross appendicular findings included appendicular abscess (62.5%), gangrenous appendicitis (25%), sloughed-out appendix (8.33%) and appendicular perforation (4.16%), as depicted in [Table 1]. Forty-eight (48) patients (92.30%) underwent ELA and 1 (1.92%) required conversion to open procedure due to failure in identification of appendicular base of a sloughed-out appendix. In 3 (5.76%) patients, there was difficulty in localisation of the appendix due to retro-cecal gangrenous appendix in 1 and sloughed-out appendix in 2 patients. Four (4) patients (7.69%) had dense adhesions and all had history of more than two attacks of acute appendicitis (AA) in the past. Post-operative complications were found in 4 (7.69%) patients, of whom 3 (5.76%) had minor wound infection at the umbilical port site and 1 (1.92%) had postoperative pelvic abscess, which was managed with percutaneous aspiration. This latter patient had appendicular perforation as a complication and went on to develop adhesive intestinal obstruction, which was successfully managed non-operatively. All patients are healthy, at the time of writing, on the minimum 6-month follow-up.

Table 1

Table showing laparoscopy findings, operative difficulties and complications

Gross appendiceal finding (n = 48)	n	Procedure	Operative difficulties		Complications		
			Difficulty in localisation of appendix	Dense adhesions	Umbilical wound infection	Pelvic abscess	Adhesive intestinal obstruction
Appendicular abscess	30	ELA	0	2	1	0	0
Gangrenous appendix	12	ELA	1	0	2	0	0
Appendicular perforation	2	ELA	0	0	0	1	1
Sloughed-out appendix	4	1 ELA, 1 Open	2	2	0	0	0

ELA: Early laparoscopic appendicectomy

IV. Discussion

The management of an appendiceal mass in children is surrounded by controversy amongst two schools of thoughts: That advocating early surgical intervention versus that advocating non-operative management with or without interval appendicectomy.[7] Advocates of operative initial appendicectomy report the advantages of immediately excluding other masquerading conditions, as well as providing a definitive treatment at the initial admission. More traditional surgeons propose initial conservative management, reporting that the majority of a patient's symptoms will resolve spontaneously, thereby avoiding an operation during the initial admission which is considered hazardous. Of those initially managing appendiceal mass conservatively, some propose elective interval appendicectomy once the mass has resolved. This is supposed to have the advantages of a less hazardous appendicectomy, prevention of any future recurrence of appendicitis and ruling out other conditions. Others manage appendiceal mass conservatively and do not perform interval appendicectomy, following up patients at the outpatient clinic to exclude other conditions and the recurrence of symptoms.[8] The need for interval appendicectomy after successful conservative treatment is still under debate. Indications for early surgery in appendiceal mass have been failure of conservative management or features of generalised peritonitis or obstruction.[9] A recent questionnaire study of 67 surgeons in the Mid-Trent region of England showed no agreed consensus on the management of appendiceal mass.[10] In the past, ELA in all cases of appendicular mass was considered an overenthusiastic approach by critics.

There are limitations of non-operative management, such as leading to failure in up to 10% of cases, frequent misdiagnosis, need for prolonged index admission along with additional hospitalisation for interval surgery, dropout, and delays in surgery by the parents. This leads to increased morbidity and cost of treatment along with loss of school days for children.[2] The literature mentions that recurrent attacks after non-operative treatment of AA usually have a milder course.[11] In the present study, 18 patients (37.5%) had evidence of more than two attacks of AA in the past, which was managed non-operatively and later on presented with appendicular mass. This reflects the reluctance of Indian parents to opt for interval surgery; it is also our unit policy, once the acute attack has been resolved with medical treatment. Misdiagnosis in 4 out of 48 patients preoperatively, which included singular cases of ileal perforation, tubercular lymphadenitis, ileocolic intussusception and gangrenous Meckel's diverticulum, also supports the necessity of early intervention on the

index admission. In the present study, patients developed appendicular complications along with appendicular mass, which included appendicular abscess (62.5%), gangrenous appendicitis (25%), sloughed-out appendix (8.33%) and appendicular perforation (4.16%), as depicted in Table1. These hidden complications are promptly detected and appropriately managed if ELA is opted for as the preferred treatment of appendicular mass, which would otherwise predispose patients to treatment failure and higher morbidity if managed non-operatively. Hence, the role of laparoscopic appendicectomy (LA) as an emergency intervention procedure for appendiceal mass is further substantiated by this study.

The percentage of infectious complications secondary to laparoscopic appendicectomy in complicated appendicitis varies widely in the literature: 19-28%, and doubts therefore remain about the safety of this procedure. In both open and laparoscopic types of appendicectomy, it is accepted that the greater the degree of evolution of AA, the worse the short-term results and the higher the rate of infectious complications.[12] Initially there were conflicting reports of increased complications such as pyoperitoneum and faecal fistula by using this approach, but most of them have been recently dismissed.[13] The recent comparative studies have tried to solve these controversies and have identified comparable results for laparoscopy in complicated appendicitis.[14] In the present study, post-operative complications were found in 4 (8.33%) patients; among these, major complication was observed in only 1 patient (2.08%) in the form of pelvic abscess and adhesive obstruction, which was managed non-operatively. The rate of conversion to open procedure, increased duration of procedure, and prolonged duration of stay were the initial concerns in ELA for complicated appendicitis, which in the present study was 2.08% (1/48), 72 min, and 3 days respectively. These data are comparable to the results of LA performed for non-mass-forming appendicitis.[15]. This supports the statement that ELA is a safe option for management of appendicular mass in children.

The question of ―golden hours for emergency LA for ―hot appendix masses, similar to that identified for emergency laparoscopic cholecystectomy for acute cholecystitis, needs to be answered. Nevertheless, the proper timing for emergency surgery needs further substantiation. At our institute, we follow the policy of ELA for all children presenting with appendicular mass on an emergency basis. But at the same time, one has to be experienced enough to manage complicated appendicitis laparoscopically and if not, it is always safer to follow the traditional regimen.

Due to the lack of sufficient Level I evidence for this common problem, no clear guidelines have been made so far. With the advancements in minimal access surgery, as seen with other surgical diseases, the management of appendicular mass needs change. More multicenter randomisedcontrolled trials and systematic reviews are required to reach a consensus on management.

V. Conclusion

ELA avoids misdiagnosis, treats complicated appendicitis at its outset, and avoids complications and/or failure of non-operative treatment of a potentially lethal, diseased appendix. This approach is associated with minimal complications in experienced hands and is a safe and feasible option in children with appendicular mass.

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