Port exteriorisation appendectomy—our experience

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ABSTRACT

BACKGROUND

Laparoscopic appendectomy is conventionally performed using 3 ports, with division of appendicular base and artery using staples/endoloops/clips. Paucity of surgical laparoscope and laparoscopic disposables necessitated adoption of laparoscopic technique obviating the need for the above. We document our experience with the port exteriorisation appendectomy performed predominantly using two ports.

METHODS

Between July 2008 and April 2009, 65 appendectomies were performed at a zonal hospital, of which 26 were performed using the contemplated technique. Technical challenges, conversions, operative time, complications, postoperative recovery, and cosmesis were analysed.

RESULTS

Twenty-six patients (13 males and 13 females), with a mean age of 22.88 ± 11.94 years, underwent port exteriorisation appendectomy. The median operative time was 20 minutes. Two cases (7.7%) needed conversion to open appendectomy. Dense adhesions necessitated addition of a working instrument/port in two cases (7.7%). Postoperative pain was < 25 by verbal response score. Visceral component predominated on the operative day, which got confined to port sites subsequently. One patient (3.85%) developed surgical site infection. Friable, gangrenous, short fibrosed appendix on a fixed caecum and very thick abdominal wall were its limitations. Postoperative recovery and cosmesis were excellent.

CONCLUSION

Port exteriorisation appendectomy proves simple, safe, economical, and efficacious, when conditions favour its performance. However, difficult appendices warrant conversion to three ports technique or to open procedure.

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Key Words: laparoscopic appendectomy; out technique; port exteriorisation appendectomy; two ports appendectomy

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INTRODUCTION

Laparoscopic appendectomy is in vogue.^{1,2} Although techniques of performing this surgery are many, they can broadly be divided into “in” and “out” techniques.^{1,2} The “in” technique involves division of appendicular artery and base intra-corporeally using endoloops/clips/staplers/sutures, with the delivery of appendix through one of the ports.^{3,4} This necessitates 3 ports and either use of costly laparoscopic disposables or mastery of intra-corporeal suturing. The “out” technique involves extraction of the appendix through one of the ports and performing the appendectomy extra-corporeally.^{1,2} This has been done using 3, 2 and 1 ports.^{1,2,5–7} Although 1 port appendectomy appears very attractive, it entails the use of either operating telescope⁸ or the use of instruments shoved in along with the camera, through an umbilical incision, enveloped in a glove.⁹ In both cases a mobile, not so inflamed appendix is mandatory for success.^{8,9} Although the 3 ports “in” technique is the most desirable in all situations. The paucity of apt surgical laparoscope, cautery, and disposables creates a yawning gap between desire and availability. Armed with only a diagnostic laparoscope, 2 ports, a Maryland, a non-toothed grasper, and a conventional cautery, the “out” technique was the most pragmatic option we had and this article documents our experience with port exteriorisation appendectomy performed predominantly using two ports.

MATERIALS AND METHODS

Between July 2008 and April 2009, 65 appendectomies were performed at a zonal hospital, of which 26 were performed using the port exteriorisation technique. Written informed consent was obtained from the patients and guardians in case of minors. The operative technique is described in brief.

With the patient under general/spinal anaesthesia (GA/SA), closed capnoperitoneum is created using Veress needle to reach an intra-abdominal pressure of 8–12 mmHg. Ten-millilitre supra/intra-umbilical port is placed for the camera. Patients are placed in Trendelenburg position with 20° head down and right side up. This, along with some additional helpful nudges by the telescope, in most cases, shifts the small bowel away to expose the caecum, for placement of 10mm working port over it (Figure 1). In case of difficulty in shifting the bowel/omentum away, the working port is placed in the right iliac fossa and an instrument is introduced to sweep the gut/omentum away. The external view of ports placement is as in Figure 2.

The appendix is isolated, and its tip is held (Figure 3) and coaxed into the introducer while simultaneously pushing the introducer and the port right up to its base (Figure 4). Pneumoperitoneum is deflated while pulling out the appendix gently yet firmly. Once deflated, the introducer, along with the port, is slowly slipped away exposing the entire length of the appendix along with its mesoappendix, outside the abdomen (Figure 5). The rest of the surgery is absolutely similar to open appendectomy, wherein the mesoappendix and the appendix base are sacrificed between clamps and ligated. On completion, the appendix is repositioned back into the abdomen by inflating the peritoneum again and satisfactory completion of the procedure is confirmed (Figure 6). The fascia is apposed with delayed absorbable suture and the skin with silk, after deflating the peritoneum and extracting the ports.

The diagnosis of appendicitis was based on an Alvarado's score >6 . The patients were administered ciprofloxacin and metronidazole, intravenously, on diagnosis and were continued postoperatively till the patients could accept the same orally, as per the recommended dosage schedule. Ampicillin,

at appropriate doses, replaced ciprofloxacin in patients below 16 years of age and in pregnant ladies. Antibiotics were stopped after 72 hours of surgery. Operative time was calculated from incision to skin closure. Parenteral diclofenac sodium was administered to the patients postoperatively in three divided doses, which was converted subsequently to oral NSAIDs on commencement of oral diet. Pain was assessed by verbal response score (VRS) and a score of >25 was used as an indication for the use of opioids (pentazocine). Patients were kept nil orally for eight hours following surgery and were permitted orally as per their desire, subsequently. Postoperative recovery was considered complete when the patients could ambulate without support, were capable of self-care, could tolerate normal diet, and had passed stools/flatus. The sutures were removed on the 7th postoperative day. All the removed appendices were subjected to histopathological examination.

Technical challenges, conversions, operative time, complications, postoperative recovery and cosmesis were recorded and analysed. Statistical analysis was performed using Microsoft Excel software.

Figure 1 Placement of working port vertically over the caeco-appendicular junction.

Figure 3 Appendix tip being held.

Figure 2 External view of the ports placement.

Figure 4 Appendix being coaxed into the port.

Figure 5 Appendix being exteriorised.

Figure 6 View after completion of the procedure.

RESULTS

Sixty-five patients (38 males and 27 females), in the age range of 9–67 years, underwent appendectomy over 10-month period. Their mean age was 27.15 ± 14.27 years. The patients presented between 4 and 60 hours of the onset of symptoms and were operated on urgent basis, within a median of three hours of admission.

Twenty-six of these (13 males and 13 females) in the age range of 9–46 years underwent port exteriorisation appendectomy. Their mean age was 22.88 ± 11.94 years.

Twenty-three patients underwent this surgery under GA and three under SA.

The operative time ranged between 8 and 45 minutes, with a median of 20 minutes.

Three cases (11.55%) turned out to have sub-hepatic appendix necessitating placement of working port in right hypochondrium.

Five cases (19.23%) had no appendicular inflammation. Two females had pelvic inflammatory disease and two had ruptured corpus luteal hematoma. One 12-year-old boy, with an Alvarado's score of 9, had an absolutely normal looking

appendix with some free fluid in the right paracolic gutter. He turned out to have falciparum malaria and had a stormy period during which he developed MODS and finally recovered.

Two cases (7.7%) needed conversion to open appendectomy which was performed by extending the right iliac fossa port site. A friable appendix ruptured during exteriorisation while attempting to obtain optimal exposure of the appendicular base in an overweight individual. Dense adhesions between the appendix, gut, and the posterior abdominal wall, in the other case, made even the subsequent open appendectomy exceedingly difficult.

Two cases (7.7%) necessitated placement of an additional working instrument for dissecting the appendix off adhesions and to facilitate exteriorisation.

Turgid, thick, and inflexible appendix in three cases made coaxing the appendicular tip into the introducer impossible. The appendix had to be pulled directly into the trocar instead. Despite complete exteriorisation, ligation of appendicular base needed placement of hook retractors for adequate exposure of the caeco-appendicular junction.

One patient (3.85%) developed surgical site infection (SSI) due to *Escherichia coli*, necessitating laying open the wound, betadine dressings, and continuation of antibiotics for seven days.

Postoperative recovery in all the patients was smooth. Complete recovery was achieved in all within 36 hours except the one with malaria.

Pain was distributed all over the abdomen on the operative day but got confined to the port sites subsequently. Opioids were unnecessary. Oral NSAIDs could be converted to “as an when required” basis from fixed dosages schedule from 3rd postoperative day.

Cosmesis was excellent in all cases except one patient in whom a drain was placed through the right iliac fossa port which healed by secondary intention.

No patient had reported back with inguinal or port site hernia.

Histopathological examination reported acute appendicitis in 80% of cases, overall (eight out of 39 open appendectomies and five out of 26 lap appendectomies).

DISCUSSION

Age and Gender

Although no age is exempt, appendicitis is, in general, a disease of late teens/young adults with a slight male predominance, as seen in our study.^{1,2,10}

Diagnosis

We used the Alvarado's score for diagnosis as, despite advances in diagnostic imaging, appendicitis remains a clinical diagnosis and a score of >6 is credited with a diagnostic accuracy of $>70\%$.¹⁰

Surgical Options and Case for Laparoscopy

Open appendectomy is the standard time honoured treatment for appendicitis, and it remains the most widely performed procedure, worldwide.^{2,10} Laparoscopic appendectomy has

emerged as a viable treatment option not only because of patients' demands for better cosmesis/lesser pain but also because of surgeons' concerns based on diagnostic ambiguity and anatomical variability.² Our experience reiterates these advantages. In one of five cases the diagnosis turned out to be otherwise despite an unequivocal clinical score and in another 11.55% the appendix turned out to be sub-hepatic. Had these cases been performed by open technique, the diagnosis would have either remained a mystery and/or the incision would have had to be extended way beyond the usual by several centimetres. The penalty for misdiagnosis/delayed diagnosis, especially in a fertile female patient, is huge.²

Anaesthesia

We commenced our laparoscopic appendectomy programme using SA. Although the surgery could be performed within the average time with ease, the patients were distressed by the pain in shoulders, during the surgery, due to the diaphragmatic stretching and hence, use of SA for laparoscopy was abandoned.

Choice of Laparoscopic Technique

Although criticised for technical difficulty and cost,⁴ the 3 ports "in" technique has been widely practised and remains the gold standard, among techniques of laparoscopic appendectomy, due to its significant advantages.³ However, as pointed out earlier, it needs a complete surgical laparoscopy set in addition to sound training. Less than optimum conditions prompted us to look for alternative techniques which combined the best of open and laparoscopy, which was in our opinion the port exteriorisation technique. This technique, performed predominantly using two ports and occasionally three ports, gained popularity initially in paediatric practice⁵⁻⁷ and later in adult surgeries as well.^{1,2} Its virtues and follies are discussed below.

TECHNICAL CONCERNS

Prerequisites

As with any other surgical technique, port exteriorisation using two ports is ideally suited for favourably placed easy to grasp appendices which are in early stages of inflammation, without friability, on mobile caecum, in patients with thin abdominal wall. However, with experience, more difficult appendices can also be tackled. It proves less invasive than both open and three ports technique. Gentle yet firm handling of the appendix is all that is required. However, some situations do call for surgeons' discretion.

Turgid Inflamed Appendix

The problem is twofold. One, on account of friability/lack of flexibility and the other, due to its thickness which prevents it from being easily coaxed into introducer. In such cases, we found it wiser to try and coax the appendix into the wider trocar, rather than the introducer. Enlarging the port site has also been described for the same.²

Adhesions

Adhesions, if not very dense or vascular, can well be divided/cauterised using Maryland, introduced through the working port. Once the appendix is freed, the remainder of the procedure can be carried out as described. However, if adhesions are much too thick or the appendix is coiled around due to recurrent inflammation, an additional working instrument placed directly through the abdominal wall, with or without a port, proves prudent both for dissection and for subsequent exteriorisation.^{1,2} Harmonic scalpel would be ideal for such dissections but use monopolar cautery, though controversial, was found safe and effective enough.^{2,11} We utilised the conventional cautery for laparoscopic work by getting into contact the metallic tip of conventional cautery lead with the metallic knob provided for cautery attachment in laparoscopic instruments (Figure 7).

Limitations

This technique is less optimally suited for very short, fibrosed appendix, especially in an obese individual, as it is difficult to pull it up enough to achieve optimal exposure of the base. This may leave a long stump with subsequent risk of stumpitis. Also, gangrenous appendices with very friable bases are unsuitable as they rupture during extrication.^{1,2} The three ports "in" technique would have a definite advantage over the contemplated technique in such situations.² Should one encounter an appendicular mass it is best left alone for a later date as fine dissection of such a friable mass needs either an outstanding experience in laparoscopic surgery or the tactile feed back provided by fingers, as in open surgery.²

Time

Our operative time ranged between 8 and 45 minutes, depending upon the difficulty, with a median operative time of 20 minutes. This compares well with the timings both of open procedure as well as that of laparoscopic appendectomy performed using port exteriorisation technique by other centres.^{1,2,5,6} It is pertinent to point out that the time consumed is less than that of standard three ports appendectomy.^{3,1}

Figure 7 Unconventional use of conventional cautery for laparoscopic work.

Economy

Besides a length a free silk suture no other disposables are needed in contrast to the classical three ports technique.¹⁰

Conversions and Additional Instruments

Of the 26 cases attempted by two ports technique, only 22 (84.61%) could be completed without conversion either to open procedure (7.7%) or to three ports “out” technique with addition of working instruments (7.7%). This compares well with the literature on this technique where the rates of success have ranged from 73% to 100%.^{1,2,5,6}

It is important to see the two and three port techniques as continuum of laparoscopic techniques and not as rivals. It is always wise to add a port or covert to “in” technique, should one require, selectively, based on the situation. Conversions and addition of working instruments should be considered good judgment, if done in time, and not failure.

Complications

Surgical site infection is a known complication following open appendectomy, which occurs in 5–10% of cases.¹⁰ Although a smaller incision, the site of exteriorisation carries the same risk, but is easier to manage.^{1,2} Our incidence of SSI compares well with that of world literature.^{1,2,5,6} Thorough wound toilet and delayed primary suturing, after few days of dressing, may further reduce the infection rate of surgical sites.

Caecal perforation, bleeding, pelvic abscess, and port site hernias have also been reported following laparoscopic appendectomy, but fortunately none were observed in our patients.^{1,2,5,6}

Postoperative Pain

Pain following laparoscopy is multifactorial with visceral and parietal components.¹² In the initial 24 hours the visceral component predominates while the parietal component takes over later,¹² as was seen in our study. Adoption of fixed dosages schedule of NSAIDs was enough to alleviate the pain.

Postoperative Recovery and Hospital Stay

Commencing orals after eight hours of surgery had no complications.¹³ Recovery, as in other laparoscopic surgeries was uniformly smooth. The hospital stay was not a criterion in this study as it is governed by service exigencies, administrative constraints, geographical distance, and socio-cultural beliefs rather than mere fitness for discharge.

None of the serving soldiers needed to be placed in low medical category. This bears testimony to the excellent recovery from surgery.

Cosmesis

Cosmesis is an important criterion especially for females undergoing treatment. Testimony to the cosmetic satisfaction as well as the recovery is one of our satisfied patients, a 26-years-old female who underwent this surgery seven days before her marriage.

In conclusion, port exteriorisation appendectomy proves simple, safe, economical, and efficacious, when conditions favour its performance. However, difficult appendices warrant conversion either to three ports technique or to open procedure.

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CONFLICTS OF INTEREST

None.

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