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Inguinal Approach for Pediatric Appendectomy: A Case Series

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Appendicitis is the most frequent indication for emergent surgery in children. Appendectomies are increasingly done laparoscopically, minimizing tissue trauma and enabling earlier recovery, but the added costs remain prohibitive in resource constrained settings. An open approach, but from a less conspicuous inguinal incision, provides similar advantages without additional resource requirements. The operative technique is described and the profile of patients, including their clinical course and operative findings, are summarized. The differences in short-term outcomes for non-perforated and perforated cases are compared. The trans-inguinal approach was utilized in 26 patients. It provided adequate surgical access even for ruptured cases and had suitable wound outcomes. Ruptured cases had significantly longer operative time, but were not associated with differences in the patients' length of stay.

Keywords: appendectomy, appendicitis, minilaparotomy

Appendicitis remains as the foremost indication for abdominal surgery in children. The annual reports of the Philippines' pediatric surgical training programs indicate that appendectomy is the most frequently performed emergency operative procedure.[1] Appendicitis can have atypical manifestations especially in younger children - contributing to misdiagnosis, delayed management, and potentially adverse outcomes.[2-6]

Evidence-based guidelines for appendicitis have been developed, and diagnostic and therapeutic modalities have evolved.[7-11] The Philippine College of Surgeons (PCS) had published clinical practice guidelines for appendicitis, including sections for pediatric patients.[12] The latter took into consideration the concurrent health service limitations in the country, such that CT scans and even laparoscopy were advised to be used selectively. While updated guidelines are yet to be provided, the logistical, technical, and financial constraints averred to still apply to present circumstances. In other settings, variations in the management of appendicitis have been attributed to several factors - such as physician preferences, availability of related technologies, health service financing arrangements and even the existing social milieu.[13-18]

An alternative pediatric appendectomy approach is presented. The technique is described and the profile of patients for whom this was utilized is summarized. The short-term outcomes (duration of surgery, length of stay, and septic complications) are also compared for non-perforated and perforated cases.

Methods

After prior Ethics Board and institutional approvals, a retrospective review of a pediatric hospital's appendicitis cases was undertaken. Eligible patients were identified from electronic operative records and additional data obtained from the respective charts. All appendectomy cases which were admitted from April 2015 to September 2016 were included. In accordance with the facility's age restrictions, all patients were less than 19 years of age. Excluded were two patients who also had appendicitis but for whom laparotomies were done through a right upper quadrant incision, as other causes of evident peritonitis were considered pre-operatively.

The preoperative preparations, including antibiotic regimens, were in accordance with the PCS guidelines.

Operations were undertaken within 12 hours after surgical referral. Except for two older patients for whom spinal anesthesia was used, the rest of the patients received inhalational anesthesia. The author was the surgeon for all cases.

Operative Technique

After anesthesia induction and antisepsis, lidocaine-epinephrine solution was infiltrated subcutaneously in the right inguinal and lower quadrant areas. The skin was incised along the inguinal crease, starting 1.0cm to 1.5cm medial to the prominence of the right anterior superior iliac spine (ASIS), and extended medially for a total length of 2.5cm to 3.0cm (Figure 1). The subcutaneous area was undermined superiorly, until the area corresponding to McBurney's point was reached. With the superficial tissues retracted cephalad, the external oblique aponeurosis was incised transversely by 3.0 cm, starting just lateral to the rectus sheath. Thereafter, the underlying muscles were split, and the transversalis fascia and peritoneum were lifted and incised. The cecum was identified and antegrade appendectomy performed, with the stump doubly ligated with silk 4-0 or 3-0 sutures. The peritoneal cavity and subcutaneous areas were washed with saline as necessary. The fascial layers and skin were closed with polyglactin sutures, and no drains were used. Occlusive dressings were maintained for five days, unless earlier removal was necessitated to allow drainage of infected wounds.

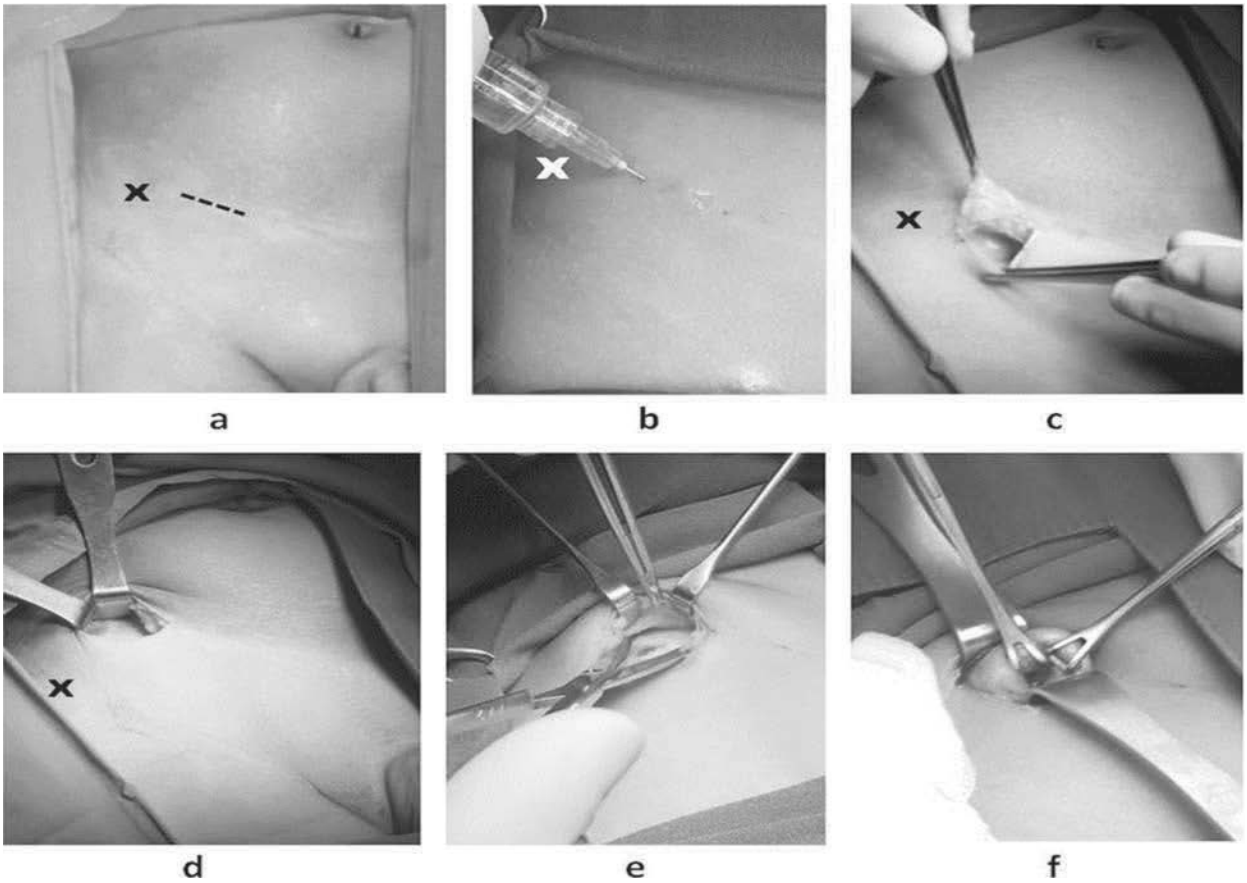

Figure 1. Trans-inguinal appendectomy steps (with ASIS marked with "x" for reference): incision site at right inguinal area (a); local anesthesia with epinephrine infiltration at incision site (b); inguinal wound (c); cephalad retraction (d) with sharp dissection (e) until skin incision is displaced until McBurney's point; appendix isolated (f)

For non-perforated cases, feedings were resumed and antibiotics were discontinued within 24 hours after surgery. For perforated cases, feedings were allowed only after normal bowel function was evident and antibiotics were administered intravenously until the patient became afebrile. Oral antibiotics were then provided for a total coverage of ten days. Analgesics were routinely given. Discharges were allowed when the patients were feeding well, afebrile, and without any acute complications requiring further in-patient care. Follow-ups with the surgeon were done one to two weeks after discharge, and continued for a month for patients with wound or other complications.

Table 1. Summary of selected patient and perioperative characteristics.

Variable	Intra-operative Finding (Mean Value)		P-value
	Perforated	Not Perforated	
Age in years	7.61	8.00	0.8379
Days symptomatic	3.64	1.56	0.0552
Operative time in minutes	72.67	44.38	0.0035
Days confined after operation	6.11	3.75	0.1226

t-test, unpaired, two-tailed

Results

There were 17 males and 9 females among the 26 patients. The youngest patient was one year old, and the oldest was 18 years of age, with a mean age of 7.73 years. On the average, abdominal pain had been present among patients for three days before their hospital admission. Upon referral to the surgeon, 16 patients were assessed to already have ruptured appendicitis. Two of these patients had signs of intestinal obstruction.

At the time of surgery, 18 patients (69%) were found to have perforated appendicitis. Among these, 12 had generalized peritonitis. The characteristics of the perforated and non-perforated cases are shown in Table 1. There were statistically significant differences in the duration of surgery (measured from the time of incision to the completion of wound closure) between the two groups.

One patient had inordinate bleeding during dissection of extensive adhesions and required blood transfusion. Another developed postoperative intestinal obstruction, but responded to conservative measures. Three patients, all with perforated appendicitis, had wound infections noted before discharge. There were no postoperative intra-abdominal infections, nor were there any mortalities.

Discussion

This series involved patients who were admitted in a local pediatric hospital which was established in 2014. It is the first such facility in the country administered by a city government. While it has a 200-bed capacity, only half of this was operational as a dedicated pediatric care facility as of writing. It is well-equipped by local standards, but laparoscopic instruments were still not available. The hospital caters particularly to the poor residents of the city. Local patronage of the new hospital had yet to peak, as there are two long-standing public hospitals in the vicinity. Surgical admissions, which were accommodated by 2015, were mostly emergency cases, of which patients with appendicitis comprised the majority.

The appendicitis perforation rate in this series is only slightly lower than what was cited in the previously cited local series[2], but is higher than figures reported in the foreign literature.[15,17] The delay in hospital consult, a mean of nearly four days among affected patients, would account for the high frequency of ruptured cases. Such a lag could be attributable to several factors - from inappropriate health-seeking behaviour by families, possibly due to financial concerns, to unresponsive primary health services. Similar issues have been mentioned in other reports.[14,15,16,18] Such circumstances also adversely bear upon their compliance with follow-up care. These conditions predispose to delayed interventions as well as favour emergent surgeries.

The presence of a perforated appendicitis, whether with localized or more extensive peritonitis, did not limit the utility of the procedure. Access remained adequate

for appendectomy, drainage of localized abscess, clearing of adhesions and peritoneal lavage. The latter was effectively performed by inserting a Fr. 14 Levin tube though the laparotomy site and directing this into different areas of the abdominal cavity for subsequent saline flushing and drainage. Surgeries for perforated cases did significantly require longer time, but this also applies for other techniques given the same findings.[7] There were three cases with wound infections, which was not unexpected given the severity of the peritonitis.[19] The absence of postoperative intra-abdominal infection imply that the surgical, and peri-operative, interventions were effective in this respect.

While patients with ruptured appendicitis tended to stay longer, the difference with the postoperative stay of non-ruptured cases was not significant. Such indicate that even non-ruptured cases were not discharged as early as could have been expected.[7] There are extraneous factors that bear upon the timing of discharge. While facility services are subsidized and social health insurance is availed of by many patients, the remaining expenses can still be prohibitive. The tedious processes for settling financial obligations unnecessarily delay patient discharge.

The approach reported in this study is technically akin to the traditional open appendectomy, inasmuch as the peritoneum is accessed at McBurney's point, but the skin incision is made in the inguinal area. While further dissection and retraction of the subcutaneous areas is needed, the additional time and effort for this is minimal. The author had much earlier selectively used Pfanensteil incisions for ruptured appendicitis cases, as had also been reported by others.[20] It subsequently became evident that smaller incisions served just as well. Had there been an instance that the initial opening proved inadequate, the abdominal wall incision could have been extended medially. The approach does not minimize trauma to the anterior abdominal tissues, as with laparoscopy. Nevertheless, adequate intra-peritoneal access is achieved through an inconspicuous inguinal wound. The latter marginal cosmetic advantage is obtained without the added expense associated with laparoscopy.

The study has several limitations, particularly its small number of patients as well as short follow-up period. The determination of the ease of performance and efficacy for other surgeons and settings, if not the actual comparative benefits of the approach, can be addressed in future controlled trials.

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