IMAGE-GUIDED DRAINAGE OF POST-APPENDECTOMY INTRA-ABDOMINAL ABSCESSES IN CHILDREN: A 6-YEAR REVIEW

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ABSTRACT

Aims: Post-appendectomy intra-abdominal abscess is an important and potentially serious complication of appendicitis. We report a 6-year review of our experience of image-guided drainage of post-appendectomy intra-abdominal abscess in children.

Methods: Twelve patients had image-guided drainage of thirteen large post-appendectomy intra-abdominal abscesses. Drains were inserted by a consultant paediatric interventional radiologist under ultrasound guidance. Nine patients had percutaneous drainage, and in 3 patients the transrectal route was used.

Results: The mean of the largest dimension of each abscess was 8.6(2.3) cm. The most common site was the pelvis. The median drainage period was 4.5 days. 75% of patients were discharged within 6 days following drain insertion.

Conclusions: Image-guided drainage is an effective treatment for post-appendectomy intra-abdominal abscesses in children. Rapid resolution of symptoms and a short hospital stay was achieved in patients with large abscesses using this minimally invasive approach.

Key words: Post-appendectomy abscess, image-guided drainage, ultrasound-guided drainage

Introduction

Acute appendicitis is the most common surgical emergency in children, affecting 4 per 1000 school age children per year (1). Post-appendectomy intra-abdominal abscess is a potentially serious complication of appendicitis. The overall incidence from a recent meta-analysis of laparoscopic and open appendectomies in paediatric patients was 3.6% (2). Traditional treatment approaches have involved open surgical drainage, or a trial of conservative management with antibiotics followed by surgical drainage if this proves unsuccessful. Herein, we present our experience of successful image-guided drainage of large post-appendectomy intraperitoneal abscesses in children.

Materials and methods

From January 2000 to December 2005, a total of 137 paediatric patients had image-guided drainage or aspiration of various intra-abdominal fluid collections at our tertiary centre. Of these, 12 patients had drainage of 13 large post-appendectomy intra-abdominal abscesses. Drains were inserted under general anaesthetic by a consultant paediatric interventional radiologist, under ultrasound guidance. An 8.5Fr Cook Simploc pigtail drain (William Cook Europe, Bjaeverskov, Denmark) was inserted using an 18G trocar in all cases. Nine patients had percutaneous drainage, and 3 patients had transrectal drainage. Patients received intravenous antibiotics alongside drainage. An ultrasound image of a pelvic abscess at drain insertion is shown in Figure 1.

One patient had two abscesses drained simultaneously. The abscess cavity was decompressed by suction of pus and a drainage bag was attached. Drains were flushed and aspirated 6-hourly, and removed on the ward when patients were asymptomatic and drainage was minimal. A fluoroscopy image of a pigtail drain in situ is shown in Figure 2.

Results

Results are expressed as mean (+/- 1 standard deviation). The average age at presentation with appendicitis was 9(2.4) years; male:female ratio 5:7. Five patients were admitted to our centre directly for appendectomy and 7
had been operated on at their local hospital and transferred. The median duration of symptoms prior to appendectomy was 6 days (range 1-7). Eleven patients had open appendectomies. One patient had a laparoscopic approach, which was converted to open.

In each case the appendix was either gangrenous or perforated. Intra-peritoneal swab results were available for 9/12 patients (Table 1). Seventy-seven percent of patients had two or more organisms at culture. Patients at our centre received intravenous benzylpenicillin, metronidazole and amikacin from admission. Patients from other hospitals who had been receiving intravenous cefotaxime and metronidazole were changed to the above antibiotics on transfer. Our antimicrobial regime was appropriate to the organisms cultured.

It took a median of 7 days from surgery to diagnosis of intra-peritoneal abscess (range 3 – 12). The diagnosis was made in 10 patients with ultrasound; two patients had further computed tomography imaging. The sites from which pus was drained are shown in Table 2. The mean largest dimension of each abscess was 8.6(2.3) cm. The mean overall abscess dimension was 6.5(2.5) cm. At the time, the mean WCC (available in 11/12 patients) was 16.2 (5.8) x 10^9/L and C-reactive protein was (available in 6/12 patients) was 308 (95). The drain fluid culture results are shown in Table 3.

The median drainage period was 4.5 days (range 2-11), and 75% of patients were discharged within 6 days following drain insertion. The median hospital stay from procedure was 6 days (range 2-17). One patient had a prolonged hospital stay (17 days) due to other co-morbidity. The median time to discharge following drain removal was 1 day (range 0-6). Intravenous antibiotics were discontinued in all patients upon drain removal. Seven patients had an abdominal ultrasound prior to drain removal to demonstrate resolution of the abscess. There was one recurrence.

Table 1 – Intra-peritoneal culture results from appendectomy (results available for 9/12 patients)

<table>
<thead>
<tr>
<th>Organism(s)</th>
<th>n = 9 patients</th>
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<tbody>
<tr>
<td>E. coli/colliforms</td>
<td>77%</td>
</tr>
<tr>
<td>Mixed anaerobes</td>
<td>44%</td>
</tr>
<tr>
<td>Enterococcus species</td>
<td>44%</td>
</tr>
<tr>
<td>Streptococcus milleri</td>
<td>22%</td>
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</table>

The patient was re-admitted 48 hours after discharge and required a further drain insertion for 5 days. One drain became kinked shortly after insertion but was successfully manipulated to restore drainage.

Discussion

Intra-abdominal abscess is an important cause of morbidity following appendectomy. The risk increases with the degree of appendiceal pathology (3). Reid et al. (1999) (4) reviewed 417 appendectomies and found that gangrenous or perforated appendicitis was associated with a 7.5% risk of post-appendectomy intra-abdominal abscess. There has been continuing debate as to whether laparoscopic appendectomy increases the risk of intra-abdominal abscess. However, a recent comparative meta-analysis of laparoscopic and open appendectomies in children (2) found no significant increase in the rate of intra-abdominal abscess formation with the laparoscopic approach; (3.8% (88 out of 2303) for laparoscopic appendectomy versus 3.4% (70/2082) for open appendectomy; odds ratio 1.11, confidence interval 0.73-1.71). In a review of 331 appendectomies, Kouwenhoven et al (2005) (5) also detected no difference in incidence, but found the conversion rate was much higher for perforated than for simple appendicitis (23.3% versus 7.8% respectively; p=0.007).

In our series, all appendectomies were open, including one conversion from laparoscopic. The majority (83%) of patients had polymicrobial cultures, which included coliforms, Enterococcus species, mixed anaerobes and Streptococcus milleri. Despite antibiotic treatment, large collections had developed, with a mean dimension of 6.5(2.5) cm (largest 8.6(2.3) cm). The most common site was the pelvis (50%).

The frequency of successful treatment with image-guided drainage of intra-peritoneal abscesses in children is 85-91% (6,7). Gervais et al (2004) (6) wrote that most intra-abdominal abscesses in children could be drained by a suitably experienced interventional radiologist, thus avoiding surgery. They reported a low incidence of complications (minor 5%, major 1%). Jamieson et al (1997) (7) reported a complication rate of 2% from 64 procedures in 46 paediatric patients; 32 of which were for post-appendicectomy abscesses. 28% of patients in their series had >1 drainage catheter inserted at the time of initial intervention and 15% returned for placement of additional drainage catheters where new collections had developed or re-accumulated. The dimensions of the collections being

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**Figure 1. Ultrasound image of a pelvic abscess at drain insertion (abscess shown with cursors)**
treated were not specified in this paper.

Reports have been published on the conservative treatment of post-appendectomy intra-abdominal abscesses in children (8,9,10). Gorenstein et al (1994) (8) managed 10 patients with antibiotics and serial sonography. However, two patients had enlarging collections despite antibiotic therapy and required percutaneous drainage. Eleven children were treated successfully by Helourey et al (1995) (9) with intravenous antibiotics for seven days, followed by oral therapy for three weeks to one month. In their series, most abscesses were less than 5 cm in diameter. Okoye et al (1999) (10) managed 21/23 children with post-appendectomy intra-abdominal abscesses with antibiotics. In their series, the largest dimension was 5.9 (2.0) cm. The mean duration of antibiotic therapy was 7.5 (2.5) days. The median hospital stay was 8.3 days (range 2-30). Of the two patients who did not respond to conservative treatment, one patient underwent laparotomy and drainage and the other was managed successfully with ultrasound-guided transrectal drainage. In our series, the largest dimension was 8.6 (2.3) cm, and the median hospital stay was 6 days. Kumar et al (2006) (11) recently reviewed factors affecting the need for percutaneous drainage in adults. Patients who improved on antibiotics alone had an average abscess diameter of 4 cm, whereas patients who required percutaneous drainage had an average diameter of 6.5 cm (p < 0.0001).

Conclusions

Children with complications following appendectomy should be managed in centres with specialist paediatric surgical and radiology services. Image-guided drainage for post-appendectomy abscess is a safe and effective treatment option, which, in our experience, is well tolerated by children. We achieved rapid resolution of symptoms and a short hospital stay in patients with a mean abscess dimension of 6.5 (2.5) cm (largest 8.6 (2.3) cm) with this minimally invasive approach. We would recommend image-guided drainage for children with large post-appendectomy intra-abdominal abscesses, particularly if the abscess has developed whilst receiving antibiotics. In these patients, conservative measures are less likely to be successful and may be associated with prolonged hospital stay and treatment duration.

<table>
<thead>
<tr>
<th>Organism(s)</th>
<th>n = 12 patients</th>
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<tbody>
<tr>
<td>E. coli/clostrids</td>
<td>33%</td>
</tr>
<tr>
<td>Mixed anaerobes</td>
<td>17%</td>
</tr>
<tr>
<td>Staph epidermidis</td>
<td>17%</td>
</tr>
<tr>
<td>Enterococcus species</td>
<td>8%</td>
</tr>
<tr>
<td>Streptococcus milleri</td>
<td>8%</td>
</tr>
<tr>
<td>No growth</td>
<td>33%</td>
</tr>
</tbody>
</table>

Table 3 - Cultures from drain fluid (results for 12/12 patients)

REFERENCES