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Incisional hernia in pediatric surgery – experience at a single UK tertiary centre

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ABSTRACT

Aims: Incisional hernia (IH) is a recognized complication of open and laparoscopic visceral surgery, with reported rates of 10–50% in adult surgical literature. There is a paucity of data relating to incisional hernias in children. The aim of our study was to analyze the incidence and treatment of IH in children.
Methods: Retrospective review of all patients admitted for incisional hernia repair at a tertiary pediatric surgical centre in the UK more than a 7-year period was performed. Data collected included age at initial surgery, time to IH repair, and type of IH repair and postoperative complications.
Results: Twenty one patients (14 male) underwent IH repair during the study period. The incidence of IH among children who had primary abdominal surgery in our institution less than the age of 6 months was 2.3%. Median age at repair was 7.9 months (range: 18 days–5 years). Median time from primary surgery to diagnosis of IH was 2 months (range 0 day–3 years), with 81% (17/21) diagnosed within 1 year of the preceding abdominal procedure. The most common pathology necessitating the primary operative procedure was necrotising enterocolitis (n = 9) in babies of gestational age less than 30 weeks.
The highest rates of IH were noted in infants following closure of stoma (7.5%) and pyloromyotomy (2.52%). Primary closure was undertaken in all cases. Two children had recurrence of IH, one of which underwent surgical repair.
Conclusions: Incidence of IH in children is low but significant. IH was most commonly diagnosed following closure of stoma for NEC in this study.

Incisional hernia (IH) is one of the most frequent postoperative complications following laparotomy. The incidence of incisional hernia following abdominal surgery in adults is reported between 10% and 50% [1,2]. Incisional herniae may present with pain or discomfort over the hernia, visible or palpable swelling, skin problems or symptoms of bowel obstruction or strangulation [3]. There is a paucity of data relating to IH in children in the worldwide literature. The aim of our study was to analyze the incidence and management of incisional herniae in children following abdominal surgery.

1. Materials and methods

Following approval from the hospital for a service review, patients undergoing repair of incisional hernia and recurrent incisional hernia were identified using OPCS codes. Hospital case records of all patients admitted under the pediatric surgeons for IH repair between January 2008 and October 2014 at Addenbrooke's Cambridge University Hospitals NHS Trust were reviewed. One child was excluded from the group as the hernia was actually a recurrence of inguinal hernia following previous inguinal herniotomy in another institution. Case notes and operative records were reviewed to obtain the following data: demographics, primary diagnosis, primary surgery, method of abdominal wall closure and suture material used, postoperative complications, follow up period, age at diagnosis of incisional hernia repair, type of incisional hernia repair and recurrence if any. Information regarding follow up was acquired from the outpatient clinic letters. Information regarding the denominator data (total number of abdominal procedures in the same age group) was obtained from the operating theater database. Data were collected and analyzed using Microsoft Excel software (v2007).

2. Results

There were 21 children (14 male and 7 female) who underwent repair of IH during the study period. Median age at primary surgery was 67 days (range: 2 days–7 years). The primary surgical procedure was performed at our hospital in 17/21 patients.

The most common primary pathology necessitating the initial surgery was necrotising enterocolitis (9), followed by pyloric stenosis (6), congenital diaphragmatic hernia (2), duodenal atresia (1), Hirschsprung's disease (1), malrotation (1) and appendicitis (1). The common initial abdominal operations in these infants were stoma formation (10), open supraumbilical pyloromyotomy (4), laparoscopic pyloromyotomy (2), diaphragmatic hernia repair (2), Ladd's procedure

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(1), duodenoduodenostomy (1) and appendicectomy (1). None of the procedures used a vertical midline incision. Absorbable sutures were used to close the abdominal wall in all patients who underwent the initial procedure at our hospital.

IH was observed at a rate of for 2.1% (15/850) for infants who underwent abdominal procedures less than the age of 6 months. The most common surgical procedure preceding IH repair was stoma closure followed by pyloromyotomy with incidence of 7.5% (8/107) and 2.3% (6/255), respectively. The details of the group of neonates with NEC and IHPS are summarized in Table 1.

Median time from primary surgery to diagnosis of IH was 2 months (range 0 day–3 years), with 81% (17/21) diagnosed within 1 year of the preceding abdominal procedure. All cases of IH presented with swelling ± pain at the scar as reported by the child or parent. None of the children underwent radiological investigations to confirm the diagnosis of IH.

Median age at repair was 7.9 months (range: 18 days–5 years). All patients underwent excision of the scar and primary closure of the wound using interrupted simple or mattress sutures. Absorbable suture materials were used in a majority of patients (18/21). The suture materials used included ethibond (3), PDS (8) and vicryl (10).

We have observed 2 recurrences in the children who underwent IH repair (Table 2). The first patient had the initial IH repair at 26 months and needed a second repair in 3 months, and is free of recurrence 4 years after the second repair. The second child had an IH repair at 25 months and a recurrent IH diagnosed after 1 year. He is asymptomatic and under observation only and has not had a second repair.

3. Discussion

Incisional hernia is a commonly reported complication following abdominal procedures with incidence rates up to 54% [2]. The reported incidence is dependent on various factors including the patient population, presence of malignancy, length of follow up and the definition of incisional hernia.

Apart from studies on transplant patients, the only published series on IH in pediatric population are those following laparoscopic procedures [4,5]. Although IH is much less common following laparoscopic surgery compared to laparotomy, it is reported at 2–5% in the adult surgical literature [6]. Cost et al., reported IH in 3.2% of port sites following pediatric urology surgery [4]. They did not find any significant difference in rates of IH in the groups which had a formal fascial closure for port sites and those without formal fascial closure. Waldhaussen et al., reported IH in a 5 mm port site in a 22-month old child. They proposed that the small size of the infant bowel has a similar proportional size relationship to a 5-mm trocar as does adult bowel to a 10-mm trocar; and therefore that 5-mm trocar sites should be closed at the fascial level in infants to prevent this complication [7]. Paya et al., recommended fascial closure of all trocar sites even if less than 5 mm to prevent port site herniation especially of omentum in young children [5]. In our series, 2 children had an IH following laparoscopic pyloromyotomy. They were 3 mm port sites in the epigastrium which did not have formal fascial closure. Both of the above studies reported a higher incidence of IH in younger children. It is interesting that IH and wound dehiscence are also recognized complications following supraumbilical pyloromyotomy having been reported in1–2% cases [8,9].

In our study neonatal laparotomies were the most common primary surgery. Among the 14 neonatal procedures in our study that resulted in an IH, 9 were performed for necrotising enterocolitis in premature infants who were also being covered by intravenous antibiotics. Although there appears to be a trend for increasing incidence in NEC, the causes are likely to be multifactorial including gestational age, nutritional status, presence of sepsis and the pathology of NEC itself. Previous studies have also reported IH following a primary emergency laparotomy in the neonatal period [10].

Literature review reveals an inconsistency in the definition of IH across different studies ranging from symptomatic to clinically palpable to radiologically identified hernia. In the present study, we have reported all patients who presented with an obvious swelling as noted by the parents, and confirmed by clinical examination by a pediatric surgeon. Ah Kee et al., reported from a prospective study that 30% of patients who had an IH were unaware of the presence of the hernia [11]. It is well known that imaging using ultrasound or CT scans increases the rate of detection of incisional hernias [12–14]. None of the children in our study had a radiological diagnosis of IH. The limitation of our retrospective study is that we have managed to capture the data for only those children with IH who have had surgical repair and therefore do not have the data regarding children who may have had symptoms of IH if they did not have surgery.

Several risk factors have been proposed for development of IH in adults including increasing age, surgical site infection, high body mass index and preoperative chemotherapy [1]. Van Ramshorst et al., reported a case control study evaluating the risk factors for abdominal wound dehiscence in children undergoing laparotomies, and concluded that age less than one year, wound infection, median incisional and emergency surgery are significant risk factors [15]. Our study supports that

Table 1
Details of IH following surgery for NEC and IHPS.

Primary diagnosis	Gestational age at birth (weeks)	Co-morbidities/complications	Suture material for abdominal muscle closure	Description of abdominal wall closure in operation notes
NEC	37	Trisomy 21, bilateral SVC	vicryl	2 layer
NEC	23	Hyaline membrane disease, retinopathy of prematurity, hypothyroidism,dysmorphic	vicryl	Not recorded
NEC	23	Donor twin, hyaline membrane disease, CoA, PDA	PDS	1 layer
NEC	29	RDS, short gut, multiple stomas	vicryl	1 layer
NEC	23	Twin 2, CLD, PDA	PDS	Mass closure
NEC	26	None recorded	vicryl	Not recorded
NEC	28	Twin 2, IUGR	vicryl	2 layer
NEC	38	Intraabdominal abscess	vicryl	1 layer
NEC	27	PFO/PDA, hyperbilirubinaemia	vicryl	Mass closure
IHPS	35	none	none	Skin glue (laparoscopy)
IHPS	33	Twin 1	none	Skin glue (laparoscopy)
IHPS	39	none	vicryl	1 layer
IHPS	40	none	vicryl	1 layer
IHPS	40	none	vicryl	1 layer
IHPS	40	none	vicryl	2 layer

CLD - chronic lung disease, CoA - coarcation of aorta, IHPS - infantile hypertrophic pyloric stenosis, IUGR - intrauterine growth retardation, NEC - necrotising enterocolitis, PDA - patent ductus arteriosus, PFO - patent foramen ovale, RDS - respiratory distress syndrome, SVC - superior venacava.
Suture materials used - PDS (polydioxanone suture, Ethicon, Livingston, UK) and vicryl (coated polyglactin 910 suture, Ethicon, Livingston, UK).
Mass closure - suture bite includes all layers of the abdominal wall except the skin.