



## PRACTICE

## CLINICAL UPDATE

# Management of paediatric hernia

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A hernia is the protrusion of an organ, such as the bowel, through the wall of the cavity in which it normally resides.<sup>1</sup> Paediatric hernias are common developmental abnormalities which have different management from their adult equivalents. Conducting research in the management of paediatric hernias is challenging because of ethical considerations and variations in treatment practice. This article provides the generalist with essential information, enabling them to educate parents, alleviate anxiety, and where appropriate enable management of hernias in primary care. We discuss three types of common paediatric hernias.

## Umbilical hernia

### How common is it?

Umbilical hernia affects an estimated 10-30% of all white children at birth, reducing to 2-10% at one year.<sup>2,3</sup> Rates in the African population have been estimated at 23-85%.<sup>4,6</sup> The exact aetiology predisposing African populations at increased risk is unknown.<sup>4,7</sup> Risk factors can be seen in table 1↓.

### What is the anatomy?

The umbilical ring exists to allow passage of vessels through the abdominal wall muscles between mother and fetus. After birth and disintegration of the cord, the ring remains, with spontaneous closure typically by the child's fifth year through growth of the abdominal muscles and fusion of peritoneal and fascial layers. A failure or delay in this process leads to the formation of an umbilical hernia. The aetiology is unknown, but most occur through the umbilical vein component of the ring.<sup>7</sup>

### How does it present?

Umbilical hernias present as a reducible, painless bulge at the umbilicus. They usually become more prominent when the patient strains or cries. Parents might present with anxiety about the appearance of a lump when their child is upset or unwell. Distress and crying cause an umbilical hernia to protrude more

because of increased intra-abdominal pressure. If the hernia is still reducible this does not indicate a complication.

### What to look out for

A literature review that includes studies of varying size and quality from several countries in 1998 reported a complication rate of 1:1500.<sup>10</sup> A large, well designed observational study in Nigeria over 15 years identified two children out of 2542 that required hernia repair for strangulation.<sup>4</sup> In Western Australia a retrospective cohort study of a mixed race population reported the risk of incarceration requiring repair as 1:3000 to 1:11000, with no incarceration in the Afro-Caribbean subset of this cohort.<sup>11</sup> There is weak evidence from retrospective cohort studies for an increased risk of incarceration in the African population; this has not been shown in cohort studies from the UK or US.<sup>11-14</sup>

Incarceration occurs when abdominal viscera or omentum become stuck within the hernia. Strangulation occurs when viscera become stuck in the hernia with compromise to their blood supply, causing ischaemia. Children with incarcerated hernias present with painful irreducible lumps that can change colour and when strangulated are associated with vomiting or constipation.

### What you should do

Take a thorough history and perform a systematic examination to ensure the umbilical hernia is the primary problem. Sometimes the appearance of an umbilical hernia is secondary to an unrelated condition, causing the child to be in distress and cry.

Patients with symptoms of incarceration or strangulation need urgent assessment and referral as an emergency to the paediatric or general surgical team.

Reassure parents of children with asymptomatic umbilical hernias that complications are rare, and that most hernias close spontaneously by the child's fourth year. Refer children over

**What you need to know**

- Umbilical hernias rarely incarcerate, and most close spontaneously by the child's fifth birthday. Reassure parents of children with asymptomatic umbilical hernias that complications are rare, and that most hernias close spontaneously by the child's fourth year
- Repair can be offered for epigastric hernias on a routine non-urgent basis, as this type of hernia will not resolve itself
- Inguinal hernias have a substantial risk of complication. Refer for specialist assessment and surgical intervention
- A unilateral tender, swollen, erythematous scrotum can be either a torsed testis or an incarcerated hernia: both require urgent surgical referral

the age of 4 to a paediatric surgeon, as spontaneous closure is less likely as the child grows older.

**What happens in secondary care?**

The patient is seen and assessed by a paediatric surgeon; usually a general surgeon with subspecialty interest in paediatric surgery. A discussion takes place over further conservative management versus surgery. Operative intervention might be offered on a routine day case basis if the child is older than 4, but practice varies locally.

Day case primary repair under general anaesthetic, with a suture obliterating the umbilical ring through an infra-umbilical incision, is the most common method of hernia repair. Some surgeons perform laparoscopic repair of umbilical hernias, although the benefits remain unclear, and the authors know of no high level evidence for or against this approach. For open repair, one large long term observational study indicates a low morbidity and low recurrence rate.<sup>15</sup> The type of repair offered depends on local circumstances and availability.

**Postoperative complications**

Specific complications are uncommon after open umbilical hernia repair (other than those for any surgical incision). It is possible to injure small bowel or omentum within the hernia. Warn patients about poor cosmesis, scarring, and recurrence. A large observational cohort study reported a 2% recurrence rate over 13 years.<sup>15</sup>

**Patient/parent information**

British Association of Paediatric Surgeons free umbilical hernia leaflet: <http://www.baps.org.uk/content/uploads/2013/03/Umbilical-Hernia-Repair-child.pdf>

**Epigastric hernia****How common is it?**

There is limited evidence on the prevalence of epigastric hernias in children, with most being based on observations in adult epigastric hernias. The true prevalence of epigastric hernia is therefore unknown. In a small observational study from the US, epigastric hernias accounted for 4% of all paediatric abdominal wall hernia referrals.<sup>16</sup>

**What is the anatomy?**

Epigastric hernias occur in the midline, anywhere from the xiphoid process to the umbilicus, and most contain preperitoneal fat. The underlying pathology is controversial; theories include failure of complete fusion of abdominal wall muscle fibres at the linea alba or defects at the sites of blood vessel penetration.<sup>17 18</sup> It has also been proposed that diaphragmatic attachment places more tension on the epigastric region leading to a weakness in this area.<sup>16</sup>

**How does it present?**

Children present with a mass in the epigastrium, which commonly enlarges and is associated with abdominal wall pain or tenderness. Nearly 10% of epigastric hernias have multiple defects, which present as multiple lumps in the midline. Additionally, many younger patients find that their hernias rub against clothes, leading to pain and irritation of the skin.<sup>16</sup>

**What to look out for**

Nearly two thirds of epigastric hernia are asymptomatic and reducible.<sup>16 19</sup> However, unlike umbilical hernias, epigastric hernias do not resolve themselves. There are no reports to date of bowel being strangulated in an epigastric hernia in children. We have not seen convincing evidence of strangulation at our institution or within the literature.

Do not confuse epigastric hernias with divarification of the recti, which is a weakness in the linea alba running down the midline from xiphisternum to umbilicus; this is not a hernia and divarification will resolve as abdominal wall musculature develops. Divarification is elicited as a uniform bulge in the midline when the supine patient raises their head off the bed.

**What you should do**

Refer all patients who present with epigastric hernias on a routine basis to secondary care for further assessment. Examine the area carefully to assess for multiple defects.

**What happens in secondary care?**

There is limited evidence to guide the management of epigastric hernias in secondary care, despite widespread referral to paediatric surgery clinics. Most recommendations are extrapolated from adult epigastric hernias.<sup>16</sup>

Generally, repair is recommended on a routine elective day case basis under general anaesthetic for all children. Some centres will discuss taking a "wait and see" approach with parents of patients with asymptomatic epigastric hernia.<sup>16</sup> Epigastric hernia repair is a relatively minor procedure, which is well tolerated by children. A small transverse incision is made over the hernia, which is then separated from the abdominal wall, the sac is reduced, and the defect closed with a suture. Children generally have thin abdominal walls, so they sometimes feel a suture present afterwards; most surgeons use sutures that dissolve over time.

**Patient information**

No patient information leaflets are yet available from British Association of Paediatric Surgeons.

**Inguinal hernia****How common is it?**

Inguinal hernias occur in 0.8% to 5% of full term infants with risk factors listed in table 1↓.<sup>7-20</sup>

## What is the anatomy?

The processus vaginalis lengthens through the inguinal canal from the third to the seventh month in utero, and allows the testes to descend into the scrotum. The processus vaginalis gradually obliterates at weeks 36-40 with just the distal portion persisting as the tunica vaginalis. Failure of closure of the processus vaginalis is a common mechanism in the pathogenesis of inguinal hernia and hydroceles in children. This enables intra-abdominal contents to herniate through the deep inguinal ring, inguinal canal, and superficial inguinal ring into the scrotum or via the canal of Nuck into the labium (fig 1).<sup>21</sup>

The left processus vaginalis obliterates before the right; this is thought to explain why right sided inguinal hernias outnumber left sided and bilateral hernias in a ratio of 7:2:1.<sup>20</sup>

## How does it present?

A hernia usually presents as a bulge in the groin, although in boys it can present as a swelling within the scrotum, which is often only visible upon straining or crying. A hydrocele can also present as a swelling in the scrotum.

## What to look out for

There is a 5-20% chance of developing a contralateral hernia in paediatric patients, so examine both sides.<sup>22</sup> Parents should be made aware that following repair on one side, development of a hernia on the contralateral side can occur.<sup>21</sup> Incarcerated hernias present as an irreducible lump in the groin. Most incarcerations occur in infants.<sup>23-25</sup>

A unilateral, swollen, erythematous labia can be a torsed ovary, which has passed through a patent processus vaginalis; urgent surgery is indicated to save the ovary

## What you should do

Refer all infant patients to secondary care, as the incidence of incarceration in infants ranges from 3 to 16%, and can be up to 31% in premature infants in the first year of life.<sup>7,26</sup> Older children with an asymptomatic inguinal hernia should be referred on a routine basis with the risk of incarceration decreasing with age. Caution should be applied with transillumination to differentiate between inguinal hernias and hydroceles as both can transilluminate with a pen torch in very young patients, especially neonates. Use an index finger and thumb to palpate the lump superiorly. You will be able to get above a hydrocele, while a hernia is continuous with the patent processus vaginalis. Some clinicians advocate the silk glove sign: this is where the index finger is used to roll the cord structures against the pubic tubercle. In the presence of an inguinal hernia this feels like two silk sheets rubbing against one another, reflecting the smooth peritoneal sac edges. This has a sensitivity of 93% and specificity of 97%.<sup>20</sup> If doubt exists then an ultrasound scan is a useful investigation to differentiate the two.

Refer patients who are exhibiting symptoms of strangulation as an emergency to secondary care.

## What happens in secondary care?

### *Incarcerated or strangulated hernias*

Attempts are made to reduce the hernia in patients presenting with signs of incarceration; this is successful in 97-99.1% of cases.<sup>27</sup>

Fifteen per cent of reduced incarcerated hernias will re-incarcerate within five days if not repaired, so discuss any patient presenting with incarceration or strangulation with the

on-call paediatric surgical team.<sup>7,27</sup> They will assess how quickly the hernia needs to be repaired

### *Asymptomatic inguinal hernias*

Asymptomatic inguinal hernias in neonates are operated on before discharge from the maternity unit. Children less than 6 months old are operated on the next available list, and older children as an elective case. Both laparoscopic and open repairs are offered, depending on local circumstances and resources.<sup>28,29</sup>

Open herniotomy is performed through a small groin incision. After identifying the cord structures, they are carefully separated from the hernia sac. The sac is ligated proximally and any distal hydrocele suctioned before closure.

All laparoscopic techniques attempt to place a purse string suture around the patent processus vaginalis. Laparoscopic techniques lack long term follow-up data. A recent meta-analysis comparing open and laparoscopic inguinal hernia repair in children showed no statistical significance between recurrence rates (0-6% P=0.66). However, the studies included in this meta-analysis used both historical data and more recent studies that use modern practices. This has introduced confounding factors such as learning curves, unit experience, and robust follow-up.<sup>22</sup>

The field is divided over whether open is better than laparoscopic surgery. Both are regarded as safe procedures. Using a laparoscopic repair, the contralateral side can be explored to exclude a metachronous hernia or patent processus vaginalis. However, the natural course of a patent processus vaginalis is uncertain and it is unclear whether there is a benefit to repairing an asymptomatic patent processus vaginalis.<sup>22</sup> These questions will remain unanswered until there is a well designed, long term prospective randomised trial study.

## Patient information

British Association of Paediatric Surgeons free inguinal hernia repair leaflet

<http://www.baps.org.uk/content/uploads/2013/03/Inguinal-Hernia-Repair-child.pdf>

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### Search strategy and selection criteria

A search of Medline, Embase, and the Cochrane collaborative was performed using the keywords "umbilical," "epigastric," "inguinal," "hernia," "child," "pediatric," and "paediatric" to gather evidence and establish current recommendations. All articles were considered and no date range was specified, with 234 articles reviewed. Many of the data reviewed were case series, best expert opinion, and retrospective cohort studies. Many of the studies drew on evidence from adult hernias, extrapolating support of current management in the paediatric population. We consulted up-to-date national and international guidelines and the British Association of Paediatric Surgeons website for patient information.

### Patient involvement

We asked 23 patients (7 inguinal, 3 epigastric, and 13 umbilical hernia) and their parents in our paediatric surgery clinic which aspects of their/their child's care? could have been managed better, and which aspects were managed well. Specific attention was then given to any information the parents thought should have been given at the initial consultation in secondary care.

### Education in practice

The British Association of Paediatric Surgeons offers free patient information leaflets regarding repair of umbilical and inguinal hernias. Ideally these should be given to parents at their initial consultation.

How might you assess whether your practice was providing relevant information to patients?

How might you assess whether appropriate referrals for paediatric hernias were being made to secondary care?

### Additional educational resources

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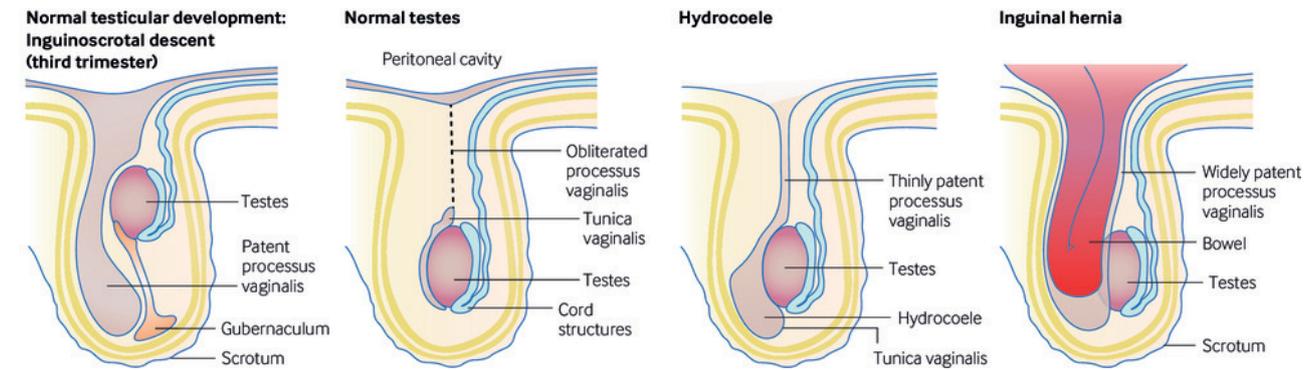
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## Table

Table 1 | Risk factors for paediatric hernia

	Umbilical hernia <sup>8</sup>	Inguinal hernia
Risk factors	<ul style="list-style-type: none"> <li>• Prematurity</li> <li>• Low birth weight</li> <li>• Down's syndrome</li> <li>• Beckwith-Wiedemann syndrome</li> <li>• Ehlers-Danlos syndrome</li> <li>• Hypothyroidism</li> <li>• Children of African descent</li> </ul>	<ul style="list-style-type: none"> <li>• Premature, low birthweight infants (&lt;1 kg) (increased rates of up to 30%<sup>4</sup>)</li> <li>4×more common in:               <ul style="list-style-type: none"> <li>• males</li> <li>• patients with connective tissue disorders</li> </ul> </li> <li>• patients with conditions which raise intra-abdominal pressure (eg, cystic fibrosis)<sup>9</sup></li> </ul>

# Figure



**Fig 1** Paediatric inguinal hernia