BMJ Best Practice

Umbilical hernia in children

Straight to the point of care

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Summary

Umbilical hernias will usually close by 4 to 5 years of age without treatment.

Complications including incarceration, strangulation, and rupture are uncommon in children.

Elective outpatient repair is associated with a low recurrence rate.

Infection and bleeding are the two most common postoperative complications.

Compression therapy (such as abdominal binders) is not helpful and may be harmful.

Definition

Umbilical hernia is a defect of the anterior abdominal wall fascia that occurs when the umbilical ring fails to close. The defect allows protrusion of a peritoneal sac that is covered by skin and may contain intra-abdominal contents, such as omentum or bowel.

Large umbilical hernia

Personal collection of Charles L. Snyder, MD; used with permission

THEORY

Epidemiology

Umbilical hernia is one of the most common surgical conditions in infants and children. However, the true overall incidence is unknown because many resolve spontaneously and accurate studies have not been performed. Most occur as an isolated finding in a healthy infant and the incidence is equivalent between boys and girls. The incidence is significantly increased in premature infants and infants of African descent. Umbilical hernia is noted in up to 75% of infants weighing <1500 g.[1] The rate of umbilical hernia is increased by up to 30% in premature, low birthweight infants (<1000 g).[2] Some studies document a high incidence in African infants.[2] [3]

Aetiology

The umbilical cord is composed of the umbilical vein, paired umbilical arteries, vitelline duct, and the allantois. These structures traverse the abdominal wall through the umbilical ring, a defect in the dense fascia of the linea alba. This ring normally closes by contracture after the cord is ligated and the umbilical vessels thrombose. When this ring fails to close, an umbilical hernia can protrude through the remaining fascial defect. The umbilical vein obliterates and becomes a fibrous cord known as the round ligament of the liver. This typically attaches to the inferior margin of the umbilical ring and provides strength to the umbilicus and protection from umbilical hernia. In approximately 25% of infants the round ligament attaches to the superior border of the umbilical ring.[4] This leaves an attenuated umbilical floor, composed of only peritoneum and umbilical fascia (a thickening of the transversalis fascia), which allows the infant to develop an umbilical hernia.

Pathophysiology

Most umbilical hernias are recognised shortly after birth, after the cord sloughs and the umbilicus heals. They are rarely symptomatic. The umbilical ring continues to close over time and the umbilical fascia strengthens, resulting in spontaneous resolution of the defect in most children. One study found that defects <1 cm in diameter have an 80% chance of spontaneous closure.[5] Another study found that despite 89.1% of hernias resolving spontaneously by age 6, the odds of spontaneous closure decreased by 5% for every 1 mm increase in defect size (up to 1 cm).[6] However, a study from Nigeria reported that spontaneous closure was still possible up to 14 years of age.[3]

Case history

Case history #1

A 6-month-old healthy girl presents with a bulge at her umbilicus that her parents have noticed since birth. She has no accompanying symptoms and has been growing and developing normally. Physical examination of the abdomen reveals a soft, non-tender bulge at the umbilicus that is easily reduced into the peritoneal cavity with gentle pressure. Reduction allows palpation of the abdominal fascia, revealing an 8 mm fascial defect.

Approach

Umbilical hernia is diagnosed by history and physical examination alone. No other tests are necessary prior to initiating treatment.

History and physical examination

Characteristic features include a bulge at the umbilicus that has been present since birth. The condition is generally asymptomatic, although it may cause mild discomfort in some children. Examination typically reveals an easily reduced hernial sac with a well-defined rim of fascia and central defect of variable diameter. The overlying skin may appear stretched and proboscoid (redundant and protuberant). Discomfort or a tender umbilical mass in an individual with an unrepaired umbilical hernia is concerning for incarceration, with or without strangulation. Symptoms of bowel obstruction include vomiting, abdominal pain, and constipation.

Imaging

Umbilical hernia may be found incidentally on imaging obtained for unrelated reasons (computed tomography, magnetic resonance imaging). However, these tests are unnecessary for the diagnosis of the typical umbilical hernia.

In the case of a suspected strangulated hernia, clinical grounds alone are sufficient to make the diagnosis and no imaging is required.

History and exam

Key diagnostic factors

presence of risk factors (common)

- Key risk factors include low birth weight (<1500 g) and African/African-American ancestry.

present since birth (common)

- Recognised after the umbilical cord sloughs and the skin heals.

bulge at the umbilicus (common)

- Parents may notice this feature. Abdominal examination reveals a bulge at the umbilicus, with intact overlying skin.

change in size/tension during movement (common)

- Becomes larger or tense when the infant cries or strains.

skin changes (common)

- The skin may become stretched and appear proboscoid (redundant and protuberant).

easily reducible hernial sac (common)

- Digital examination reveals an easily reducible hernial sac and a well-defined rim of fascia with central defect. Defect diameter varies from a few millimetres to a few centimetres.

well-defined rim of fascia with central defect (common)

- Digital examination reveals an easily reducible hernial sac and a well-defined rim of fascia with central defect. Defect diameter varies from a few millimetres to a few centimetres.

variable diameter of defect (common)

- Digital examination reveals an easily reducible hernial sac and a well-defined rim of fascia with central defect. Defect diameter varies from a few millimetres to a few centimetres.

symptoms of small bowel obstruction (uncommon)

- Incarceration may occur rarely; usually involving the small bowel; results in obstructive symptoms such as vomiting, abdominal pain, and constipation. Identification of these features is critical as surgery may need to be expedited.

Other diagnostic factors

intermittent discomfort (uncommon)

- Generally asymptomatic. Older children occasionally report intermittent discomfort.

Risk factors

Strong

low birth weight

- Umbilical hernia is noted in up to 75% of infants weighing <1500 g.[1] The rate of umbilical hernia is increased by up to 30% in premature, low birthweight infants (<1000 g).[2]

African ancestry

- Some studies document a high incidence in African infants.[2][3]

Weak

Beckwith-Wiedemann syndrome (BWS)

- Children with BWS often present with abdominal wall defects, pre- and post-natal overgrowth, and macroglossia.[7]

trisomy 21, 18, 13

- Umbilical hernias are associated with chromosomal disorders including Down's syndrome.[7]

congenital hypothyroidism

- Like other congenital disorders, the risk of umbilical hernia is elevated in this condition.[7]

mucopolysaccharidoses

- Umbilical hernias are found in the familial lysosomal storage disease, Hurler's syndrome.[8]

Investigations

1st test to order

Test	Result
diagnosis is clinical	**no tests required**

Differentials

Condition	Differentiating signs / symptoms	Differentiating tests
Epigastric hernia	• Located in the midline of the upper abdomen, cephalad to the umbilicus, as a result of defects in the linea alba. • Defects may be multiple. • Unlikely to cause strangulation/obstruction as only pre-peritoneal fat herniates through the defect.	• No differentiating tests.
Hernia of the umbilical cord	• May occur in a newborn with defects in both the umbilical fascia and peritoneum. • Intestines herniate into the substance of the cord itself, covered only by amnion.	• No differentiating tests.
Omphalocoele	• Results from a defect at the umbilicus, through which abdominal contents herniate. • Is covered only by an outer layer of amnion and inner layer of peritoneum. • Omphalocoeles are not covered by skin.	• No differentiating tests.

Approach

Small, asymptomatic hernia

Traditional management of small hernias (<1.5 cm) involves observation until 4 or 5 years of age.[2] This allows for spontaneous closure in up to 80% of children.[5] If the hernia persists beyond 4 to 5 years of age, it can be managed with elective outpatient surgical repair. However, the risk of complications in older children, as well as the likelihood of eventual spontaneous closure, cannot be clearly defined from the available data.[9] If a hernia incarcerates during the period of observation, it should be reduced by manual pressure and repaired surgically, generally within 24 hours. If an incarcerated hernia cannot be reduced, an emergency operation is indicated. It can be challenging to convince the child's carers that observation alone will be successful in most cases and that an operation is not indicated.

Large or symptomatic hernia

Fascial defects >1.5 to 2 cm are unlikely to close spontaneously. Many surgeons advocate elective repair at 2 to 3 years of age for such hernias.[10] Earlier repair is also indicated if intermittent symptoms of incarceration or recurring pain develop.[11] There is some evidence that complications may be increased in children undergoing repair at an earlier age; a study suggests deferring elective repair until the child is 4 years of age or older, and this was the management strategy used most commonly in a survey of American Pediatric Surgical Association members.[12] [13] Compression therapy (such as abdominal binders) have no role in management and may be harmful or complicate the repair.

Incarcerated hernia

If an individual with an unrepaired umbilical hernia presents with discomfort or a tender umbilical mass, incarceration with or without strangulation should be suspected and treated immediately, regardless of age or size. Incarceration occurs if intra-abdominal contents (e.g., abdominal viscera or omentum) become trapped in the protruding hernial sac. This is termed 'strangulation' if the blood supply to the bowel is compromised, causing ischaemia.[2]

Management consists of an immediate attempt at reduction (in the absence of signs of peritonitis) by milking air or fluid out of the incarcerated loop of intestine and applying firm, steady pressure to the mass. If reduced, the patient should be admitted and observed for peritonitis, with surgical repair the following day. If the hernia cannot be reduced, emergency repair is indicated. Assessment of bowel integrity should be part of the procedure, particularly if bloody peritoneal fluid is encountered during surgery.

Treatment algorithm overview

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: see disclaimer

Acute (summary)		
incarcerated hernia		
	1st	**surgical repair following attempted reduction**

MANAGEMENT

Ongoing		(summary)
large or symptomatic hernia		
	1st	**elective outpatient surgical repair**
small and asymptomatic hernia		
	1st	**observation**
	2nd	**elective outpatient surgical repair**

Treatment algorithm

Please note that formulations/routes and doses may differ between drug names and brands, drug formularies, or locations. Treatment recommendations are specific to patient groups: see disclaimer

Acute

incarcerated hernia

1st **surgical repair following attempted reduction**

» If an individual with an unrepaired umbilical hernia presents with discomfort or a tender umbilical mass, incarceration with or without strangulation should be suspected and treated immediately, regardless of age or size. Incarceration occurs if intra-abdominal contents (e.g., abdominal viscera or omentum) become trapped in the protruding hernial sac. This is termed 'strangulation' if the blood supply to the bowel is compromised, causing ischaemia.[2]

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Ongoing

large or symptomatic hernia

1st **elective outpatient surgical repair**

» Fascial defects >1.5 to 2 cm are unlikely to close spontaneously, so many surgeons advocate elective repair at 2 to 3 years of age for such hernias.[10] Earlier repair is also indicated if intermittent symptoms of incarceration or recurring pain develop.[11] There is some evidence that complications may be increased in children undergoing repair at an earlier age; a study suggests deferring elective repair until the child is 4 years of age or older, and this was the management strategy used most commonly in a survey of American Pediatric Surgical Association members.[12] [13]

» Compression therapy (such as abdominal binders) have no role in management and may prove harmful or complicate the repair.

small and asymptomatic hernia

1st **observation**

» Traditional management of small hernias (<1.5 cm) involves observation until 4 or 5 years of age.[2] This allows for spontaneous closure in up to 80% of children.[5] If a hernia incarcerates during the period of observation, it should be reduced by manual pressure and repaired surgically, generally within 24 hours. If an incarcerated hernia cannot be reduced, an emergency operation is indicated. It can be challenging to convince the child's carers that observation alone will be successful in most cases and that an operation is not indicated.

2nd **elective outpatient surgical repair**

» If the hernia persists beyond 4 to 5 years of age, it can be managed with elective outpatient surgical repair due to risk of incarceration. However, the risk of complications in older children, as well as the likelihood of eventual spontaneous closure, cannot be clearly defined from the available data.[9]

Patient discussions

During a course of observation for an unrepaired hernia, the child's carers should be informed of the signs and symptoms of incarceration and advised to seek medical attention immediately if this occurs.

Postoperatively, the surgical dressing is typically removed in 2 days, and bathing can resume after the dressing is removed. No activity restrictions are necessary. The child's carers should be advised of signs

and symptoms of wound infection, haematoma, and hernia recurrence postoperatively, though these are rare.

Complications

Complications	Timeframe	Likelihood
postoperative wound infection	**short term**	**low**
Surgical repair is a sterile technique; infection is rare.		
postoperative haemorrhage/haematoma	**short term**	**low**
Postoperative bleeding can be troublesome and may lead to a haematoma. With appropriate attention to haemostasis intra-operatively, this complication is rare.		
recurrence of hernia	**short term**	**low**
Wound infection predisposes to hernia recurrence, though this is uncommon.		
incarceration/strangulation	**long term**	**low**
Incarceration occurs if intra-abdominal contents (e.g., abdominal viscera or omentum) become trapped in the protruding hernial sac. This is termed 'strangulation' if the blood supply to the bowel is compromised, causing ischaemia.[2] Discomfort or a tender umbilical mass in an individual with an unrepaired umbilical hernia is concerning for incarceration, with or without strangulation. Symptoms of bowel obstruction include vomiting, abdominal pain, and constipation. Incarceration is very rare, though some studies suggest that incarceration occurs more frequently than is generally believed.[14] [15]		
peritonitis	**variable**	**low**
A rare but serious, life-threatening complication of surgery that can lead to septicaemia and death.		
rupture/evisceration	**variable**	**low**
Rupture and evisceration of an unrepaired hernia is extremely rare, but has been reported.[16]		

Prognosis

Postoperative follow-up

After surgical repair, the dressing can be removed in 2 days. No activity restrictions are necessary. The most common complications after hernia repair are wound infection and bleeding, though both are rare. A single postoperative consultation with the surgeon in 2 to 3 weeks is generally considered sufficient follow-up.

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Images

Figure 1: Large umbilical hernia

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This approach is in line with the guidance of the International Bureau of Weights and Measures Service.

Figure 1 – BMJ Best Practice Numeral Style

5-digit numerals: 10,000

4-digit numerals: 1000

numerals < 1: 0.25

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