# A Few Words about Hernia

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## Abstract:

A hernia occurs when an abdominal organ breaks through an opening or a weakened part of the muscle that surrounds it. A hernia can occur in several places on the abdominal wall, e.g., in the umbilical region or after abdominal surgery at the site of an earlier incision. However, it most often develops in the inguinal area, ie in the groin. 80% of all hernias occur in this area. There is a inguinal canal in the groin through which in men the vas deferens passes with blood vessels, and in women the oval ligament that supports the uterus. The intestine can also be pulled through this canal and manifest as a bulge in the groin. The second most common hernia is located in the umbilical cord. There are other types of hernias that are not common (hiatal, internal hernia).

**Key Words:** hernia; emergency; repair; management

## Introduction:

Hernias may occur anywhere in the body [1]. Groin hernias are the most common, usually occurring through the inguinal or femoral canals. Other sites for hernias are where musculofascial weaknesses may develop (umbilicus, diaphragm, edge of rectus abdominis, lumbar triangle), when abnormally raised pressure develops (cerebral tumours causing 'coning') or as a complication of wound healing (incisional hernias). Omentum and small bowel are the most common contents of abdominal wall hernias, but most organs (including the pregnant uterus) have been described in hernias. Sometimes the organ within the hernia sac may be pathological, such as Meckel's diverticulum (the rare Littre's hernia). As well as pain from the hernia itself, their main importance relates to the complications arising from their contents. Fibrosis may lead to irreducibility of the contents (incarceration) and possibly obstruction of any contained bowel. If the blood supply of the contents is compromised, this may cause ischaemia (strangulation), necrosis and even perforation.

A hernia is a protrusion of tissue or organ(s) through a defect, most commonly in the abdominal wall [2]. In abdominal hernias, peritoneal contents, such as the omentum and/or bowel, protrude through a defect or weakness in the muscle/fascia. Hernias have three components: the abdominal wall defect, the hernia sac which protrudes through the defect, and the contents within the sac. The neck of a hernia is the part of the hernia sac adjacent to the abdominal wall defect. If the neck is narrow, bowel may herniate less frequently, but once it does enter, it has a higher chance of becoming constricted by the narrow neck and incarcerating.

A hernia can be described as reducible if the contents within the sac can be pushed back through the defect into the peritoneal cavity, whereas with an incarcerated hernia, the contents are stuck in the hernia sac. A strangulated hernia is a type of incarcerated hernia in which there is compromised blood flow to the herniated organ. Strangulation more frequently occurs when the hernia defect is narrow. A loop of bowel protrudes through the hernia and becomes entrapped by the narrow neck. This may lead to a closed-loop bowel obstruction whereby both ends of the bowel are blocked with nowhere for fluid and gas to egress. As the bowel continues to produce gas and secrete fluid, the progressive distention leads to a compromise of the blood flow. Strangulation requires prompt surgical intervention since it can lead to intestinal ischemia, sepsis, bowel infarction, and death. The overall incidence of strangulation in inguinal hernias is less than 1 %. This risk is increased in symptomatic patients and those with significant comorbidities. Predisposing risk factors include older age, duration of hernia (shorter is worse), type (femoral), and comorbidities. Some incarcerated hernias (particularly those with large defects) can remain irreducible for years without causing major symptoms. Others (particularly with narrow necks) are at higher risk of

progressing to strangulation.

## Inguinal Hernia:

Beneath the skin and subcutaneous tissue lies the aponeurosis (a word meaning a flat tendon) of the external oblique muscle [3]. The lower inwardly folded edge of this aponeurosis, which runs between the anterior superior iliac spine and pubic tubercle, forms the inguinal ligament. The fibres of the aponeurosis run parallel to the inguinal ligament in the direction taken by a hand when placed in a trouser pocket, and separate above the crest of the pubis to form the external inguinal ring.

The half-moon gap beneath the arch of the internal oblique muscle is the weak spot of the inguinal region. The tissue filling the gap is not very strong and is called the transversalis fascia. This area is crossed by the inferior epigastric artery as it runs upwards (from the femoral artery), curving medially towards the rectus sheath. The point where the vas deferens and testicular artery pierce the transversalis fascia is lateral to the inferior epigastric artery and known as the internal inguinal ring. Indirect inguinal hernial sacs leave the abdomen at this point. Direct inguinal herniae push through the weak area of the posterior wall medial to the inferior epigastric artery.

Because the sac of an indirect inguinal hernia comes down obliquely alongside the vas deferens inside the spermatic cord, it has an easy path of little resistance down into the scrotum. The three fascial layers of the cord funnel the peritoneal sac towards the scrotum. By contrast, the sac of a direct inguinal hernia begins medial to the epigastric artery, outside the spermatic cord with its three external layers of tissue, and so has no easy path to the scrotum, which in consequence it rarely enters.

In general, indirect inguinal hernias are congenital, whereas direct hernias are acquired [2]. Indirect inguinal hernias are caused by a persistent (patent) processus vaginalis. During embryologic development, the processus vaginalis, an outpouching of the peritoneum, descends into the scrotum, bringing along the testicle with it. It subsequently closes prior to birth. If the processus remains patent (open), peritoneal fluid can fill the scrotum (communicating hydrocele) or bowel can pass through the patent processus vaginalis into the scrotum (indirect hernia). In men, the indirect hernia sac travels along with the spermatic cord through the internal ring, and into the scrotum. In women, it follows the tract of the round ligament towards the pubic tubercle. Direct inguinal hernias are due to a weakness in the floor (transversalis fascia) of the inguinal canal, directly through Hesselbach's triangle. They typically manifest after years of chronic straining, causing wear and tear to the abdominal wall musculature. Since they are acquired, it is unusual to find a direct inguinal hernia in a young person. The neck of an indirect inguinal hernia is relatively narrow as it passes through a relatively rigid and inflexible space (the internal ring), whereas direct inguinal hernias typically have a more broad- based neck, making strangulation less likely to occur.

## Hiatal Hernia:

Obesity, aging, and general weakening of the musculofascial structures set the stage for enlargement of the esophageal hiatus and herniation of the stomach into the posterior mediastinum [4]. Hiatal hernias are divided into sliding hiatal hernias (type 1) and paraesophageal hiatal hernias (types 2, 3, or 4). The most common (95%) is the sliding hernia, where the gastroesophageal junction

moves above the diaphragm together with some or the entire stomach. Type 2 hernias are characterized by herniation of the gastric fundus into the mediastinum alongside the esophagus, with the gastroesophageal junction remaining in an intra-abdominal position. Since the gastroesophageal sphincteric mechanism functions normally in most of these cases, reflux of gastric contents is uncommon. Type 3 hernias, also called mixed hernias, involve herniation of the stomach with the gastroesophageal junction into the mediastinum. In types 1 and 3, symptoms due to GER may occur along with symptoms secondary to the mechanical obstruction.

Finally, the rare type 4 hernias are characterized by an intrathoracic stomach along with associated viscera such as the spleen, colon, small bowel, or pancreas.

Small hiatal hernias are in most cases asymptomatic, while large hiatal hernias may cause a wide variety of symptoms such as epigastric discomfort, chest pain, postprandial bloating, dysphagia, or respiratory problems (asthma, cough, or dyspnea caused by chronic aspiration). Anemia is secondary to gastric erosions, and it can be the only presenting symptom. In addition, patients may experience symptoms due to GER.

The most common type of hiatal hernia is type I, or a sliding hiatal hernia, which accounts for about 95% of all hiatal hernias with the remaining 5% being true paraesophageal (types II, III, and IV) hernias [5]. Hiatal hernias are classified as follows:

I. Type I, also called a sliding hiatal hernia, occurs when the gastroesophageal (GE) junction ascends into the thorax through the esophageal hiatus, pulling the cardia of the stomach up as well. This occurs due to a laxity in the phrenoesphageal ligament.

II. Type II is a true paraesophageal hernia, where the GE junction resides in the abdomen but a portion of the stomach fundus herniates through the hiatus into the thorax. This is commonly due to a combination of phrenoesphageal ligament laxity and widening of the esophageal hiatus.

III. Type III occurs as a combination of type I hiatal and II paraesophageal hernias. The GE junction ascends into the thorax as well as the fundus of the stomach herniating in parallel thought the hiatus.

IV. Type IV is when an organ other than the stomach herniates through the hiatus into the thorax. This is most commonly the colon, but can be the spleen, or small bowel as well.

Trauma, congenital malformations, and iatrogenic factors, such as complications from surgical dissection, have all been implicated in the development of hiatal hernias. Type I hiatal hernias result from the progressive disruption of the GE junction and as such a portion of the gastric cardia herniates upward. Type II, III, and IV paraesophageal hernias can result in displacement of the greater curvature of the stomach into the thorax due to hernia enlargement and laxity in the gastrocolic and gastrosplenic ligaments. The GE junction, however, often remains fixed in the abdomen, and this results in the herniated stomach rotating around its longitudinal axis. Gastric volvulus can occur if the stomach rotates around its long or short axis, resulting in organoaxial or mesenteroaxial, respectively. Organoaxial volvulus occurs when the stomach rotates around its long axis as drawn from the GE junction to the pylorus where as mesenteroaxial volvulus occurs when the stomach rotates around a perpendicular line drawn from the lesser curvature to the greater curvature. Gastric volvulus is more common in persons age > 50 years and in those with diaphragmatic defects.

Gastric volvulus can be classified as primary or secondary gastric volvulus. Primary gastric volvulus is due to abnormalities

occurring with the gastric ligaments which allows the stomach to twist. More common, however, is secondary gastric volvulus which occurs as the result of anatomic abnormalities not associated with gastric ligamentous distention. These are usually due to paraesophageal hernias or diaphragmatic hernias but also can be due to diaphragmatic eventration and phrenic nerve paralysis.

As more people seek bariatric surgery for durable treatment of morbid obesity and its associated metabolic diseases, the decision of whether or not to concomitantly treat co-existing hiatal hernia (HH) has become increasingly relevant [6]. The prevalence of symptomatic HH (Hiatal Hernia) in the general population is thought to range between 16 and 22%. However, the problem is more signifcant in the morbidly obese population, with rates reported as high as 37% when diagnosed on preoperative barium swallow.

The distribution amongst the four types of HH in morbidly obese individuals is similar to the overall population, with type I "sliding" hernias being the most common (90–95%). Risk factors that predispose this population to widening and laxity of the hiatus as well as gastroesophageal sphincter incompetence are thought to be related to increased intraabdominal pressure.

The problem of hiatal hernia complicating bariatric surgery is sometimes approached from a slightly different angle when a morbidly obese patient is referred for treatment of symptomatic hiatal or paraesophageal hernia. Particularly for larger type III and IV HH or paraesophageal hernias, a second related question arises: since obesity is a risk factor for both occurrence and recurrence of HH, should morbidly obese patients undergoing HH repair undergo simultaneous bariatric surgery? Taken together, with the growing numbers of patients with BMI (Body Mass Index) greater than 35 being referred for foregut surgery, as well as rising popularity of sleeve gastrectomy (SG) over Roux-en-y gastric bypass (RYGB), preoperative consideration of the patient's native anatomy and severity of refux symptoms becomes an important part of the preoperative discussion and decision-making process.

## Emergency:

Patients in the emergency setting will usually describe a tender irreducible swelling at the site of the hernia [7]. This may be at the site of a previous reducible hernia or alternatively may represent a de novo presentation. Around half of patients presenting with strangulation are known to have a hernia at the time of emergency admission. A history of recent weight loss may predispose to the development of a femoral hernia as a result of loss of fat within the femoral sheath. Although an uncomplicated irreducible hernia may not require immediate management, careful assessment must be made for symptoms and signs of intestinal obstruction and strangulation.

Intestinal obstruction: Approximately, 25% of the cases of intestinal obstruction are caused by strangulated external hernia. The cardinal signs of intestinal obstruction are abdominal distension, colicky abdominal pain, absolute constipation and vomiting although the onset of each symptom will depend on the anatomical region of bowel involvement. Furthermore, with small herniae in obese patients and the rarer pelvic herniae, intestinal obstruction may be the only presenting symptom.

Strangulation: A hernia becomes strangulated when the blood supply of the contents within the sac becomes impaired to such a degree that gangrene becomes imminent. The intestine becomes obstructed, venous congestion followed by arterial compromise occurs which can result in gangrene as early as 5 or 6 hours following the first onset of symptoms. Alternatively the pressure of a tight constriction ring at the neck of the peritoneal sac may cause a localised necrosis of the bowel wall. A Richter's-type hernia is when there is only partial involvement of the bowel wall within the sac and as a result is not necessarily associated with bowel obstruction.

## Repair:

Inguinal hernia repair is one of the most commonly performed procedures in general surgery, with nearly 800,000 being performed in the United States each year [8]. Because of the complex anatomical relationships within the inguinal region and the large number of important structures susceptible to injury, there are a number of unique challenges during inguinal hernia repair.

Hernia repair may occasionally require intentional sacrifice of the spermatic cord. This maneuver is usually reserved for particularly difficult large or recurrent inguinal hernias in elderly men. After inguinal herniorrhaphy, unintentional cord transection usually causes fever, and testicular swelling and tenderness; it may cause long-term complications of testicular atrophy or hydrocele formation rarely requiring orchiectomy in the future.

The nerves at risk of injury during open inguinal hernia repair are the ilioinguinal nerve, iliohypogastric nerve, and genital and femoral branches of the genitofemoral nerve. The ilioinguinal nerve lies beneath the external oblique aponeurosis along the surface of the spermatic cord. Injury most commonly occurs when the external oblique is opened for exposure of the inguinal canal. It results in loss of sensation to the base of the penis, upper scrotum, and inner thigh. The iliohypogastric nerve can be injured by relaxing incisions in the rectus sheath or by medial dissection during preperitoneal hernia repair. Such injury usually causes sensory loss to the suprapubic area. The genitofemoral nerve perforates the internal oblique muscle at the origin of the cremaster muscle. Injury to this nerve causes motor weakness of the cremaster muscle and cutaneous sensory loss in the penis and scrotum. The femoral branch of this nerve lies deep to the inguinal canal; injury to this branch causes sensory loss to the lateral thigh. Injury to any of these nerves usually produces only temporary symptoms that characteristically resolve within 6 months. Reports indicate that as many as 18%–20% of patients with hernias experience neurapraxia and hyperesthesia.

Because of its potential impact on fertility, injury to the vas deferens is a serious concern of all surgeons performing inguinal hernia surgery. When it occurs, transection of the vas deferens mandates immediate repair. Approximately 50% of such repairs yield a functional result. Improper handling of the vas deferens can cause injury in the absence of transection. Such injury may involve obstruction of the lumen of the vas, a lesion that can cause painful ejaculatory dysfunction.

Injury to abdominal viscera during inguinal herniorrhaphy usually occurs in association with sliding hernias involving bladder or bowel wall. The wall of the urinary bladder can participate as a sliding component of the medial aspect of a direct inguinal hernia. As such, it can be injured during the placement of medial sutures or with dissection or opening of the hernia sac during the hernia repair. When recognized intraoperatively, injury to the urinary bladder should be repaired immediately, and the repair should be protected with bladder decompression via an external bladder

catheter. Bowel injury can occur during high ligation of an indirect hernia sac, when the bowel wall is a component of the sac. The injury can be a simple enterotomy or a mesenteric injury with segmental vascular compromise. In either case, potential sequelae are bowel obstruction, fistula, and abscess formation. Enterotomies are best managed with primary repair, wound irrigation, and hernia repair without prosthetic material if possible. Devascularization of bowel may require resection, with or without laparotomy, and proximal diversion may occasionally be required for colon injuries.

## Management:

Prior to the mid-1980s, the choices for repair of elective and emergent hernia repairs was simple [9]. Primary tissue repairs were exclusively performed. The introduction of the first polypropylene mesh then expanded polytetrafluoroethylene change the face of elective hernia repairs almost completely by the mid-1990s. The use of mesh for elective hernia repairs is well established now. Laparoscopic repairs were added to the elective hernia repair options in the early 1990s, and all use some form of prosthesis. It was inevitable that these options would be considered for urgent/emergent repairs as well. Unfortunately, there are very few prospective trials performed to determine optimal repair of incarcerated hernias. Cohort sizes ranged from 21 to 60 patients. The conclusions from these three trials would seem to indicate that a tension-free Lichtenstein repair is superior to a primary open repair; however, a laparoscopic preperitoneal repair may be superior to either when repairing an incarcerated hernia. Operator experience will influence outcome in laparoscopic repairs. In addition to these prospective trials, there are a number of retrospective series and case reports indicating success repairing inguinal, femoral, and ventral hernias with Lichtenstein repairs, transabdominal laparoscopic repairs (TAP), and totally extraperitoneal laparoscopic repairs (TEP). These studies indicate use of polypropylene synthetic mesh in incarcerated (nonstrangulated) hernias appears acceptable and concerns of translocation leading to clinical infection appear unwarranted.

For an indirect hernia, the main goal is to open the sac (anteriorly), assess viability of the intestine, reduce any contents, and then perform a high ligation (at the internal ring) of the hernia sac [2]. This eliminates the patent processus vaginalis. The distal sac can be excised if small or left in situ if large. In addition, in adults, the long-standing protrusion of the hernia through the internal ring weakens the surrounding muscle. As such, the floor of inguinal canal is reinforced with a tension-free mesh repair. With a direct hernia, since there is no patent processus vaginalis, the sac is not opened nor ligated. Since the sac consists of peritoneum, and protrudes through the weakened floor of the inguinal canal, the sac is just reduced, and the floor of the inguinal canal is reinforced with a tension-free mesh placement (Lichtenstein repair). Laparoscopic inguinal hernia repair can be used to repair indirect, direct, and femoral hernias utilizing a posterior approach to the myopectineal orifice with mesh reinforcement. An alternative to using mesh is to strengthen the floor by sewing the conjoined tendon to the inguinal ligament (tissue-based repair). Such a repair (without mesh) has the disadvantage of being under tension, and as such the hernia recurrence rate is significantly higher. As such, it is reserved for situations where mesh is unavailable or contraindicated (in association with gangrenous bowel).

## Conclusion:

The abdominal wall consists of muscles and muscle sheaths so there are congenital openings through which anatomical structures pass during their development. These are places like the navel or groin where the abdominal wall is naturally weaker. Hernia most often occurs when there is increased pressure in the abdominal cavity in combination with the listed places of weakened abdominal wall. That is why most cases of vomiting are found in the area of the abdominal wall. Anything that causes tension in the abdominal muscles can cause a hernia. A bulge in the groin or on the abdominal wall can be a hernia, but there can be another cause, so it is important to visit a surgeon if a hernia is suspected. Timely diagnosis can prevent complications, and physical examination is most often used. Sometimes it is necessary to do an ultrasound, CT or MR of the abdominal wall. The hernia will not go away on its own. All hernias increase over time and as a result begin to cause burning and pain in the groin. Symptoms of inguinal hernia are discomfort and pain when bending over, coughing or lifting weights. In addition, a hernia incarceration can occur. This is a condition where the bowel from a hernia can no longer return to the abdomen, and is accompanied by severe pain and vomiting. If this condition lasts longer than six hours, there is a high possibility of rupture of the bowel with inflammation of the peritoneum. Such a condition is often fatal. Hernia surgery used to be recommended to all patients for fear of entrapment.

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