Inguinal hernias

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The word 'hernia' is derived from the Latin word for rupture. A hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls.

Although hernias can occur at various sites in the body these defects most commonly involve the abdominal wall, particularly the inguinal region. Inguinal hernia repair is the most common operation performed by general surgeons, hence the importance of ongoing improvements in operative technique.

Brief history

Before the 1980s repairs were tissue-based anatomical approximations. These techniques caused the repair to be subjected to continuous tensile stresses and strains, resulting in recurrence rates of 1 - 20%.

The 1980s saw an explosion of surgical advances, with the 'tension free' polypropylene mesh repairs (described by Lichtenstein) becoming the gold standard of open repairs. Recurrence rates were reported as less than 2%.

The 1990s saw the birth of laparoscopic hernia repairs, with a concerted effort to reduce postoperative pain and recovery time after surgery.

All these improvements met initial resistance from the surgical community, with eventual acceptance after critical analysis of long-term outcomes.

Aetiology and pathophysiology

Evolution

The absence of the posterior rectus sheath below the arcuate line and a weak fascia transversalis resisting intra-abdominal pressure predisposes to the development of hernias. The erect posture of humans has resulted in gravitational stresses passing down to the lower abdominal wall, which is structurally not designed for these forces. However, despite these deficiencies, less than 5% of people develop a hernia.

Causes

These are multifactorial:

- **A patent processus vaginalis** is the prime cause of indirect inguinal hernia, most commonly seen in infants. However, 20% of autopsy studies reveal a patent processus with no hernia – therefore other factors must play a part.
- **The shutter mechanism.** With a rise in intra-abdominal pressure the conjoined tendon contracts, descends and comes to lie close to the inguinal ligament. The crura around the internal ring contract around the spermatic cord and the external oblique aponeurosis becomes tense and presses on the internal ring, thus reinforcing the weak posterior wall. Failure of this 'shutter mechanism' would predispose to a hernia.
- **Raised intra- abdominal pressure.** This could be caused by coughing, straining or lifting. The shutter mechanism could be overwhelmed, particularly in men over 50 years who have weakening of the abdominal muscles, the shutter and the fascia transversalis.
- **Collagen and fascia transversalis**. A disorganised framework of the fascia transversalis could lead to weakening and predispose to a direct hernia.
- **General factors.** Advancing age, lack of exercise, illness and prolonged bedrest all lead to weakening of muscle and fascia.

Diagnosis

An intermittent or persistent swelling in the inguinal region is a sign of an inguinal hernia. It may be associated with pain or vague discomfort, and occasionally patients may present with paraesthesia caused by compression or irritation of the inguinal nerves by the hernia.

The inguinal region should be examined with the patient in the supine and standing positions. The distinction between a direct and indirect inguinal hernia is of little importance because the operative repair of these two types of hernias is the same.

Ultrasonography may aid in the diagnosis of occult groin hernias. The differential diagnosis of a groin mass includes femoral hernia, hydrocele, inguinal adenitis, femoral adenitis, lymphoma, varicocele, ectopic testis, lipoma, haematoma, psoas abscess, metastatic neoplasm, epididymitis, testicular torsion and femoral artery aneurysm.

Should all inguinal hernias be repaired?

Traditionally, inguinal herniorrhaphy was the norm, mainly to prevent complications such as incarceration and/or strangulation of abdominal contents. All symptomatic patients should undergo herniorrhaphy.

However, two recent randomised controlled trials comparing 'watchful waiting' with repair in minimally symptomatic men have shown the risk of complications to be less than 1.1%. Therefore asymptomatic patients could be treated conservatively.

Operative techniques

Hernia repairs may be done by the traditional open method or by the laparoscopic methods.

Open operations

The most common open operation is the Lichtenstein tension-free onlay mesh repair (Fig. 1). A mesh plug or a combination of plug and mesh may also be used in large hernias (Fig. 2).

Advantages

- These operations can be performed under local, regional or general anaesthesia.
- Open operations are easily taught and most surgeons are *au fait* with the techniques.

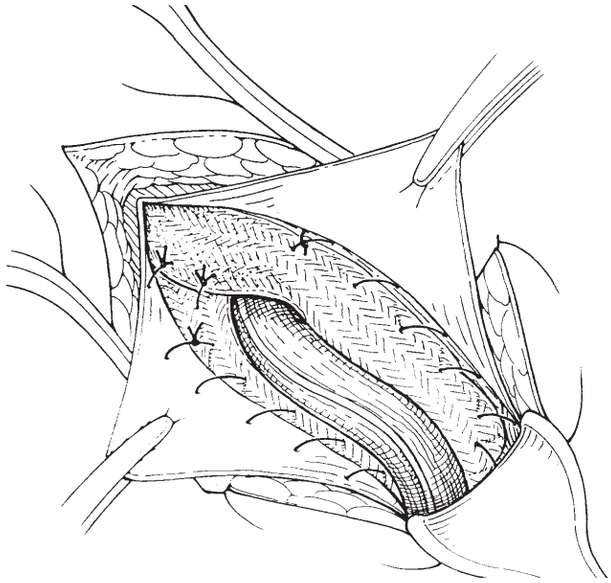

Fig. 1. Lichtenstein repair.

Fig. 2. Mesh plug repair.

- The operating time is short.
- There is a low recurrence rate equivalent to that of a laparoscopic operation.

Disadvantages

- The surgical scars are larger.
- There is more postoperative pain and discomfort.
- The risk of sepsis is higher.

Laparoscopic repairs

Two techniques are widely used:

- The transabdominal preperitoneal (TAPP) technique – this involves entering the peritoneal cavity, with the attendant risk of injury to abdominal contents.
- The totally extraperitoneal (TEP) technique – this operation is technically more demanding, and the repair is done in the plane between the peritoneum and the abdominal wall musculature.

Advantages

- There is reduced postoperative pain and discomfort.
- One can return to work sooner.
- Bilateral repairs can be done concomitantly.
- These techniques avoid the previous operative field in recurrent hernias.
- The inguinal and femoral canals can be repaired bilaterally.

Disadvantages

- All operations have to be done under general anaesthesia.
- There is a longer learning curve and operative time for the surgeon.
- There is a higher risk of rare serious complications, especially bladder and vascular injuries.
- The cost is significantly more than that for the open operation.

Chronic pain after herniorrhaphy

Up to 30% of patients will have mild pain and 3 - 6% will have severe pain 1 year after hernia repairs. Patients need to be counselled about this potential side-effect of herniorrhaphies, particularly those with asymptomatic hernias.

Postoperative convalescence

Traditional convalescence recommended 3 - 6 weeks before resumption of normal activity. This was based on the assumption that the earlier repairs under tension would have a high recurrence if strained.

It no longer applies to tension-free repairs, as most patients can resume work in 7 - 10 days. Patients can mobilise once recovered from anaesthesia and resume normal activities within 14 days. However, pain and wound problems remain limiting factors to the early resumption of full physical activity.

Summary of key points

- Hernia repair is the general surgeon's most common operation.
- Asymptomatic hernias can be treated conservatively.
- Mesh tension-free repairs are the gold standard.
- Laparoscopic and open repairs have similar recurrence rates.
- Laparoscopic repairs
  - produce less pain and allow an earlier return to work
  - are more costly, take longer, and require a general anaesthetic
  - have a longer learning curve
  - are more difficult with large hernias.
- Chronic pain has become a more

significant problem than hernia recurrence.

Suggested reading

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Transplantation

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Transplantation represents the best therapy for non-recoverable organ failure. Transplantation is divided into two major categories: solid organ transplants (kidney, heart, pancreas, lung, liver, small bowel, and more recently even the face and upper limbs) and tissue transplants (corneas, blood, bone, skin and stem cells). Tissue may be procured several hours after cardiac death.

Donation

With modern immunosuppression, solid organ transplantation is the ideal management for all end-organ failure. The demand for solid organs of all types has risen exponentially, while the number of organ donors remains almost static. Consequently, live donor organ donation has increased to cope with demands. In Europe and the USA more than 50% of kidney donors are living relatives or friends of the patient. Risks of live donation vary considerably with regard to the organ being donated, i.e. kidney – minimal; pancreas, lung and liver – more substantial.[1] A living donor kidney has a 20% better graft survival at 5 years than a deceased donor kidney. Every medical practitioner should be familiar with criteria for establishing brain death.[2]

Kidney transplantation

Patient survival is significantly increased compared with dialysis.[3] Currently, immunosuppressant therapy has improved to enable long-term graft survival. Overall 50% of kidneys transplanted can be expected to be functional 10 years later. Steroid-free immunosuppression and graft tolerance are current fields of development. Waiting lists are long and allocation systems for fair distribution are used in line with Chapter 5 of the National Health Act, 2003. Regulations regarding the general control of human bodies, tissues and organs state that: 'Allocation must be based purely on clinical needs which may not include race, religious belief, financial and political affiliation.'

Pancreas transplantation

Whole-organ pancreas transplantation is performed in three ways:

- Simultaneous pancreas/ kidney transplantation (SPK) – type 1 diabetic with end-stage renal disease is given the pancreas and kidney from the same donor – 80% of patients remain off dialysis and insulin free at 5 years post transplantation.[4] Recurrent diabetic nephropathy is prevented and secondary effects of diabetes do not progress.
- Pancreas transplantation after kidney transplantation (PAK) – used in patients where a living donor kidney is available. A cadaver pancreas is transplanted later.
- Pancreas transplantation alone. This requires the trading of insulin therapy for immunosuppression. As a rule this is not a good trade unless the type 1 diabetes results in life-threatening hypoglycaemic events or is uncontrollable with conventional therapy.

Islet transplantation

A whole donor pancreas is processed to isolate islet cells, which are then cultured, placed in suspension and injected percutaneously into the portal vein. Two or three such transplants may be required to obtain the end result of insulin freedom. Shapiro *et al.*[5] removed steroids from the immunosuppressive drug regimen of islet transplant patients and improved 1-year insulin freedom to 80%. An explosion of islet cell transplant units occurred worldwide.[5] Unfortunately only 10% of patients remain insulin free at 5 years.

Liver transplantation

This is the ideal therapy for end-stage liver disease and fulminant liver failure. Outcomes are excellent, with 90% 1-year survival and 75% 5-year survival. Liver transplantation is no longer an extremely risky venture, but rather routine, therapy. Indications are deterioration of liver function as gauged by MELD (model for end-stage liver disease). [6] Other indications in patients with liver disease are severe lethargy, variceal bleeding with diminished liver reserve, urticaria, ascites, encephalopathy or spontaneous bacterial peritonitis.[7]

Small-bowel transplantation

This is a highly specialised field applied mostly to infants. Better results are increasingly being obtained. Donors are frequently neonates who are brain dead as a result of a frustrated parent shaking the child violently – the 'shaken baby syndrome'.[8]

Heart transplantation

This is undertaken primarily to improve survival rates and secondarily to improve quality of life. An 80% 3-year survival is expected. Outcomes are determined by both recipient and donor factors.[9]

Lung transplantation

Survival is best with bilateral lung transplant, then single lung transplant, and lastly combined heart-lung transplant. A significant survival advantage exists, and quality of life is returned to near normal in most patients.[10]

Stem cells

Stem cell storage from umbilical cord blood is available but expensive. Currently, applicable uses are limited. Experimentation with cardiac muscle regeneration[11] and neurological spinal cord regeneration are exciting fields with enormous potential.

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Laparoscopic surgery– the good, the bad and the ugly

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This year marks the 20th anniversary of the modern era of laparoscopic surgery. It is remarkable that in this short space of time, most abdominal operations can now be performed laparoscopically– often with greater precision than with open surgery – while offering all the advantages of minimal access surgery. The 'bad' aspect of laparoscopic surgery, at least during its fledgling years, was that the proper acquisition of surgical skills was severely compromised. The learning curve was painful and the proverbial two-edged sword soon reared its ugly head.

This review intends bringing the non-specialist up to date with the current status of established laparoscopic abdominal operations, highlighting some of the emerging and advanced procedures and providing a glimpse at what the future holds for this fascinating new approach to surgery.

Cholecystectomy

There is general acceptance that laparoscopic removal of the gallbladder is the preferred operation for gallstone disease. The fact that this is perceived to be a lesser operation than open surgery should, however, not be construed as a mandate to relax on indications. The main indication for cholecystectomy remains biliary colic and as a general rule asymptomatic gallstones do not warrant removal of the gallbladder. Bile duct injuries remain the major concern with this operation. Unfortunately, the majority of these injuries still go unrecognised at the time of surgery, and there is often a delay in diagnosis during the postoperative period. Since general practitioners are often the first to see these patients, they should take note of the insidious way in which bile peritonitis may present. Bile does not cause early signs of peritonism. Hence patients are frequently discharged from hospital with a seemingly uncomplicated postoperative course. Typically, patients present with vague abdominal pain and distension, fatigue, nausea, loss of appetite, an ileus, mildly deranged liver function tests and a raised white blood cell count. Prompt referral for further investigations is of paramount importance to avoid the devastating consequences of this complication. It should be emphasised that no cholecystectomy is an easy operation and that it is a more hazardous procedure in elderly males, those who have had previous attacks of acute cholecystitis and those with associated bile duct stones.

Antireflux operations

Riding on the crest of 'key hole surgery', laparoscopic antireflux surgery (LARS) for gastro-oesophageal reflux disease (GORD) has enjoyed a meteoric rise since its introduction in 1990, particularly in Western countries. In South Africa, which must have one of the highest operation rates for GORD, the prohibitive expense of proton pump inhibitors (PPIs) (which do not qualify for chronic illness benefits by medical aids) has driven many patients prematurely into the hands of surgeons, who are mostly called upon to evaluate these patients.

In expert hands a long-term cure is of the order of 75 - 80%, but troublesome side-effects such as dysphagia and 'gas-related' symptoms occur in about 10% of patients and may be difficult to treat. It should also be noted that improvement of extra-oesophageal symptoms (hoarseness, asthma and chronic cough) is unpredictable when they fail to respond to PPI therapy. Regression of Barrett's mucosa and the reduction in risk for malignancy are also not achieved with antireflux surgery. Patients should be informed about these facts when surgery is offered.

LARS should be regarded as an alternative to PPI therapy in GORD and should only be considered in patients with proven PPI dependency or where medical therapy fails in patients with regurgitation (high-volume reflux).

Heller's myotomy

Laparoscopic Heller's myotomy with a partial fundoplication has become a well-established operation for achalasia. The jury is still out on whether to dilate or to operate as there appears to be no short-term benefit of the one over the other. As a day-case procedure balloon dilatation, which can be done under conscious sedation, remains an attractive first-line treatment but there is some evidence that it is less effective in young patients and that myotomy provides better overall long-term results.

Sympathectomy and adrenalectomy

Although less commonly performed, sympathectomy and adrenalectomy are eminently suitable for the laparoscopic approach and are now the preferred treatment for hyperhydrosis and most adrenal tumours, respectively. However, large adrenal tumours, most of which are malignant, usually require open surgery.

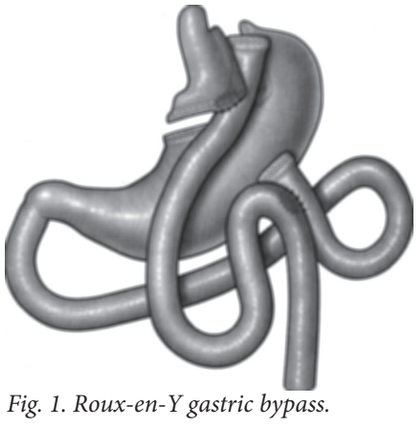

Fig. 1. Roux-en-Y gastric bypass.

Bariatric operations

Morbid obesity has become enemy number one among lifestyle-related diseases in Western countries, particularly in the USA, and South Africa carries a fair share of this burden. It is universally accepted that dietary measures and medical therapies are ineffective and that bariatric surgery is the only successful method of achieving sufficient weight loss to address the complications of morbid obesity.

The current recommendation for bariatric surgery is a BMI over 40 kg/m^2. Three types of laparoscopic bariatric operation

are performed today, namely gastric banding for a BMI of 40 - 50, Roux-en-Y gastric bypass for a BMI of 50 - 60 (Fig. 1), and a biliary-pancreatic bypass procedure for those with a BMI of more than 60. The cost of these procedures is substantial, particularly when subsequent plastic operations are added to the equation, but proponents argue that this outweighs the cumulative long-term expenses related to the disease. These complex operations, which carry considerable morbidity, should be performed only in specialist units with a multidisciplinary team of accredited endocrinologists, dieticians, psychologists and surgeons.

Appendicectomy and inguinal hernia repair

There is ongoing debate regarding the role of laparoscopic appendicectomy and hernia repair. While most randomised controlled trials have not demonstrated an appreciable benefit with the laparoscopic approach, subgroups of patients seem to benefit. The current recommendations for laparoscopic appendicectomy are obese patients and young women, while hernia repair should be reserved mainly for recurrent and bilateral hernias.

Colorectal surgery

The development of specialised staple devices has contributed significantly to the development of laparoscopic colorectal operations. Again, randomised trials have not yet shown clear benefits over open operations, particularly from a cost perspective. Currently the laparoscopic approach is most suitable for right and sigmoid colectomy, reversal of a Hartmann's colostomy, raising of a colostomy and repair of a rectal prolapse.

Other advanced laparoscopic operations

Exciting new and advanced operations are currently being developed in the upper gastrointestinal and hepato-pancreatobiliary field. Examples are: oesophagectomy, distal pancreatectomy and left lateral segmentectomy of the liver, which are increasingly performed in high-volume specialised units with promising results.

The future

Only time will tell where the phenomenal advances in technology will take the scope of laparoscopic surgery in the future, but there is no question that the remarkable progress witnessed over the last 20 years will continue and that the art of surgery has been changed for ever. Robotic surgery has become a reality with a recent 'transatlantic' cholecystectomy being performed where the surgeon was stationed in France and the patient was being operated on in a hospital in the USA. But, the learning curve for most advanced procedures is long and the current expense of longer theatre time and equipment remains a limiting factor in their wider application outside high-volume specialised centres.

Single suture

A healthy weight for babies?

Outdated targets for infant growth may be starting healthy babies on the path to obesity, according to new research. This is just confirming what many mothers have long suspected – that the most commonly used growth charts, based on babies fed on high-protein formula milks, may classify lean but healthy babies as underweight. The generally used growth chart has been used for nearly 30 years. The main aim was to make sure that babies are not underfed and suffer from malnutrition. But, it is now increasingly being recognised that these charts were based on babies who were atypically heavy – almost all fed on high-protein formula diet, from white, middle-class families in Ohio, USA.

The charts were revised in 2000 by the Centers for Disease Control to include more breastfed infants. But, the previous charts have skewed infant nutrition towards overfeeding for decades, according to Bert Koletzko, who heads a major European programme, Earnest, which is set up to investigate the effects of infant nutrition on obesity in adult life.

New Scientist, 28 April 2007.

Single suture

Straight to the tumour

A new delivery system that directs cancer drugs to tumours virtually anywhere in the body should start human testing this year. The new delivery technique, which could dramatically reduce the side-effects of chemotherapy, uses fragments of bacteria to target a tumour, avoiding the need to flood the patient's body with toxic drugs.

Himanshu Brahmbhatt and Jennifer MacDiarmid of Engeneic, in Australia, use *Salmonella enterica* and *Escherichia coli*, making them divide at their centres, instead of at their ends. This produces small buds of cytoplasm called 'engeneic delivery vehicles' or EDVs. These EDVs are repeatedly washed to remove toxins – they have no chromosomes and are not living, are easy to make and can be loaded with chemicals. They are made target-specific using monoclonal antibodies connected via a linker molecule. One of the antibodies attaches to the EDVs' surface, while its partner is specific to a protein on the target tumour. So far results in mice and dogs have been promising and the EDVs can carry multiple drugs, which may be more effective than the usual drug combinations that are used at present.

New Scientist, 12 May 2007.