

# Inguinal hernia guidelines 2015

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**HERNIA INTEREST GROUP  
SOUTH AFRICA**



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# Guideline for the management of inguinal hernias

## Foreword

Inguinal hernia repair is among the most common elective surgical procedures. How effectively this is done has a considerable socioeconomic bearing on a healthcare system.

In South Africa (SA) there are no national management guidelines, training, programme, audit, database or measures of patient outcome following hernia surgery. The South African Society of Endoscopic Surgeons (SASES) and the Association of Surgeons of South Africa established the Hernia Interest Group (HIG) in August 2013, with a view to addressing these shortcomings.

There are many areas in hernia management that are currently still questioned and debated:

- open v. laparoscopic repair
- local v. general anaesthetic
- type of mesh to be used
- is antibiotic prophylaxis essential?
- day case or not?
- what and how outcomes should be measured
- should every patient with a groin hernia have it repaired or is there a place for watchful waiting?

In establishing this management guideline the HIG have highlighted the important issues to be addressed in groin hernia management, and have presented objective, locally relevant evidence-based guidelines that will be useful to surgeons at all levels, referring doctors and the healthcare industry. Development of guidelines is a dynamic process and the intention is to update this guideline every 3 years.

Guidelines for training, research, audit and data analysis will soon follow.

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## Executive summary

**Background.** Inguinal hernia repair is the most frequent general surgical procedure. These guidelines aim to improve and standardise practice. They apply to adult patients only. This is a summary of the key points in the document. The authors strongly recommend the guidelines be read thoroughly.

**Clinical.** The diagnosis is almost always a clinical one. Imaging is seldom required and should only be requested at specialist level.

**Referral.** *Routine* referral of men with uncomplicated, minimally symptomatic, reducible hernias. All hernias should be repaired wherever possible as most patients ultimately come to surgery. *Urgent* referral of all women and men with irreducible hernias is recommended and *emergency* referral is used for patients with obstruction or strangulation. Patients with hernia recurrences should be referred to a surgeon with an interest in hernia surgery.

### Peri-operative.

**Anticoagulation.** It is recommended to continue aspirin, but stop clopidogrel 5 - 7 days before surgery. Warfarin should be stopped 5 days before, and bridging with low-molecular weight heparin (LMWH) should be done if the patient has a high thromboembolic risk.

**Hair removal.** Shaving should be avoided. If needed, clipping is recommended.

**Antibiotic prophylaxis** is not routinely recommended; however, it should be used in high-risk groups (recurrence, age >70, immunocompromised, obese, diabetes mellitus (DM), catheterised patients).

**Anaesthesia.** General anaesthetic (GA) is required for laparoscopic repair, although it is feasible to do a totally extraperitoneal (TEP) repair under spinal anaesthesia. Open repair could be performed under local anaesthesia in all patients with reducible unilateral hernias, especially ASA III/IV, the elderly and those with multiple comorbidities. Patients with morbid obesity, incarcerated hernias, and very anxious patients should have a GA. Spinal anaesthesia is not recommended. Day-case surgery should be offered to all patients, where feasible.

**Surgery.** Laparoscopic repair is the treatment of choice for all inguinal hernias including primary unilateral hernias. The contralateral side should always be inspected for an occult hernia, but repair should only be performed if a defect exists. Prophylactic repair is not advised.

There are no data to recommend transabdominal preperitoneal (TAPP) over TEP repairs or vice versa.

The Lichtenstein repair is the preferred technique for open repairs. The Shouldice repair may be considered if there is gangrenous bowel and resection is required.

All groin hernias must be repaired with a mesh. A regular polypropylene or polyester mesh is adequate for all open and laparoscopic hernia repairs.

*Special circumstances.* If the initial operation was an open repair, then the operation for a recurrence should be laparoscopic, and vice versa. Strangulated hernias may be repaired with open or laparoscopic methods but the bowel should always be inspected.

A femoral hernia should always be excluded in women with a groin hernia. Patients presenting with hernias in pregnancy should be managed conservatively, with a planned postpartum repair.

**Complications.** Include seroma (which is common but often insignificant clinically), haematoma (which should be managed conservatively unless causing tension of skin), urinary retention, ischaemic orchitis, infection, and chronic groin pain. In patients with mesh infection it is not always essential to remove the mesh.

**Aftercare.** Patients may return to work and driving after 1 week.

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## 1. Introduction

Inguinal hernia surgery is the most frequent operation in general and visceral surgery worldwide, with 1.5 million procedures carried out in the Western world every year.<sup>[1]</sup>

Guidelines for inguinal hernia management result in improved patient outcomes and have major medical and economic consequences.<sup>[2]</sup> Hernia recurrence is not a sufficient indicator for assessing the success of a hernia repair. A successful hernia repair also means lower risk of complications, early recovery and minimal risk of persistent pain, disability, a low rate of recurrence,<sup>[2]</sup> improved patient experience and quality of life, and is cost-effective.<sup>[3]</sup>

The current guideline has been developed by the Hernia Interest Group of South Africa (HIG). The aim of the guideline is to improve surgical practice in hernia management, reduce the variation between physicians, make practice more transparent, and serve as a base for education and training. This guideline deals only with inguinal hernias in adults.

The guidelines from the EHS (European Hernia Society), BHS (British Hernia Society), IEHS (International Endohernia Society) and EAES (European Association for Endoscopic Surgery) were incorporated and modified with the best current evidence to suit the local South African (SA) needs.

The Oxford classification for levels of evidence (LOEs)<sup>[4]</sup> was used (Table 1).

The LOEs appear in normal brackets in the text, followed by the reference, where

applicable, as a superscript in square brackets.

### 1.1 Definitions

A hernia is a defect in the abdominal wall that allows intra-abdominal organs to protrude through. A hernia through a defect in the inguinal area is called an inguinal hernia.

### 1.2 Presentation

The hernia could be direct or indirect, primary or recurrent, reducible, irreducible, incarcerated or strangulated. It could be asymptomatic (no discomfort or pain), minimally symptomatic (minor symptoms not interfering with daily life) or symptomatic (presenting with a swelling, pain, discomfort, signs and symptoms of obstruction (nausea, vomiting, distention and abdominal pain), incarceration or strangulation).

An irreducible hernia is an incarcerated hernia, while a hernia with irreducible contents and compromised blood supply is a strangulated hernia.<sup>[5]</sup>

### 1.3 Age

- These guidelines are for adult patients with inguinal hernias.
- No absolute contraindications are identified for endoscopic repair in adolescents aged 14 - 18 years (5).<sup>[5]</sup> The use of mesh in this age group should be individualised (5).
- Groin hernias in young active adults are preferably repaired laparoscopically (1A).<sup>[5]</sup>

## 2. Classifications

A number of classifications exist,<sup>[6]</sup> including Harkins, Casten, McVay, Lichtenstein, Gilbert, Nyhus, Schumpelick and the EHS groin hernia classification.<sup>[7]</sup>

Schumpelick and his colleagues<sup>[8]</sup> developed the Aachen classification using anatomical location (L – lateral or indirect and M – medial or direct) and size (<1.5 cm, 1.5 - 3.0 cm, >3 cm). The EHS board added F – femoral hernia, P – primary and R – recurrent hernia forming the EHS classification for inguinal hernia.

**Table 1. The Oxford classification for levels of evidence (LOEs)<sup>[4]</sup>**

1A: SR (with homogeneity) of RCTs
1B: Individual RCT (with narrow confidence interval)
1C: All or none
2A: SR (with homogeneity) of cohort studies
2B: Individual cohort study (including low-quality RCT, e.g. <80% follow-up)
2C: 'Outcomes' research; ecological studies
3A: SR (with homogeneity) of case-control studies
3B: Individual case-control study
4: Case series (and poor-quality cohort and case-control studies)
5: Expert opinion without explicit critical appraisal; or based on physiology, bench research, or 'first principles'

SR = systematic review; RCTs = randomised controlled trials.

**Table 2. HIG – SA classification**

Size (cm)	0 (nil felt)	1 (<1.5 cm)	2 (1.5 - 3.0 cm)	3 (>3 cm)
Site	Medial	Lateral	Femoral	-
Side	Unilateral	Bilateral	-	-
Type	Primary	Recurrent	-	-

The HIG modified the Schumpelick classification by adding U – unilateral and B – bilateral hernia (Table 2).

### 3. Differential diagnosis

Differential diagnosis of a groin swelling: primary inguinal hernia, recurrent inguinal hernia, femoral hernia, incisional hernia, lymphadenopathy, aneurysm, saphena varix, soft-tissue tumour, abscess, ectopic testis, endometriosis<sup>[2]</sup> and epididymo-orchitis.

### 4. Risk factors

Smoking, deficiencies of collagen metabolism, positive family hernia history, ascites, peritoneal dialysis, chronic obstructive pulmonary disease (COPD) and performing long-term heavy work increase the risk for developing a groin hernia. HIV-infected male patients on antiretroviral drugs may have an increased incidence of abdominal wall hernias.<sup>[5]</sup>

### 5. Prevention

Stopping smoking is sensible advice for preventing the development of inguinal hernias.<sup>[2]</sup> Besides cessation of smoking and maintaining fitness, very little can be done to prevent inguinal hernia formation.<sup>[9]</sup>

### 6. Investigations

The diagnosis of an inguinal hernia is based on clinical findings. History of a reducible swelling confirmed on clinical examination should suffice.

Preoperative differentiation between direct and indirect hernia is not essential (2C).<sup>[2]</sup> If diagnostic uncertainty exists or exclusion of other causes for the patient's symptoms is necessary, then radiological imaging is required.<sup>[3]</sup>

Imaging should be done only at the specialist level in order to reduce costs (5).<sup>[3]</sup>

Ultrasound is the first line of investigation (2B).<sup>[3]</sup> If this is negative, a magnetic resonance imaging (MRI) or computed tomography (CT) scan should

be considered. If these are normal, referral to a physiotherapist or biokineticist could be considered. A diagnostic laparoscopy should be considered a last resort.

### 7. Referral

- **Routine:** Men with occult, asymptomatic, minimally symptomatic and reducible symptomatic inguinal hernias (5).<sup>[3]</sup>
- **Urgent:** Men with irreducible hernias, partially reducible and a history of being irreducible; all women with groin hernias (5).<sup>[3]</sup>
- **Emergency:** When strangulation or obstruction is suspected (5).<sup>[3]</sup>

#### 7.1 Where to refer

- Patients with primary inguinal hernia can be referred to any surgeon who regularly does hernia repairs (5).<sup>[3]</sup>
- Patients with bilateral or recurrent hernias should possibly be referred to a surgeon who performs both open and laparoscopic repair, where possible (5).<sup>[3]</sup>
- Patients with two or more recurrences should be referred to a surgeon with special interest in hernia repairs.<sup>[3]</sup>

### 8. Preoperative preparation

A detailed preoperative medical assessment should be performed (5).

#### 8.1 Deep vein thrombosis prophylaxis

Evidence for routine thromboembolic prophylaxis is insufficient in respect of laparoscopic hernia surgery.<sup>[1]</sup> Thromboembolic prophylaxis, given according to usual routine, is recommended in patients with risk factors.<sup>[1]</sup>

#### 8.2 Antithrombotic therapy

Anticoagulants should be stopped before surgery, if possible.<sup>[1]</sup> This should be done in consultation with the treating physician or cardiologist.

Aspirin should be continued peri-operatively.<sup>[10]</sup> Clopidogrel should be

stopped 5 - 7 days before surgery if there is no increased risk for thrombosis.<sup>[11]</sup>

**8.2.1 Warfarin.** In low-risk patients the warfarin is stopped 5 days before the procedure and there is no need for any bridging treatment.<sup>[12]</sup> If the patient has a high thromboembolic risk the patient will need peri-procedural bridging with low-molecular-weight heparin (LMWH).<sup>[12]</sup> An INR of <1.5 is recommended before surgery. LMWH injections start 36 hours after the last warfarin dose.<sup>[12]</sup> LMWH is stopped 24 hours before the procedure and started again 24 hours after the procedure.<sup>[12]</sup>

#### 8.2.2 New oral anticoagulants (NOACs)

**Dabigatran:** if creatinine clearance is >50 mL/min, the drug is stopped 1 - 2 days before the procedure; if <50 mL/min it is stopped 3 - 5 days before the procedure, and is restarted 12 - 24 hours after the procedure.<sup>[19]</sup>

**Rivaroxaban:** if creatinine clearance is >30 mL/min, the drug is stopped 24 hours before the procedure; if <30 mL/min then it is stopped 48 hours before the procedure. The drug is restarted 12 - 24 hours after the procedure.<sup>[12]</sup>

Because the action of NOAC is fast, there is no need for perioperative bridging.<sup>[12]</sup> If the patient cannot eat for few days after surgery then LMWH is given for that period.<sup>[12]</sup>

If the risk of bleeding is very high, pneumatic compression devices instead of bridging therapy can be considered.<sup>[12]</sup>

In an emergency setting, patients who are taking anticoagulants or are at risk for bleeding may be better suited to open repair (5).<sup>[3]</sup>

#### 8.3 Hair removal

Avoid shaving if possible. If needed, clipping is preferred.<sup>[5]</sup> Fewer surgical site infections occur with clipping than with razor shaving.<sup>[1]</sup> No benefits are evident for the use of depilatory creams as opposed to razor shaving.<sup>[1]</sup>

There is no difference in the frequency of surgical site infection when hair is removed the day before or on the day of the surgery (1A).<sup>[1]</sup>

#### 8.4 Antibiotic prophylaxis

Routine use of prophylactic antibiotics is not recommended in laparoscopic or

elective open repair in low-risk patients (2A),<sup>[3]</sup> (1A),<sup>[1,2]</sup> (5).<sup>[5]</sup> If risk factors for infection are present, antibiotic prophylaxis should be considered (2B).<sup>[3]</sup>

**Risk factors.** Recurrent hernias, advanced age (over the age of 70) immunosuppressed patients, obesity, diabetes, malignancy, expected long operating times, use of drains (2C),<sup>[2]</sup> contamination and urinary catheters.<sup>[1]</sup>

## 9. Anaesthesia

### 9.1 Laparoscopic hernia repair

Laparoscopic hernia repair is almost universally performed under general anaesthesia (GA). Isolated cases are reported of total extraperitoneal (TEP) repair being performed with spinal anaesthesia.<sup>[1,3]</sup> Laparoscopic TEP repair under spinal anaesthesia appears to be safe, technically feasible and an acceptable alternative to GA<sup>[3]</sup> in selected cases.

### 9.2 Open repair

- Local anaesthesia (LA): Most open hernia techniques are eligible for LA (2A).<sup>[2]</sup> All adult patients with a primary, reducible unilateral hernia should be considered for LA (1A).<sup>[2]</sup> LA is recommended for ASA III and IV patients<sup>[2]</sup> and in elderly patients and patients with comorbidities (2B).<sup>[3]</sup> Exceptions are morbid obesity, incarcerated hernias and young anxious patients.<sup>[2]</sup> All patients undergoing LA should have long-acting anaesthetic infiltration.<sup>[2]</sup> LA can be given by local infiltration, block of the ilioinguinal or iliohypogastric nerves or a combination.<sup>[2]</sup>
- Spinal anaesthesia (especially when using high doses and/or long-acting agents) has no documented benefits and should be avoided (2A).<sup>[2]</sup> It increases the risk of urinary retention (1B).<sup>[2]</sup>
- GA using short-acting agents together with local infiltration is an acceptable alternative to LA.<sup>[2]</sup>

## 10. Day/inpatient surgery

Inguinal hernia surgery as day-case surgery (where discharge takes place on the same day) is as safe and effective as surgery performed in an inpatient setting and is cost-effective (2B).<sup>[2]</sup> The pre-assessment process by the surgeon and anaesthetist, the surgical infrastructure, patient access and surgeon availability are important in ensuring appropriate selection and effective day-case services.<sup>[1,4]</sup>

Day surgery for hernia repair should be offered to every patient (2A).<sup>[2,3]</sup> Selected older and ASA III/IV patient are also eligible for day surgery (4).<sup>[2]</sup> Patients with comorbidity, social reasons and complex inguinal hernias may require postoperative inpatient stay.<sup>[1,4]</sup>

## 11. Treatment of hernias

### 11.1 Surgical options

All patients with inguinal hernia should be offered surgical repair.<sup>[5]</sup>

The anterior open Lichtenstein (1984) and the posterior, laparoscopic inguinal hernia techniques (1991) are recommended as the best evidence-based options for the repair of a primary unilateral hernia (1A).<sup>[2]</sup> It is the HIG opinion that after taking all the available information into consideration, laparoscopic repair of inguinal hernias is the suggested treatment of choice for primary unilateral inguinal hernias.

### 11.1.1 Laparoscopic repair

- Two main types: total extraperitoneal (TEP) and transabdominal preperitoneal (TAPP).
- Laparoscopic hernia repair, compared with open repair, is associated with less acute and chronic pain and the chronic pain is less severe; there is less postsurgery numbness in the groin, less infection and a quicker return to work (2A).<sup>[3,14]</sup> It is also associated with a lower incidence of haematoma formation and earlier return to normal activities (1A).<sup>[2]</sup>
- There is no evidence supporting TEP instead of TAPP repair and vice versa (2B).<sup>[3,14]</sup>
- TAPP is associated with more port-site hernias, visceral injuries and possibility of adhesion formation; there are more conversions with TEP (2A).<sup>[2]</sup>
- Laparoscopic inguinal hernia repair is not contraindicated in patients with previous major, open lower abdominal surgery or previous radiotherapy to the pelvic organs (5),<sup>[2]</sup> but patient selection and surgical skill need to be considered (5).
- A laparoscopic technique should be considered if a quick postoperative recovery is particularly important (1A).<sup>[2]</sup>
- A laparoscopic hernia surgeon must be familiar with open techniques, because there are instances when the procedure needs conversion.<sup>[1]</sup>
- In laparoscopic repair a mesh of at least 10 × 15 cm should be considered (5).<sup>[2,5]</sup> The higher recurrence rate for laparoscopic repair in some series may be related to the small size of mesh used (7 × 12 cm).<sup>[2]</sup> Sufficient overlap of the mesh is more important than fixation of the mesh. The mesh should overlap the hernia defect by at least 3 cm in all directions.<sup>[1]</sup>

### 11.1.2 Open repair

- The Lichtenstein open mesh repair is the preferred technique for all open hernia surgery (5).<sup>[2]</sup>
- Techniques using mesh result in fewer recurrences than techniques which do not use mesh (1A),<sup>[2]</sup> irrespective of the placement method (open or laparoscopic).<sup>[3]</sup>
- The use of mesh is associated with a lower incidence of chronic groin pain (1B).<sup>[2]</sup>
- Patients with recurrent hernia who cannot undergo GA (and laparoscopic repair) may be considered for open preperitoneal hernia repair with mesh (Stoppa, Cooper ligament repair).<sup>[1]</sup>
- Other open mesh techniques (Prolene hernia system, Kugel patch, plug and patch) show similar results to the Lichtenstein technique in short-term follow-up.<sup>[2]</sup>
- The Shouldice repair technique should be used in a non-mesh repair (1A).<sup>[2]</sup> A suture (non-mesh) repair could be considered if gangrenous bowel is present and resection is required.<sup>[15]</sup> Suture repair may also be used in indirect inguinal hernias in women.<sup>[16]</sup>

Intraperitoneal onlay mesh (IPOM) cannot be recommended for mainstream inguinal hernia repair at this time.<sup>[1]</sup>

### 11.2 Non-surgical options

The majority of patients with an asymptomatic inguinal hernia eventually become symptomatic; thus, an elective repair is recommended in patients who have no contraindications to

surgery. Evidence for a watchful waiting policy is lacking.<sup>[5]</sup> High-risk patients will require an individualised approach (5).

*Hernia truss.* Its use is not recommended (5).

## 12. Approach to specific types of hernias

### 12.1 Recurrent hernias

If the initial operation was an open repair, then the operation for a recurrence should be a laparoscopic repair, and vice versa (2A),<sup>[3]</sup> (5).<sup>[2]</sup> Repeat laparoscopic repair is only feasible when the surgeon has a high level of experience in laparoscopic hernia repair (5).<sup>[5]</sup> TAPP repair of recurrent inguinal hernia after prior TEP or TAPP may be performed, but only by experts in TAPP.<sup>[1]</sup> The old mesh is left in place and the new mesh can be laid on top.<sup>[1]</sup>

### 12.2 Bilateral

Laparoscopic repair is the preferred option, from a patient outcome (and cost-effectiveness perspective) (5).<sup>[3]</sup> No clear advantage is noted for TEP over TAPP, and vice versa, in bilateral hernia repair (2A);<sup>[5]</sup> however, a TAPP procedure takes longer (5).

### 12.3 Contralateral

When an incidental, asymptomatic contralateral hernia is discovered during laparoscopic repair of a symptomatic unilateral hernia, both should be repaired during the same procedure (5).<sup>[5]</sup> In the absence of a contralateral hernia, prophylactic placement of a mesh in the contralateral area is not advisable (5).<sup>[5]</sup> If a strong clinical suspicion of a hernia exists, but no hernia opening is visible, a preperitoneal exploration is indicated.<sup>[1]</sup> The patient with unilateral hernia should be asked to give consent to allow simultaneous repair if a contralateral hernia is found and he/she wishes it.<sup>[1,5]</sup>

### 12.4 Incarcerated/strangulated hernias

These hernias can be repaired laparoscopically or using an open approach. The incarcerated viscus must be inspected. If the viscus has been reduced by the time of exploration, it will need to be inspected by open or laparoscopic means (5).

Incarcerated hernias should be operated on urgently (2A)<sup>[5]</sup> to prevent ischaemia of the incarcerated viscera.<sup>[5]</sup>

Incarcerated femoral hernias may be safely repaired via the TAPP or TEP repair.<sup>[1]</sup> The use of a flat mesh is recommended.<sup>[1]</sup>

Mesh placement after bowel resection is possible, in clean contaminated situations (2A).<sup>[5]</sup> A suture (non-mesh) repair could be considered if resection is required when gangrenous bowel and peritonitis is present.<sup>[1,5]</sup>

Laparoscopic repair should be avoided in the setting of peritonitis or an infected abdominal wall.<sup>[1]</sup>

### 12.5 Large hernias

Three treatment options are available:

- Lichtenstein repair
- Preperitoneal repairs (i.e. Stoppa)
- Laparoscopic approach.

When repairing a large hernia (>3 - 4 cm) laparoscopically a larger mesh should be used (12 × 17 cm).<sup>[1]</sup> The mesh should be fixed

to the symphysis, Cooper's ligament and rectus muscle.<sup>[1]</sup> If the hernia is large and direct, reduction of dead space (fixation of the transversalis fascia) could be considered (5).<sup>[5]</sup>

## 13. Special groups

### 13.1 Hernias in women

A laparoscopic approach is recommended in inguinal hernias in women (2A),<sup>[3]</sup> (5).<sup>[1,2]</sup> The existence of a femoral hernia should be excluded in all cases of groin hernias in women (5).<sup>[2]</sup> Women have a higher rate of recurrence of 'inguinal hernias' because of higher occurrence of femoral hernias (overlooked or *de novo*) (2C).<sup>[1,2]</sup> Recurrent hernias in women should be repaired laparoscopically if the expertise is available (5).<sup>[3]</sup>

### 13.2 Hernias in obesity

No evidence exists for the preferential use of any particular approach in morbidly obese patients (5).<sup>[3]</sup>

### 13.2 Hernias in pregnancy

A conservative approach is suggested with an elective postpartum repair.<sup>[17]</sup>

### 13.3 Sportsman's hernia

- Among professional athletes, groin pain is common.<sup>[5]</sup> The common causes are osteitis pubis or musculotendinous injuries.<sup>[1]</sup>
- A multidisciplinary team should evaluate a patient with possible sportsman's hernia (5).<sup>[5]</sup>
- Imaging techniques may be needed to investigate a possible sportsman's hernia and to exclude other causes of groin pain.<sup>[5]</sup> Ultrasound is the preferred imaging technique. MRI may sometimes be needed (5).
- In unclear cases, if posterior wall deficiency is suspected, diagnostic surgical exploration may be performed (4).<sup>[1]</sup>
- The decision to operate should be taken by the multidisciplinary team and not by the surgeon alone.
- Laparoscopic mesh repair is effective in sportsman's hernias (1B).<sup>[5]</sup>
- A 6-week rehabilitation programme should be undertaken after both open and laparoscopic repair (4).<sup>[1]</sup>

## 14. Technical considerations

### 14.1 General points: Laparoscopic repair

- Reduction should be attempted in incarcerated hernias with no strangulation symptoms.<sup>[2]</sup>
- Lipoma of the cord: Lipomas of the spermatic cord/round ligament and the pre-peritoneal lipomas of direct and femoral sacs should be removed.<sup>[1]</sup>
- If dense adhesions to the cord structures are present, the sac may be transected at the level of the inner inguinal ring to prevent injury.<sup>[1]</sup>
- Complete parietalisation of the vas deferens and the testicular vessels needs to be performed.<sup>[1]</sup>
- In large direct hernias, the extended transversalis fascia (sac of the hernia) should be inverted.<sup>[1]</sup> The whole pelvic floor should be completely dissected for flat placement of the mesh to cover the entire myopectineal orifice and prevent its folding.<sup>[1]</sup>

- The mesh should cover all the fascial defects in the groin, including Hesselbach's triangle, the indirect, the femoral and the obturator ring.<sup>[1]</sup>
- A thorough closure of the peritoneal incision or tears should be done.<sup>[1]</sup> This can be accomplished with a running suture.<sup>[1]</sup>
- Drains: Wound drains should be used only when specifically indicated (large blood loss, coagulopathies) (2A).<sup>[2]</sup>

## 14.2 Mesh

### 14.2.1 Types of mesh

- No universally accepted and widely used classification currently exists for hernia meshes.<sup>[3]</sup> The parameters of the ideal mesh are not known.<sup>[2]</sup>
- More than 200 commercial meshes are available on the market, with major and minor variations in polymer, structure<sup>[3]</sup> and textile parameters (polymer, filament, construction, pore size, elasticity, tensile strength, weight, and surface).<sup>[2]</sup>
- Most synthetic meshes are constructed from a base polymer of polypropylene, polyester or expanded polytetrafluoroethylene (ePTFE).<sup>[3]</sup> ePTFE is not indicated for use in the extraperitoneal repair of inguinal hernias.<sup>[3]</sup>
- Textile requirements for meshes are: monofilament structure, pore size 1 - 1.5 mm and tensile strength >16N/cm (3).
- Monofilament polypropylene and polyester meshes appear to produce comparable results<sup>[3]</sup> and are the meshes we recommend.
- Multifilament materials seem to be associated with increased bacterial adhesion *in vivo* and *in vitro* in experimental studies.<sup>[3]</sup>
- Meshes are arbitrarily divided into two groups, 'lightweight' and 'heavyweight'.<sup>[3]</sup>
- The use of lightweight/large-pore meshes in open inguinal hernia repair seems to decrease long-term discomfort and foreign-body sensation but possibly at the cost of increased recurrence rate (1A).<sup>[2]</sup> The EAES consensus document suggests that insufficient evidence supports the general use of lightweight mesh over heavyweight mesh in laparoscopic hernia repair (1A).<sup>[5]</sup>

### 14.2.2 Meshes in inguinal hernia repairs

- All adult patients with inguinal hernias should be offered a tension-free repair, using synthetic, non-absorbable flat meshes (or composite meshes with a non-absorbable component) (1A).<sup>[2,3]</sup>
- The use of synthetic meshes substantially reduces the risk of hernia recurrence irrespective of the placement method.<sup>[2]</sup>
- The use of mesh in inguinal hernia repair is not associated with a higher risk of wound infection.<sup>[2]</sup>
- The use of mesh in hernia repair can be related to some nonspecific complications (pain, infection, recurrence) or some specific complications (shrinkage, dislocation, migration, erosion).<sup>[2]</sup>

### 14.2.3 Mesh fixation

#### 14.2.3.1 Laparoscopy

- Sufficient overlap of the mesh is more important than fixation of the mesh (5).<sup>[5]</sup>
- In TAPP repair, the mesh is usually fixed with glue or tackers.<sup>[5]</sup> The type of fixation in TAPP does not seem to influence the recurrence rate or occurrence of acute or chronic pain.<sup>[5]</sup>

- In TEP repair, the mesh is not fixed or is fixed with glue or tackers.<sup>[5]</sup>
- Tacker or suture fixation in laparoscopic hernias should not be done in the inferior or lateral position. Avoid the so-called triangle of doom, triangle of pain and circle of death.
- When fibrin sealant is used, it is applied to the Cooper's ligament, the inferior edge and medial corner of the mesh and held in position with graspers for a few minutes.<sup>[1]</sup>

#### 14.2.3.2 Open hernia

- Sutures, glue or tackers can be used for fixation.
- Studies on self-adherent meshes show mixed results. Some show significant improvement in quality of life,<sup>[18]</sup> while others show the same results (no reduction in chronic symptoms) as suture fixation.<sup>[19]</sup> Data are limited and long-term results are needed (5).

## 15. Postoperative analgesia

- Postoperative pain is best treated with a combination of LA and peripherally acting agents (paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) or a combination).<sup>[3]</sup>
- Local infiltration of the wound or regional nerve blocks provide extra pain control and limit the use of analgesics (2A),<sup>[3]</sup> (1A).<sup>[2]</sup> Opioids should be avoided because of their side-effects (2A).<sup>[3]</sup>

## 16. Complications

- **Seromas** are common but lack clinical significance (incidence of 7%) (5).<sup>[5]</sup> The incidence of seroma is significantly higher for laparoscopic than for open repair.<sup>[2]</sup> Patients should be informed preoperatively about the possibility of seroma formation (5).<sup>[5]</sup> Aspiration of seromas is not necessary (2C),<sup>[2]</sup> (5).<sup>[5]</sup> Most disappear spontaneously within a period of 6 - 8 weeks.<sup>[2]</sup>
- **Small haematomas** can be treated conservatively.<sup>[2]</sup> Haematomas causing tension of the skin should be surgically evacuated (2A).<sup>[2]</sup> The incidence of haematomas is lower for laparoscopic than open repairs.<sup>[2]</sup>
- The current recommendation is that patients should empty their **bladder** prior to laparoscopic or open procedures (5).<sup>[1,2]</sup> A full bladder predisposes the patient to bladder injury (4).<sup>[1,2]</sup> The possibility of bladder herniation should be considered in direct hernias (5).<sup>[2]</sup> Restricting intravenous fluid administration perioperatively reduces the risk of postoperative urinary retention.<sup>[1]</sup> Urinary retention prolongs hospitalisation and predisposes the patient to urinary tract infection.<sup>[1]</sup> Perioperative catheterisation of the urinary bladder is rarely necessary (4).<sup>[1]</sup> If technical difficulties or extended operating times arise, consider using a urinary catheter during the procedure.<sup>[1]</sup> Recognised intraoperative bladder injuries may be managed laparoscopically (3B).<sup>[1]</sup> All patients should pass urine before discharge (5).
- Damage to cord structures should be avoided (5).<sup>[2]</sup> Minimising cord dissection is recommended.<sup>[2]</sup> Transecting the hernia sac and leaving the distal part *in situ* is also recommended (5).<sup>[2]</sup> This is done to reduce the risk of **ischaemic orchitis**.<sup>[2]</sup> No significant difference in testicular complications occurs after either open or laparoscopic hernia repair (1A).<sup>[1]</sup>
- Most **vascular injuries** are to the inferior epigastric vessels; vascular injuries occur more often in TEP series, while small-bowel and bladder injuries are more common after TAPP repair.<sup>[1]</sup>



- **Infection:** the risk of wound infection should be less than 5%.<sup>[2]</sup> Superficial infections are rare (1 - 3% for open and <1% after laparoscopic surgery).<sup>[2]</sup> Mesh infections rarely occur after laparoscopic hernia repair (1A).<sup>[5]</sup> In cases of mesh infection, removal of the mesh is generally not necessary (5).<sup>[5]</sup> In monofilament materials, drainage and antibiotics are sufficient and the mesh does not usually require removal.<sup>[2]</sup> Removal of the mesh is inevitable with multifilament meshes.<sup>[2]</sup>
- **Mesh erosion** into the bladder is rare and could present as repeated urinary tract infections, haematuria or the development of bladder stones.<sup>[1]</sup>

## 17. Chronic pain

- Chronic pain after inguinal hernia repair is defined as pain lasting for 3 months or more.<sup>[2]</sup>
- The patient should be informed about the possibility of this negative outcome.<sup>[1]</sup>
- Postoperative pain is more frequent than previously thought.<sup>[2]</sup> Moderate-to-severe pain has been experienced by 10 - 12% of patients.<sup>[1]</sup>
- Risk factors for chronic pain are:
  - preoperative pain in the groin
  - preoperative chronic pain conditions not related to the groin (headache, back pain and irritable bowel syndrome) (2B).<sup>[2]</sup>
  - early postoperative pain
  - recurrent hernia
  - patients aged <50 years, female gender, and surgical complications such as seroma, wound infection, bowel or bladder injury, bowel obstruction, patients who received workers' compensation and employed patients.<sup>[1]</sup>
- Bilateral hernia, body weight, hernia defect size or location and mesh size are not related to acute and chronic pain.<sup>[1]</sup>
- The risk of chronic pain is less after hernia repair with mesh than after non-mesh repair (1B).<sup>[2]</sup>
- Laparoscopic techniques (TAPP and TEP) should be preferred to open mesh or non-mesh repair to reduce acute pain and the risk of chronic pain.<sup>[1]</sup> Laparoscopic surgery offers a reduction in acute pain compared with open surgery.<sup>[5]</sup> The risk of chronic pain is lower after laparoscopic hernia repair than after open hernia repair (1B).<sup>[2]</sup>
- Nerve entrapment and pain caused by shrinkage of the mesh due to scar tissue formation have been suggested as possible causes of chronic pain.<sup>[1]</sup>
- The difference in postoperative pain scores in favour of the laparoscopic approach diminish over time.<sup>[5]</sup>
- The risk of chronic pain after hernia surgery decreases with age (2A).<sup>[2]</sup>

### 17.1 Prevention of chronic pain

- The identification of all three inguinal nerves at risk during open hernia surgery may reduce chronic pain (2A).<sup>[2]</sup>
- Prophylactic resection of the ilio-inguinal nerve does not reduce the risk of chronic pain (2A).<sup>[2]</sup>
- Fibrin glue and non-fixation techniques were compared with mesh fixation with staples and tackers in laparoscopy.<sup>[2]</sup> No differences were found in the risks of late chronic pain in two studies, while one study reported less pain with fibrin glue.<sup>[2]</sup>

- Lightweight meshes seem to decrease long-term discomfort in open hernia repair.<sup>[2]</sup>

## 17.2 Treatment of chronic pain

- The current recommendation is to take into account the risks for the development of chronic postoperative pain when deciding upon the method of hernia repair (2A).<sup>[2]</sup>
- A multidisciplinary approach at a pain clinic should be considered for the treatment of chronic post-hernia repair pain (2C).<sup>[2]</sup>
- Surgical treatment of specific causes can be beneficial, such as the resection of the entrapped nerves, mesh removal in mesh-related pain and removal of endoscopic staples or fixing sutures.<sup>[2]</sup>

## 18. Sexual complications

- Preoperative hernia-related sexual dysfunction was successfully treated by hernia operation in all cases in one study.<sup>[2]</sup>
- The same study showed that postoperative sexual dysfunction recovered spontaneously in 6/10 patients within 12 months.<sup>[2]</sup>
- Another study indicated that laparoscopic repair caused more severe pain during sexual activity compared with the Lichtenstein repair.<sup>[1]</sup>
- Caution must be exercised when dissecting the cord structures to avoid the possibility of injury to the vas deferens or blood supply to the testicle.<sup>[1]</sup>
- Transection of the hernia sac, leaving the distal part in situ, is recommended to reduce the risk of ischaemic orchitis (5).<sup>[2]</sup>
- Mesh repair, in general, does not seem to cause infertility in men (2C).<sup>[5]</sup>

## 19. Mortality

- The mortality following elective hernia repair is 0.02% in patients under the age of 60 and 0.48% above 60 in a Danish study of 26 304 patients.<sup>[2]</sup>
- The mortality was 7% if the repair was done as an emergency in the same Danish study.<sup>[2]</sup>
- The mortality increased 20-fold (0.4%) if bowel resection was performed.<sup>[2]</sup>
- The mortality increased sevenfold (0.14%) after a femoral hernia repair.<sup>[2]</sup> For this reason, early planned surgery is recommended in femoral hernias even with vague or absent symptoms (2A).<sup>[2]</sup>
- Efforts should be intensified to improve the early diagnosis and treatment of patients with incarcerated and/or strangulated hernia (5).<sup>[2]</sup>
- Women have a higher mortality risk than men because of a greater risk for emergency procedures.<sup>[2]</sup>

## 20. Aftercare

- The current recommendation is not to place limitations after an inguinal hernia repair (2C);<sup>[2]</sup> a ban on lifting, participating in sports or working is not necessary.<sup>[2]</sup> A limitation on lifting heavy weights for 2 - 3 weeks is probably sufficient (2 C).<sup>[2]</sup> Early mobilisation of patients after inguinal hernia repair is associated with shorter convalescence and earlier return to work (3).<sup>[5]</sup>
- Early activity after groin hernia repair does not increase recurrence rates (3).<sup>[5]</sup>
- Median time for return to work is 7 days for all uncomplicated inguinal hernia surgeries (2B).<sup>[3]</sup>

- Patients should be able to drive 7 days after both open and laparoscopic hernia repair (5).<sup>[3]</sup>

## 21. Quality assessment

- Quality of life after laparoscopic groin hernia repair is generally excellent in most patients (1A).<sup>[5]</sup>

## 22. Economic considerations

- From a funder perspective, an open mesh repair is the most cost-effective operation in primary, unilateral hernias (1A).<sup>[2]</sup>
- From a socioeconomic perspective, a laparoscopic procedure is proposed for the active, working population, especially for those with bilateral hernias (1A).<sup>[2]</sup>
- The need for special equipment and GA makes laparoscopic repair more expensive than open repair.<sup>[5]</sup> Eliminating fixation devices, performing TEP without balloon dissection and doing laparoscopic repairs as day-cases reduce the costs of laparoscopy.<sup>[1]</sup>
- Direct medical costs of laparoscopy are higher than for open repairs, but if societal costs are included, total costs were similar or lower after laparoscopic repair in many studies (1A).<sup>[5]</sup>

## 23. Diagnostic coding

### 23.1 Procedure codes

- 1819: Inguinal or femoral hernia in adults
- 1821: Inguinal or femoral hernia in child under 14 years
- 1823: Inguinal hernia: infant under 1 year
- 1825: Recurrent inguinal or femoral hernia
- 1827: Strangulated inguinal or femoral hernia

### 23.2 Diagnostic codes

- K40: Unilateral or unspecified inguinal hernia
- K40.0: Bilateral inguinal hernia with obstruction, without gangrene
- K40.1: Bilateral inguinal hernia with gangrene
- K40.2: Bilateral inguinal hernia without obstruction or gangrene
- K40.3: Unilateral or unspecified inguinal hernia with obstruction without gangrene
- K40.4: Unilateral or unspecified inguinal hernia, with gangrene
- K40.9: Unilateral or unspecified inguinal hernia without obstruction or gangrene

## 24. Training

- Adequate patient selection and training might minimise the risks for the infrequent but serious complications seen in the learning curve of laparoscopic techniques (2C).<sup>[2]</sup>
- Development of structured training programmes is mandatory.<sup>[5]</sup>
- The learning curve is longer for laparoscopic repair (especially TEP) than for Lichtenstein repair and ranges between 50 and 100 procedures (2C).<sup>[2]</sup> The learning curve can be evaluated by means of operative times, rate of conversions and complications.<sup>[2]</sup> Previous experience with other laparoscopic procedures and experience in open hernia repairs determines the number of cases required to accomplish competency.<sup>[5]</sup>
- Hernia training with adequate mentoring should be started with junior registrars (2C).<sup>[2]</sup>

- Junior registrars performing the Lichtenstein procedure have higher recurrence rates than senior registrars.<sup>[2]</sup> No differences are seen for laparoscopic repairs.<sup>[2]</sup>
- All graduating general surgeons should have a profound knowledge of the anterior and posterior preperitoneal anatomy of the inguinal region (5).<sup>[2]</sup>
- Postgraduate training in laparoscopic inguinal hernia repair should be offered to inexperienced surgical specialists.<sup>[2]</sup>
- Specialist centres seem to perform better than general surgical units, especially for laparoscopic repairs (2C).<sup>[2]</sup>
- Complex inguinal hernia surgery (multiple recurrences, chronic pain, mesh infection) should be performed by an experienced hernia surgeon (5).<sup>[2]</sup>
- A laparoscopic hernia surgeon must be familiar with open techniques because a need for conversion sometimes arises.<sup>[3]</sup>

## 25. Hernia registry

A national hernia registry could provide meaningful data to all healthcare providers to make informed decisions to improve the quality of hernia care.

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**THE HERNIA INTEREST GROUP OF SOUTH AFRICA( HIG)** is a group of surgeons with an interest in hernia care. We are involved with teaching, training, research and the development of management guidelines.

We also aim to provide an unbiased source of hernia information for surgeons, general practitioners, other healthcare professionals, patients, their families and the healthcare industry.

## **MISSION STATEMENT**

The mission of HIG includes:

1. Develop guidelines for hernia management for the South African environment.
2. Develop a national training programme for trainers and trainees for open and laparoscopic hernia repair
3. Address the possibility of a national data base or registry
4. Help identify locally relevant research questions and facilitate the process of research
5. Establish a close working relationship with all the role players
6. Cooperation in educational endeavors with groups of similar interest throughout Africa and beyond.

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