Abstract

Inguinal hernia repair is a common operation often performed as a day case procedure. Day surgery is popular with patients and offers many benefits. This article outlines the most common forms of hernia repair and discusses the need for general or local anaesthesia. Basic principles of day surgery management, including patient selection criteria, pain relief, post-operative information, nurse-led discharge and subsequent aftercare are described, many of which are applicable to other day surgery procedures.

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Keywords

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Introduction

An inguinal hernia is a protrusion of abdominal contents through the muscle of the abdominal wall at the level of the inguinal canal in the groin. It is most commonly seen in men (Purkayastha et al 2008), because they have an inherent weakness in the abdominal wall where the spermatic cord passes through the inguinal canal, but it can also occur in women. It is also increasingly common with ageing because the muscles in the abdominal wall become weaker. The protrusion may be an out-pouching of peritoneum, but it often contains peritoneal fat or bowel (Purkayastha et al 2008), and can appear as a swelling or lump. If the lump appears intermittently, usually on standing or on straining, and then disappears on lying down or can be pushed back into the abdominal cavity, then the hernia is said to be reducible. A lump that

Aims and intended learning outcomes

The aim of this article is to provide an overview of the pathology of an inguinal hernia and the indications for surgical repair. After reading this article and completing the time out activities you should be able to:

- Describe the pathology of an inguinal hernia and reasons for surgical repair.
- Outline the most common methods of inguinal hernia repair, including open surgery and laparoscopic surgery.
- List the benefits of performing hernia repair under local anaesthesia.
- Discuss why day surgery is appropriate for the majority of patients undergoing inguinal hernia repair.
- Describe the basic principles of day surgery, in particular regarding analgesia, which can be applied to other procedures.
- Explain the importance of providing patient information to aid early detection and treatment of post-operative complications.
remains permanently outside the abdominal cavity and which cannot be pushed back is said to be irreducible (Purkayastha et al 2008).

If a loop of bowel becomes trapped in an irreducible hernia, it can compromise the blood supply to the bowel, leading to intense pain, perforation and peritonitis. Preventing this life-threatening condition is one of the main reasons for electively repairing an inguinal hernia. Patients may also request repair because the hernia is uncomfortable or painful. A hernia may occur on one (unilateral) or both (bilateral) sides of the body. It is said to be primary on its first occurrence and recurrent if it returns after repair (Purkayastha et al 2008).

More than 80,000 inguinal hernia repairs were performed from April 1 2011 to March 31 2012 in England (Health & Social Care Information Centre 2013). Overall, about two thirds of all inguinal hernia repairs are performed on a day case basis (British Association of Day Surgery (BADS) 2012a), with the remainder of patients spending at least one night in hospital, although there is considerable variation between individual hospital trusts (BADS 2012a, NHS Institute for Innovation and Improvement 2013). BADS (2012b) believes that more patients with inguinal hernia could benefit from day surgery if current selection criteria were applied consistently and patients followed an appropriate ambulatory pathway. Up to 95% of primary and 70% of recurrent hernia repairs could be performed without an overnight stay in hospital (BADS 2012b).

**Complete time out activity 1**

## Open inguinal hernia repair

A range of operations has been described for inguinal hernia repair (Purkayastha et al 2008). Most of these used sutures to pull the patient’s tissues, which could be muscles, ligaments or tendons, tight across the defect. Recurrence rates associated with these procedures were relatively high and with lack of agreement over which techniques were best, many surgeons suggested that none of these operations were particularly effective (Purkayastha et al 2008).

Lichtenstein (1964) began performing tension-free repairs in the 1960s. With the development of appropriate materials, the technique evolved to include a synthetic mesh (Amid et al 1996) and has since become the gold standard for inguinal hernia repair, primarily because the recurrence rate is significantly lower than that following sutured repairs (Purkayastha et al 2008, Amato et al 2012). Because the mesh is placed without tension, post-operative pain is reduced (Purkayastha et al 2008) and manageable with oral analgesia. This in turn leads to earlier ambulation and shorter hospital stays (Purkayastha et al 2008).

### Laparoscopic inguinal hernia repair

Laparoscopic inguinal hernia repair involves the placement of a sheet of mesh into the abdomen through the laparoscope to cover the hernia orifice from the inside. The mesh is fixed in place, without tension, using sutures or tacking devices. Early results showed a high recurrence rate (Bhandarkar et al 2006), however the technique has evolved and recurrence rates have reduced (Schmedt et al 2005, Bhandarkar et al 2006). Currently, two main laparoscopic techniques are used. The first of these is the transabdominal preperitoneal (TAPP) repair, in which the hernia is approached through the peritoneal cavity. A mesh is placed over all possible hernia sites in the inguinal region and the peritoneum is then closed over this. The second technique is the totally extraperitoneal (TEP) repair, in which the hernia opening is reached without going through the peritoneal cavity, and instead is approached via the preperitoneal plane (a plane developed in front of the peritoneum) by separating it from the abdominal wall. Although technically more difficult than TAPP repair, the TEP technique may reduce the risk of damage to intra-abdominal organs (National Institute for Health and Care Excellence (NICE) 2004).

The outcome of laparoscopic hernia repair compared to open techniques remains controversial. Laparoscopic repairs appear to result in reduced post-operative pain, faster recovery and similar recurrence rates compared with open mesh repair (Purkayastha et al 2008). Laparoscopic techniques are thought to reduce the incidence of wound infection, haematoma formation and nerve injury leading to persistent numbness, however collections of serous fluid in the wound (seromas) appear to occur more frequently (Schmedt et al 2005). A recent meta-analysis found no conclusive evidence of a difference in chronic pain, recurrence rates or severe adverse events between TEP and open mesh repair (Konig et al 2013). NICE (2004) found insufficient evidence to recommend any single technique and advises that laparoscopic surgery is one of the treatment options for the repair of inguinal hernia and that patients should be fully informed of the risks and benefits.
of each technique to enable them to choose between procedures.

One concern about laparoscopic hernia repair is that there may be an increased risk of damage to internal organs and major blood vessels, although this is rare (Schmedt et al 2005). NICE (2004) recognises that TAPP repair, in particular, is associated with an increased incidence of vascular and visceral injuries, and recommends that TAPP or TEP repair should be performed by appropriately trained surgeons who regularly carry out the procedure.

**Complete time out activity 2**

## Day surgery management

Day surgery is associated with high quality patient care, delivering enhanced recovery with earlier return to normal activities, minimal adverse events, effective analgesia and post-operative support (BADS 2012c, 2012d). Day surgery is popular with patients (BADS 2012d, Thirlway and Hart 2012) and, isolated from emergency pressures, treatment is more timely, with less risk of last-minute cancellations and less opportunity for hospital-acquired infections. Patients also appreciate completing their recovery in the comfort and convenience of familiar surroundings (Thirlway and Hart 2012), free from dependency on nursing staff for food and drink, analgesia and other basic needs.

Best practice day surgery is a planned pathway that continues from the GP surgery through to the provision of follow-up support in the immediate period after discharge (BADS 2012c). Because inguinal hernia repair is a procedure that can be carried out as a day case, the initial referral from GP to hospital should be with the intention of day surgery management, unless a barrier to safe early discharge is encountered. Patient motivation is one of the major factors in assisting early discharge, and a consistent emphasis on day surgery helps to reinforce this (Hammond 2012a, 2012b).

Throughout the process, appropriate, procedure-specific information is essential, both to inform the consent process and to raise awareness of early warning signs that may indicate post-operative problems (BADS 2013a). Many hospitals produce information leaflets, and information is also available from commercial sources, providing accurate, up to date peer-reviewed detail. The Royal College of Surgeons of England (2009) produces information that can help patients plan their recovery after surgery, and the leaflet on inguinal hernia encourages early mobilisation and suggests that most patients should be back to work, including undertaking light lifting, within one to two weeks. Providing appropriate information in sufficient time allows the majority of patients to return to work within two weeks of hernia repair (Crook et al 2005).

**Complete time out activity 2**

### Patient selection criteria

Publicising successful outcomes in patients with multiple comorbidities has redefined day surgery patient selection criteria. Arbitrary limits on age (Chung et al 1999a, Aldwinckle and Montgomery 2004), body mass index (Davies et al 2001, Servin 2006) and health status as per the American Society of Anesthesiologists (ASA) grading system (Chung et al 1999b, Ansell and Montgomery 2004) do not prevent the occurrence of post-operative complications, and the majority of patients are suitable for day surgery unless there is a clear benefit from an overnight stay (Verma et al 2011).

In particular, day surgery is ideal for many chronic stable conditions such as diabetes, asthma or epilepsy, because of minimal disruption to the patient’s routine (Verma et al 2011). For similar reasons, day surgery is also an ideal choice for patients with learning disabilities or mental health issues (BADS 2008).

It is important to consider strategies that could assist day surgery even where inpatient surgery is being considered, because an overnight stay in hospital is not a substitute for optimally treating chronic conditions (Smith and Jakobsson 2012). Planning for day surgery as the ‘default’ option simplifies the information that patients need and still allows them to be admitted to hospital should complications arise and persist, or in cases where recovery does not proceed as smoothly as anticipated (Verma et al 2011, Smith and Jakobsson 2012). In contrast, when patients are scheduled as inpatients and recover from the surgical repair better than expected, the temptation is to discharge them on the day of surgery; this usually leaves patients feeling dissatisfied, frightened and unsupported (Smith and Jakobsson 2012).

Inguinal hernia is more common with increasing age, and older patients are more likely to experience adverse intra-operative events, especially cardiovascular ones, than younger patients (Chung et al 1999a). However, this does not mean that day surgery is contraindicated, but suggests the need for careful intra-operative management of these patients. In contrast, older patients experience fewer post-operative complications (Chung...
Inguinal hernia repair under local anaesthesia

Inguinal hernia repair is possible under local infiltration anaesthesia in the majority of cases and is the technique of choice for patients with comorbidities which could significantly increase the risks associated with general anaesthesia. It may also enable some patients to be discharged as day cases when they would require an overnight stay after general anaesthesia (BADS 2009a). Where general anaesthesia is inadvisable or contraindicated, local anaesthesia is preferable to epidural or spinal anaesthesia because these techniques are associated with an increased risk of urinary retention and other medical complications, especially in older patients (Bay-Nielsen and Kehlet 2008). Local anaesthesia is appropriate for all types of open mesh repair, including recurrent hernia repairs (Callesen et al 2001), and is advantageous compared to laparoscopic techniques, which usually require general anaesthesia. Although there are reports of laparoscopic hernia repair under epidural or local anaesthesia (Bhandarkar et al 2006), this is yet to be established as feasible and safe in frail patients.

Compared to general or regional anaesthesia, hernia repair under local anaesthesia is associated with fewer post-operative complications (Bay-Nielsen and Kehlet 2008) and recovery time is shorter, even if sedation is used in addition to anaesthesia (Song et al 2000). Recovery at home is also improved, with lower rates of analgesic use, and earlier return to work and normal activities (Kark et al 1998). Despite these advantages, relatively few hernia repairs are performed under local anaesthesia outside of specialist centres (Kingsnorth et al 2003, Kehlet and Bay-Nielsen 2008). This may be as a result of concerns about higher recurrence rates of hernia after repair under local anaesthetic, but this has not been observed within private specialist clinics, suggesting the experience of the surgeon may be a more important factor (Kehlet and Bay-Nielsen 2008).

The preference of the patient, and especially the surgeon, is suggested as a possible reason for choosing general anaesthesia as the routine approach. However, with appropriate training, a local anaesthesia service is relatively easy to establish, enabling practitioners to gain experience before dealing with more challenging cases (BADS 2009a). There are few absolute exclusion criteria for inguinal hernia repair under local anaesthesia and the main requirement is the patient’s ability to lie still and relatively flat for the duration of the procedure (BADS 2009a).

Integrated care pathways

Standardising as many aspects as possible of the care pathway of a patient with a hernia is essential to ensure patient safety and assist a seamless journey, and one of the most appropriate mechanisms is use of an integrated care pathway (BADS 2004). This is a single document that contains every nursing and medical element of a patient’s journey from diagnosis to discharge following surgery. Such pathways define the patient’s expected progress and, in the post-operative phase in particular, make identifying potential problems easier. The pathway can commence at either the initial outpatient appointment or at the time of pre-operative assessment, and should contain:

- Patient demographics.
- Pre-operative assessment screening questionnaire.
- Pre and post-operative patient information leaflets.
- Day of surgery nursing documentation.
- Pre-populated consent form listing the most

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TIME OUT

4 Does the hospital where you work have a set of written day surgery criteria, and when were these last updated? To determine if these could be updated, review the latest guidelines on day case and short stay surgery produced by the Association of Anaesthetists of Great Britain & Ireland and British Association of Day Surgery (www.aagbi.org/publications/publications-guidelines/D/D). Reflect on whether day surgery could be the default option for procedures such as hernia repair.

5 Is inguinal hernia repair performed under local anaesthesia where you work? Reflect on how this could be developed into a regular service so that any high-risk patients or patients who would prefer to be awake could be treated without general anaesthesia. The BADS booklet on local anaesthetic hernia repair available from the BADS shop at www.bads.co.uk provides useful information on setting up such a service.
common risks and benefits.

- Anaesthetic chart.
- Operative notes.
- Prescription chart, which can also be pre-populated with the most common pre-medications, post-operative medication, and take-home medication.
- Nurse-led discharge checklist.

Inclusion of suggested protocols for use when caring for patients undergoing hernia repair, for example, anaesthetic regimens and routine nursing care may also be considered. Although a pathway encourages standardised care, variances are permitted, allowing the flexibility to adapt care to specific patient needs. In addition, an integrated care pathway can be a valuable audit tool for exploring patient outcomes.

**Complete time out activity**

### Pain management

Pain management is an integral part of the patient’s care pathway and begins before the person undergoing surgery. Multimodal analgesia is most effective, using a combination of simple analgesics, non-steroidal anti-inflammatory drugs (NSAIDs) and local anaesthesia (Kehlet and Dahl 1993, Lipp and Jackson 2012). The use of strong opioid analgesics, such as fentanyl and morphine, is usually unnecessary after hernia repair, and should be avoided (Kehlet 2005) because side effects such as nausea, sedation and dizziness are likely to compromise the quality of recovery and delay discharge. The author’s practice is to administer 1,600mg of sustained-release ibuprofen orally before surgery to all patients (Hammond 2012b), unless there are major contraindications to the use of NSAIDs. This should provide effective analgesia for up to 24 hours, and patients can be prescribed ibuprofen for the first few days of recovery at home.

During hernia repair, surgeons infiltrate the wound with long-lasting local anaesthesia, either as the sole technique or to supplement general anaesthesia. Most patients awaken without significant pain, but for those who experience significant pain, small doses of fentanyl are appropriate and result in fewer adverse effects than morphine (Claxton et al 1997). Subsequently, post-operative pain can be controlled with paracetamol, supplemented with weak opioids if necessary. It can be beneficial to administer 1L of clear intravenous fluid to patients during surgery to hasten and improve the quality of recovery (Keane and Murray 1986), and reduce post-operative dizziness and nausea (Aptel et al 2012).

Before discharge, patients should be provided with several days’ supply of analgesia for use at home. By standardising the analgesia provided, suitable take-home packs can be dispensed from the day surgery unit, thereby avoiding the need for patients to wait for the pharmacy to provide medications before discharge.

**Complete time out activity**

### Post-operative care

Patients who have undergone inguinal hernia repair should be managed actively during the post-operative period, with recovery progressing along a clearly defined pathway. Deviations or variances from this care pathway may be the first sign of complications. This is especially relevant after laparoscopic surgery, where bleeding and visceral (organ) injury may not be immediately obvious (Association of Laparoscopic Surgeons of Great Britain and Ireland 2004, Royal College of Obstetricians and Gynaecologists 2008, National Patient Safety Agency 2010). Wound sites should be checked immediately on return to the ward, following first mobilisation, and immediately before discharge. Routine observations such as pulse, blood pressure and temperature should be checked at the same time as the wound, and more frequently in patients who fail to achieve the usual recovery milestones. Patients who continue to cause concern should be referred promptly to the surgical team for review.

Most patients should be able to eat and drink within one hour of return to the day surgery unit. Levels of pain and nausea should be assessed regularly and treated promptly. Patients should be assisted and encouraged to mobilise as soon as possible following surgery, assuming the predetermined recovery milestones have been met (Hammond 2012a, 2012b).

**Nurse-led discharge**

Nurse-led discharge allows for standardisation in the discharge process, assisting safe and timely discharge, reducing errors and preventing unnecessary delays caused by unavailability of medical staff (BADS 2009b). In contrast to junior medical staff who rotate to other clinical areas frequently, nursing staff represent a stable care team who are more likely to follow an agreed discharge protocol consistently and conscientiously (BADS 2009b, Hammond 2012b).

Since recovery during the post-operative period should follow a clearly defined pathway, the patient will be ready for discharge home once all recovery milestones have been achieved. Nurse-led discharge represents a final
check that all milestones have been reached. In addition, it confirms that there are no early warning signs of imminent problems, for example tachycardia suggesting concealed bleeding; all necessary information has been provided to the patient; all necessary support is in place; and the patient is happy to return home. The discharge process should create an environment in which patients and their carers understand their roles and responsibilities for ongoing care and feel confident to return home (BADS 2009b, Hammond 2012b).

Complete time out activity 8

Discharge information
The residual effects of general anaesthesia impair memory for some time after surgery, and therefore information provided to the patient in the early post-operative period is unlikely to be retained (Blandford et al 2011). It is suggested that most information concerning post-operative care should be provided before surgery, so that the patient is prepared appropriately, but anything new should be conveyed as close as possible to discharge and be provided in writing also. Providing written information ensures consistency, prevents omissions and gives the patient information to refer back to if he or she cannot recall important details.

Typical information that should be provided includes post-operative wound care, pain management and resumption of usual activities, including driving and return to work. The residual effects or anaesthesia or sedation should not impair driving ability for more than 24 hours (Chung et al 2005), but hernia repair may compromise the patient’s ability to control the car safely or perform an emergency stop for considerably longer. Patients should be advised to avoid driving until their mobility is not compromised seriously by pain. The written post-operative information should provide details of important early warning signs of deterioration, what to do if they occur and how to access urgent medical advice.

Aftercare
Earlier discharge may increase patient safety in the early post-operative period (BADS 2013a). This is because patients who undergo day surgery are often more active than inpatients, and therefore physiological signs of surgical complications such as breathlessness, dizziness and light-headedness are observed earlier. In addition, if the patient does feel unwell, he or she is more likely to report symptoms and seek help than when he or she is in the perceived safety of the hospital ward.

All patients should be provided with a telephone number to seek advice and in case of an emergency. Ideally, this should be a single number which is answered 24 hours per day by an experienced member of the multidisciplinary surgical team (BADS 2013a). Patients should be discouraged from contacting the GP or other general care services, because they have little experience in the detection and management of early post-operative complications. In the unlikely event that a serious problem is suspected, the patient should return to hospital urgently. Ideally, this will be to an acute surgical area, because the triage process in the emergency department may delay surgical reassessment.

Complete time out activity 9

Conclusion
Inguinal hernia repair can be carried out safely and effectively as a day case procedure for the majority of patients, including older patients, the obese and those with relatively stable chronic medical conditions. Repairing the inguinal hernia under local anaesthesia assists day surgery and safety in patients with co-existing diseases. Day surgery should be the default option for inguinal hernia repair, encouraging better, more consistent patient preparation and information. This will result in a high quality pathway of care NS

Complete time out activity 10

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