

# **LAPAROSCOPIC INGUINAL HERNIA REPAIR**

## **BACKGROUND**

Inguinal hernia repair is one of the most commonly performed general surgical operations. It is considered appropriate surgery for trainees and most sub-specialists to perform. There have been many described operations. Historically these have all been based upon some form of suture darn or transversalis fascia repair. The production of prosthetic mesh material suitable for insertion into the inguinal has allowed the development of a newer form of repair – the so-called Lichtenstein repair. The success of this repair lies with the concept of a tension-free repair. This produces a more comfortable repair with a lower requirement for analgesia compared to older suture repairs and an earlier return to normal activity for patients. These two features alone have made it a popular repair among patients. In addition to this is it has a low recurrence rate - of around 1% (compared to 10% for older nylon darn techniques or 1% for the more painful schouldice repair) and is therefore popular among surgeons. It is a relatively easy operation to perform, there is a low incidence of complications – notably infection rates and the mesh has good tissue tolerability.

## **LAPAROSCOPIC REPAIR**

The application of laparoscopic techniques to inguinal hernia repair has now produced an alternative to the open mesh repair (Lichtenstein) which offers several advantages over the open operation. The only clinical disadvantage of the laparoscopic repair is it cannot be performed under a local anaesthetic.

## **LAPAROSCOPIC ADVANTAGE**

Established advantages of laparoscopic inguinal hernia repair over an open mesh repair are a more comfortable repair and a quicker return to normal activity. The two very features that popularised the open mesh repair. There is no difference in other measurable parameters such as mesh infection rates, haematoma formation or long-term neuralgia.

Both operations are suitable for daycase surgery

In term of ease of performance both are straightforward operations on first time hernias. Both require appropriate training though as the laparoscopic approach requires additional laparoscopic skills that may not be readily available to all surgeons it may require a longer training period.

## **CONTRA-LATERAL DEFECTS**

An extra advantage of the laparoscopic approach is clear visualisation of the contra-lateral side. It is well recognised that up to 25% of unilateral hernias have contra-lateral defects present at the time of initial surgery. More than 10% of unilateral hernia represent within 1 year with a contra-lateral hernia. Identification of the contra-lateral defect at the time of primary surgery allows immediate repair of this defect with little or no impact on post-operative recovery or management of the patient.

In the cases of recurrent and bilateral hernias the laparoscopic approach offers enormous advantages.

## **BILATERAL HERNIA REPAIR**

For open bilateral repair the size of the surgery is more than double a single side.

Early post-operative pain is considerable and requires significant analgesic dosing.

Some surgeons would not recommend bilateral repair at one sitting and prefer a staged repair. Recovery periods vary but may be in excess of 6 weeks before normal activity is achieved. There is an additional risk of penile and scrotal oedema after bilateral open hernia repair. If it is performed under local anaesthetic then near toxic doses of anaesthetic may be required if both sides are to be repaired at the same time. In comparison a bilateral laparoscopic inguinal hernia repair is little or no different from a single side repair. No additional incisions are required. There is no need for extra analgesia and return to normal activity occurs over the same period as a unilateral repair. Surgery is usually faster than an open bilateral repair.

### **RECURRENT HERNIA REPAIR**

Open recurrent inguinal hernia repair can be technically challenging. Dissection through post-operative scar tissue may be difficult with poor recognition of anatomy and an increased risk of damage to spermatic cord structures. This is even more so in the presence of a previous open mesh repair where considerable peri-mesh fibrosis may cause technical difficulties.

In comparison a laparoscopic repair of a recurrent inguinal hernia is little different from a first time hernia repair. The approach is through virgin tissue with usually little or no encroachment on previous surgical scar tissue. Most recurrent inguinal hernias are medial, away from the deep ring and therefore relatively simple to dissect using a laparoscopic approach. There is no difference in post-operative analgesic requirement or return to normal activity time in unilateral or bilateral laparoscopic inguinal hernia repair.

## **NICE RECOMMENDATIONS**

The national institute for clinical excellence (NICE) reviewed hernia repair in 2000. They compared the open mesh repair with laparoscopic mesh repair as the only two real contenders in the in the options for hernia repair. They recommended almost entirely on financial grounds. At that time it was recommended that unilateral first time hernias should be repaired using an open mesh technique, as this was cheaper. It was recommended that in the case of bilateral and recurrent inguinal hernias a laparoscopic approach should be considered. NICE guidance suggested the use of an extraperitoneal laparoscopic approach rather than a trans peritoneal approach though there was little evidence to support this.

NICE have recently reviewed the recommendations for hernia repair (2004) and now confirm that laparoscopic repair for first time hernia can be considered and that for bilateral and recurrent hernias a laparoscopic approach may be preferred.

## **SURGICAL TECHNIQUE**

The surgical technique has evolved over the few years since it first appearance. There are two approaches in use for this form of repair. These are either a trans-abdominal pre-peritoneal approach (TAPP) or a totally extra-peritoneal approach (TEP).

### **TAPP**

The pneumoperitoneum is created in the favoured fashion of the surgeon. A camera port is inserted at the umbilicus – usually a 10mm port. Two further ports are placed in the right and left flanks. The position of these is usually planned so that

triangulation is towards the side of the hernia but placed so that they are all above the level of the iliac crests. If the ports are too low then they may encroach upon the upper boarder of the mesh. In the case of bilateral hernias the lateral ports are placed level with each other.

The patient is then placed in a head down tilt to take the small bowel away from the inguinal regions. The hernia is easily seen and differentiation can be made between an indirect and direct hernia. The contra-lateral side is easily inspected to look for a defect. A peritoneal pocket is then created to enter the extra-peritoneal plane. The incision is planned and marked with diathermy scissors as a transverse line across the anterior abdominal wall about 2cm above the level of the anterior iliac spine from as far lateral as is comfortable to a point medially at the level of the median umbilical ligament.

The peritoneum is dissected off the overlying anterior abdominal wall. It is important to dissect off only peritoneum and to try to avoid taking down extra-peritoneal fat as this may lead the operator away from the correct plane. The extra-peritoneal plane is developed in two directions, firstly toward the posterior aspect of the pubic tubercle to reach the pubic arch. This is easily recognised due to the bright appearance of the periosteum. The bladder is dissected off the arch to drop inferiorly. The dissection continues to reach the lower border of the superior ramus of the pubic arch. Then continues laterally to reach the medial edge of the peritoneal hernia sac. The second direction of dissection from the peritoneal incision is lateral to the lateral edge of the peritoneal hernia sac effectively leaving the superior border of the hernia sac isolated between the two directions of dissection. The dissection then varies between direct and indirect hernias.

## **DIRECT SAC DISSECTION**

The direct sac dissection is relatively easy. The sac is grasped and inverted and the transversalis fascia is easily identified as it is pulled into the created space with the inverted sac. The transversalis fascia separates easily from the sac and is blown back out into the inguinal canal by the pressure of the pneumoperitoneum. Once the sac has been completely separated from the transversalis fascia and the margins of the defect cleaned the posterior aspect of the deep ring can be dissected to separate the peritoneum from the vas and gonadal vessels. The folded edge of the peritoneum as it is dissected off the posterior abdominal wall below the level of the inguinal canal is usually easily seen. Posterior dissection can be aided by grasping and elevating the vas and then the gonadal vessels to peel the peritoneum off. Care should be taken around these structures. The external iliac vein lies under the vas and the external iliac artery lies in the inverted V created by the vas and the vessels as they enter the deep ring. The dissection of the peritoneum off the posterior abdominal wall proceeds as far as is necessary to allow the insertion of an adequately sized piece of mesh. This usually corresponds to a level opposite the peritoneal incision. Lateral dissection is completed to join the anterior and posterior dissections. The medial dissection is taken across the midline behind the symphysis pubis.

## **INDIRECT SAC DISSECTION**

This is started as with the direct sac dissection passing down each side of the hernia sac. The position of which can be checked during the dissection by elevating the peritoneal flap. Once the lateral and medial sac margins have been isolated the sac is then cleaned off the vas and vessels by separating the peritoneal sac from all attached

tissues. This dissection reveals the vas lying postero-medially and the gonadal vessels lying postero-laterally. Once the sac has been encircled the sac can then be separated from the spermatic structures to allow it to be inverted into the dissected space to complete the sac dissection. The remainder of the dissection continues as described for direct sac dissection.

If the sac is long and forming an inguino-scrotal hernia, to dissect the entire sac is unnecessary. Once the sac is dissected far enough along its length it can be transacted. The open end may be tied off or endolooped if desired.

## **MESH PLACEMENT**

Once the pre-peritoneal space is dissected enough the mesh can be placed. A number of mesh types are available. The operator must decide which they find the most suitable for them. It is useful to have a mesh which is see-through to facilitate placement and one which has a degree of stiffness so that it holds itself open once inserted. .

The larger the mesh the better. Smaller meshes are associated with higher recurrence rates. It is usually recommended that mesh should measure at least 10cm by 15cm.

Prior to insertion of the mesh it is usually marked to allow orientation.

The mesh is usually inserted through the largest trocar – either rolled up or folded width ways to allow passage down the trocar. If three 5mm trocars are used the mesh will not fit down a 5mm trocar but can be pulled through the abdominal wall through a 5mm trocar site once the trocar has been removed. The trocar can then be re-inserted.

The mesh is placed long axis widthways. The medial edge is placed across the midline. The inferior margin is placed well down over the vas, vessels and psoas

muscle. The upper boarder is positioned below the peritoneal incision line. This positioning provides a good lateral overlap and means that the three critical areas: femoral canal, deep inguinal ring and posterior wall of inguinal canal are all covered by mesh with a good overlap kin all directions.

Mesh fixation is the norm and can be performed with sutures, staples, tacks or anchor devices. The mesh is fixed at three points: lower medial corner, upper medial corner and upper lateral corner. Fixation should be avoided anywhere below the level of the inguinal ligament. Damage to femoral artery, vein or nerve could occur in these areas.

## **CLOSURE**

Once secured the peritoneal pocket is then closed by the same device used to fix the mesh. Care should be taken not to curl up the lower border of the mesh as the peritoneal flap is lifted up. The closure technique must not leave any gaps in the peritoneal opening that may be large enough to allow a loop of small bowel to pass through as this will result in a small bowel obstruction.

## **TEP**

The approach for this technique is very different from a TAPP. Once the pre-peritoneal space is created mesh insertion is the same as the TAPP repair.

## **INITIAL PORT PLACEMENT**

The pre-peritoneal space can be dissected with instruments or a balloon. The initial access to the extra-peritoneal space is critical. The simplest route is via the rectus sheath. A short 1.5cm longitudinal incision is made approximately 2cm lateral to the umbilicus on the opposite side to the hernia. The incision is deepened to expose the

anterior rectus sheath. A short longitudinal incision is made in the anterior rectus sheath to expose the underlying rectus muscle. This is retracted laterally to expose the posterior rectus sheath. The plane between the rectus muscle and the posterior rectus sheath leads inferiorly to the extra-peritoneal plane. The posterior rectus sheath disappears halfway between the umbilicus and the symphysis pubis at the level of the arcuate line. At this point the extra peritoneal (pre-peritoneal) plane is entered. This plane can be accessed with a blunt tipped trocar or a dissecting balloon.

### **BALLOON DISSECTION**

The balloon dissector is provided on an introducing system. This allows the balloon to be placed in the correct position before it is inflated. The introducer is slid down behind the rectus muscle to enter the pre-peritoneal space. The tip abuts upon the pubic arch and is then slid 1cm behind the upper border of the arch and then inflated. Depending upon the balloon type the inflation can be performed with the laparoscope within the balloon so that inflation progress can be monitored. There are a number of different balloons available. The most popular inflate into a saddle shape, dissecting both groins at the same time. Unilateral balloons are available. The balloons unfurl in a fashion that keeps the inferior epigastric vessels held up against the posterior aspect of the rectus muscles.

Once full inflation has been performed the balloon is removed and either a structural balloon is inserted in the same plane to maintain the dissected space or a standard trocar can be inserted but suture closure of the insertion site is required to keep a gas tight seal. The pre-peritoneal space is then insufflated and the second and third trocars can be inserted under direct vision. Usually the balloon dissection is slightly asymmetrical. The second trocar site is often more conveniently inserted on the side that has the further lateral dissection. Scissors can then be used to dissect out to the

opposite side to enable a symmetrical third port insertion. The third trocar can then be inserted in a symmetrical position.

The dissection of the hernias can then be carried out in the same fashion as described for a TAPP repair, though it is frequently found that the balloon has stripped out the sacs of direct hernias and all that is required is enlargement of the space to allow mesh insertion.

### **INSTRUMENT DISSECTION**

Instrument dissection is reserved for unilateral hernia repairs. The pre-peritoneal plane is accessed in the same fashion as a balloon dissection. Instead of a balloon being inserted into the pre-peritoneal plane a blunt 10mm port & trocar are inserted. This is insinuated down to the pubic arch. Carbon dioxide insufflation is then begun. A suture closure of the port site may be required to keep a gas seal. The trocar is then removed from the port and the laparoscope inserted. The second 5mm port can be inserted into the tunnel made by primary trocar at a point approximately 4cm below the first skin incision. Location of this site is facilitated by needle puncture under direct vision. After the second port is inserted the dissection of the pre-peritoneal space can proceed. This is initially down to a beyond the upper border of the pubic arch to drop the bladder down. The plane is then developed laterally to identify the inferior epigastric artery and vein. These are protected and left adherent to the posterior surface of the rectus muscles. The plane of dissection is carried out laterally behind the rectus muscle to a point at which the third port can be inserted. This should be above the level of the anterior iliac spine and far enough laterally to allow reasonable triangulation at the back of the inguinal region. The third port (5mm) is then inserted and dissection then concentrates on the hernia itself. This again is now similar to the TAPP dissection.

## **MESH INSERTION**

During a TEP repair the pre-peritoneal space is generally larger than a TAPP repair and will accommodate a mesh size of 15 x 12cm quite comfortably. Insertion is as for a TAPP repair. Once positioned the mesh is anchored in the same fashion. There is no peritoneal closure but care should still be taken to ensure that as the CO<sub>2</sub> is released the lower border of the mesh does not curl up.

## **BILATERAL HERNIA REPAIR**

### **TAPP**

The peritoneal pockets are dissected out on each side first before the mesh is inserted. The insertion of two separate pieces of mesh is recommended. The use of a single piece of mesh is cumbersome. Sizing the mesh is difficult. The mesh may be placed bow-stringed across the pelvis. On desufflation the mesh is pushed against the pubic arch causing it to become detached at one end which may expose the deep ring promoting an early recurrence.

The two pieces of mesh should be placed to overlap in the midline by at least 1cm.

### **TEP**

The balloon dissector is ideal for this type of repair. It gives rapid and easy access to the pre-peritoneal space. Instrument dissection is not usually possible without the insertion of a fourth port. The principals of mesh insertion are the same as a TAPP repair.

## **POST-OPERATIVE CARE**

Most laparoscopic inguinal hernias, whether single, bilateral or recurrent can be repaired as day cases. There is no difference in the post-operative management between TAP and TEP repairs.

Analgesic requirements are minimal. Oral paracetamol and codeine combinations are usually sufficient for the first 24 hours then paracetamol alone as required. Analgesics are not usually needed beyond three days. Gentle activity is recommended for the first three days (washing, dressing, walking) there after activity is permitted as pain allows. Driving can be resumed after 5 days.

Normal activity is usually achieved after 5 days to 1 week. Return to work can then be considered. If a heavy manual work is required this can be achieved after 14 days.

## **COMPLICATIONS**

Complication with laparoscopic hernia repair can be considered in two categories:

1. General complications due to a laparoscopic procedure.
2. Complications specific to inguinal hernia repair.

### **GENERAL LAPAROSCOPIC COMPLICATIONS**

Minor complications after laparoscopic surgery are well-recognised but unusual – wound infection, port site haematoma, and port site hernia. The incidence is no different for comparative complications in open hernia surgery though laparoscopic wound infections are less frequent.

More major complications can occur that are not a feature of open surgery but are extremely rare. These include inadvertent visceral trauma (small bowel perforation, hepatic laceration – both usually from off-screen trauma), visceral diathermy burns

resulting in late bowel perforation from inadvertent diathermy discharge, poor instrument insulation or capacitance coupling. Complications from the creation of the pneumoperitoneum – bowel perforation, bleeding from vessel damage or CO<sub>2</sub> embolus. Complications from the first port insertion – vessel or visceral damage. Most of these major complications are not seen with TEP repairs.

### **SPECIFIC COMPLICATIONS FOR LAPAROSCOPIC INGUINAL HERNIA REPAIR**

Most complications that occur do so in open and laparoscopic inguinal hernia repair. There is no difference in their incidence. These complications include mesh infection, urinary retention, chronic post-operative neuralgia and hernia recurrence.

One complication peculiar to TAPP repairs is post-operative small bowel obstruction from a loop of small bowel passing between the closures of the peritoneal flap. Since its recognition and the now recommended closer closure of the peritoneal incision this complication is rare.