Umbilical Hernia Repair: The Spectrum of Management Options

19

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Introduction

Umbilical hernias are among the more common abdominal wall hernias, accounting for 10% of primary hernias in the adult patient population, with over 270,000 repairs per year in the United States. In children, most are congenital, while umbilical hernias are typically acquired fascial defects in adults and can occur either spontaneously or at the site of prior surgical access, such as those which may develop following laparoscopic port placement at the umbilicus. For the purposes of discussion in this chapter, these two types of umbilical hernias will be classified as either primary or recurrent, with recurrent hernias including small incisional hernias localized to the umbilicus.

While most surgeons generally think of an umbilical hernia as a simple, single primary fascial defect, the repair of which represents one of the more straightforward technical exercises in surgery, there is a wide spectrum of disease and hence a number of surgical options for repair. As a result, a careful analysis of the potential clinical presentations and current options for management reveals a much more challenging clinical dilemma than might be initially recognized. Variables that may play a role in management include defect size, etiology (primary vs. recurrent), body habitus (BMI), fascial integrity (tissue strength and thickness), and patient factors such as steroid use, chronic cough, smoking, ascites, previous surgical site infection, and even vocation. Each of these factors will be addressed in the various management algorithms described in this chapter.

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Current Trends

At this point, it is clear that tension-free repair of incisional and inguinal hernias reduces recurrence rates. The impact of mesh for umbilical hernia repair remains a subject of debate. To date, four prospective randomized controlled trials have addressed this question. Three of these studies found lower recurrence rates after mesh (0–2.7%) vs. primary suture repair (11–19%), with the greatest differences identified in cirrhotic patients and those undergoing emergent repair for incarcerated hernias. A number of other observational series have provided similar results (Table 19.1) [1–7]. Pooled data from these studies including one meta-analysis indicate that recurrence rates are lower after mesh, with no significant increased risk for wound or infectious complications.

That being said, most authors agree that the repair of umbilical hernias should be tailored to the individual patient and there remains some

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Table 19.1 Summary of selected umbilical hernia repair studies

Author	Study	*n*			Recurrence (%)			Surgical site infection (%)		
		Total	Suture	Mesh	Suture	Mesh	*p*	Suture	Mesh	*p*
Aorroyo	PRCT	200	100	100	11	1	0.0015	3	2	ns
Abdel-Baki	PRCT	42	21	21	19	0	<0.05	14.3	9.5	ns
Ammar	PRCT	72	35	37	14.2	2.7	<0.05	8.5	16.2	ns
Polat	PRCT	50	18	32	11	0	ns	5.6	6.3	ns
Asolati	RCS	229	97	132	7.7	3	ns	NR	NR	–
Sanjay	RCS	100	61	39	11.5	0	0.0007	11.5	0	0.007
Berger	RCS	392	266	126	7.5	5.6	ns	7.9	19.8	<0.01

skepticism that every umbilical hernia requires mesh. To date, no study has firmly identified a method to stratify patients effectively, though some trends do exist [8–10]. Identified risk factors for recurrence include obesity, cirrhosis, defects >3 cm, and recurrent hernias. In lower risk patients, the potential disadvantages of mesh (infection, foreign body sensation, and adhesions) should be carefully weighed against the potential benefits. Since there is no one perfect repair for umbilical hernias, a number of options are presented below and should be included in the surgeon's armamentarium for managing this diverse group of patients.

Options for Surgical Repair of Umbilical Hernias

Primary Repair

Primary repair (using sutures alone) has been the standard method for treating umbilical hernias for many decades. Initially described in 1901, the Mayo repair involved a "vest over pants" fascial closure using two rows of horizontal mattress sutures placed in a transverse orientation (Fig. 19.1) [11]. While popular for many years, recurrence rates of up to 54% have been reported during long-term follow-up. Today, suture repair typically involves closure of the defect with simple interrupted or figure-of-eight permanent sutures used to approximate the fascia in a horizontal fashion.

My personal technique for primary repair is as follows: After induction of general anesthesia, the abdomen is widely prepped and draped in the usual sterile fashion (Fig. 19.2). Intravenous antibiotics are administered [first generation cephalosporin or Vancomycin (if penicillin allergic)]. A small, curvilinear incision is made along the infra-umbilical fold. The hernia sack is circumferentially dissected using Metzenbaum scissors. Dissection from both sides of the umbilicus is critical to achieving complete isolation of the hernia sack such that both sides of the dissection can be connected and the scissors can be easily passed across the midline. Use of a forceps or hemostat can assist in guiding the tips of the scissors around the hernia sack and out of the skin incision on the opposite side. The hernia sack is then divided with either a scalpel or cautery, taking care to avoid a "button hole" in the umbilical skin. Sounding out the depth of the umbilicus with a hemostat prior to hernia sack division can help to prevent this complication. Incarcerated fat within the hernia defect can be reduced or excised as necessary (Fig. 19.3).

The fascial defect should now be easily visualized. The superior and inferior fascial edges are elevated with either Kocher clamps or a hemostat. With judicious use of electrocautery, the anterior fascia is circumferentially cleared of subcutaneous tissue over a distance of 1–2 cm. If the fascia is of good integrity and can easily be approximated without significant tension, three to four figure-of-eight #1 woven nonabsorbable sutures are placed, taking bites of fascia at least 1-cm from edge of the defect (Fig. 19.4). After all sutures are placed, Kocher clamps are removed and sutures are tied down (Fig. 19.5). The wound is irrigated and the

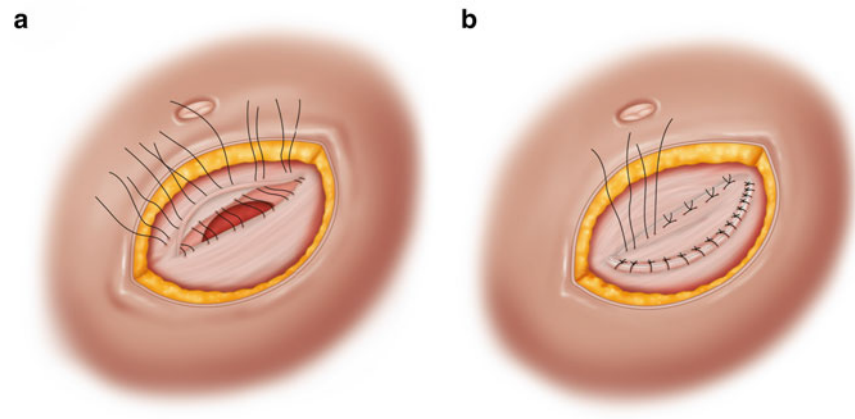

Fig. 19.1 Mayo repair

Fig. 19.2 Sterile prep for primary umbilical hernia repair

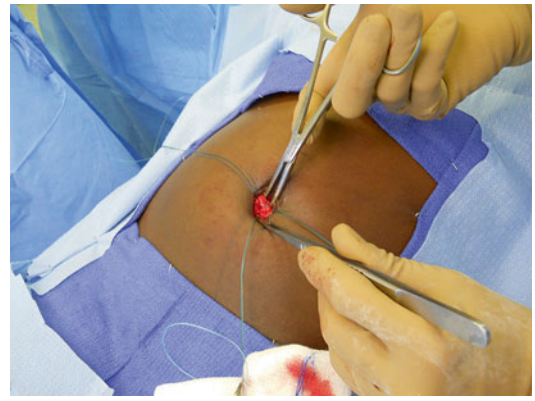

Fig. 19.4 Primary repair with permanent suture

Fig. 19.3 Chronically incarcerated pre-peritoneal fat within umbilical hernia defect

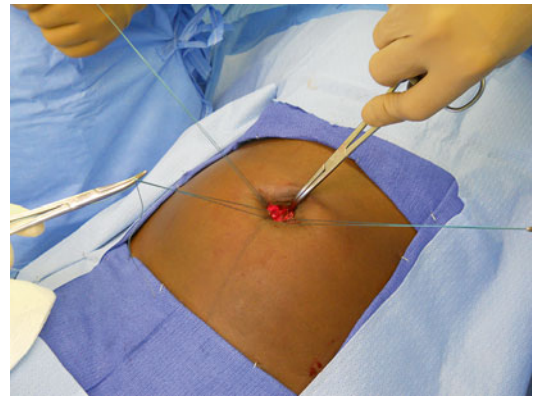

Fig. 19.5 Defect closure

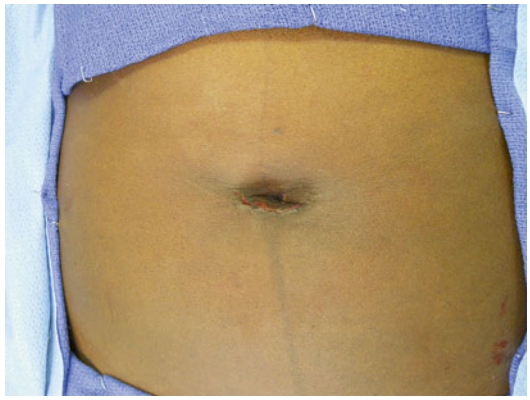

Fig. 19.6 Subcuticular skin closure

Fig. 19.8 Circumferential dissection and isolation of hernia sack

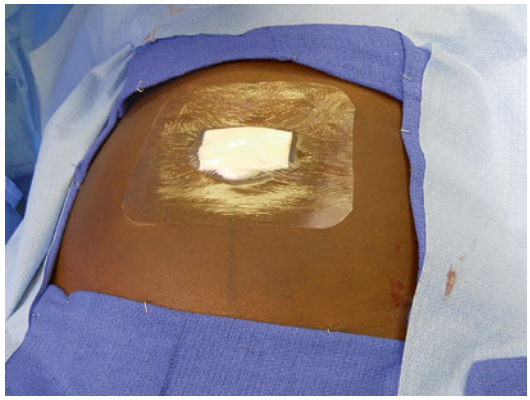

Fig. 19.7 Occlusive pressure dressing

umbilicus tacked down using 3-0 absorbable suture and the skin closed with 4-0 absorbable subcuticular sutures. Skin adhesive is applied and a sterile occlusive pressure dressing is placed (Figs. 19.6 and 19.7). The patient is discharged to home from the recovery room.

Mesh Repair

Open mesh repair generally utilizes a flat sheet of mesh or possibly a mesh plug, though newer mesh patch devices have been designed specifically for treatment of umbilical hernias utilizing a common design that allows for mesh deployment deep to the fascia. As with other mesh-based repairs of abdominal wall defects, there are a number of options for mesh placement location. These include mesh onlay (over a primary fascial closure), mesh inlay (mesh plug fixated to the fascial ring), and mesh underlay (either in the intra-peritoneal, pre-peritoneal, or retro-muscular space). Two final options for mesh repair are the purely laparoscopic and the laparoscopic-assisted approaches, both of which involve placement of an intra-peritoneal tissue-separating mesh with variable degrees of mesh fixation and varying numbers of laparoscopic ports, with or without primary closure of the hernia defect over the mesh.

Open Techniques

For open mesh repair of umbilical hernias, I prefer a mesh underlay which utilizes one of the three available umbilical hernia patches currently on the market. These include the Proceed Ventral Patch (Ethicon, Inc), the CQur V-Patch (Atrium, Inc.), and the Ventralex-ST Patch (Bard, Inc.). While each of these meshes is equipped with an absorbable tissue-separating layer designed to allow for intra-peritoneal mesh placement, my personal preference is for pre-peritoneal mesh deployment. Preparation of the patient and location of skin incision are identical to that described for the open primary repair. If possible, opening of the hernia sack is avoided during the initial phases of dissection and tissue division (Fig. 19.8). Once the hernia sack is delineated, it is carefully dissected away from the edges of the

fascial defect. Fascial edges are again elevated with Kocher clamps, and meticulous dissection is used to enter the pre-peritoneal space using electrocautery. The easiest location to enter the pre-peritoneal space is inferiorly at the interface between the hernia sack and the caudal edge of the fascial defect. Once entered, the pre-peritoneal space is circumferentially developed with a combination of blunt dissection and judicious use of cautery. Care must be taken to elevate the fascia and to divide only the tissue between the fascia and the peritoneum in order to avoid potential injury to the underlying viscera.

After a wide pre-peritoneal pocket has been developed, hemostasis is confirmed. Oozing along the medial umbilical ligaments (at the 5 and 7 o'clock positions) is the most common area of minor but nuisance bleeding. Any holes in the hernia sack are closed with absorbable suture to exclude the viscera from the pre-peritoneal space. Depending upon the size of the hernia defect and width of the pre-peritoneal space achieved, an appropriate mesh size is selected. When possible, my preference is to develop a wide pre-peritoneal pocket that will accommodate an 8-cm hernia patch (Figs. 19.9 and 19.10). The mesh is then deployed into the pre-peritoneal space deep to the muscular layers of the abdominal wall and the anchoring straps are brought out through the hernia defect. The fascia is closed with #1 woven non-absorbable suture using two figure-of-eight sutures on each side and one or two horizontal mattress sutures in the center, incorporating the tails of the mesh with the closure. Fascial sutures are tied down and the tails of the mesh cut just above the fascia. Adjacent scar and fascia are closed over the cut tails of the mesh, the umbilicus is tacked down, and the skin closed with subcuticular suture (Figs. 19.11, 19.12 and 19.13).

If the pre-peritoneal space cannot be developed, then the mesh patch can be deployed deep to the fascial defect into the intra-peritoneal space (Figs. 19.14, 19.15 and 19.16). The anchoring straps on the mesh are again brought out through the hernia defect, allowing the mesh to be pulled up into apposition with the peritoneum (Figs. 19.17, 19.18, 19.19, 19.20 and 19.21). Non-absorbable sutures are utilized

Fig. 19.10 Umbilical hernia patch folded to allow for mesh insertion into pre-peritoneal pocket

Fig. 19.9 Elevation of fascial edges assists in development of pre-peritoneal space for mesh deployment

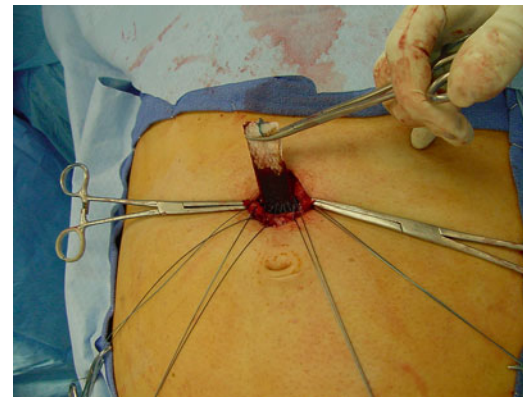

Fig. 19.11 Fascial sutures incorporate mesh tails during defect closure

Fig. 19.12 Hernia defect closed over mesh patch

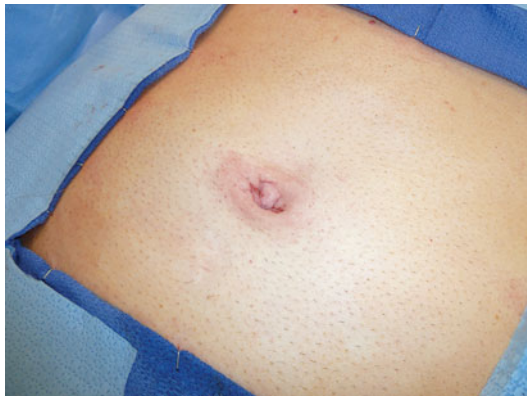

Fig. 19.13 Umbilical skin tacked down and closed

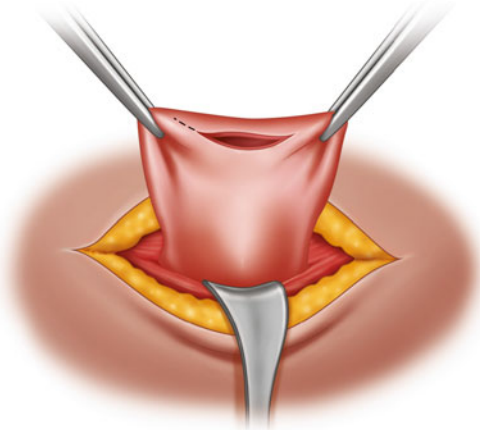

Fig. 19.14 Umbilical hernia sack is circumferentially dissected from the fascia, opened, and resected

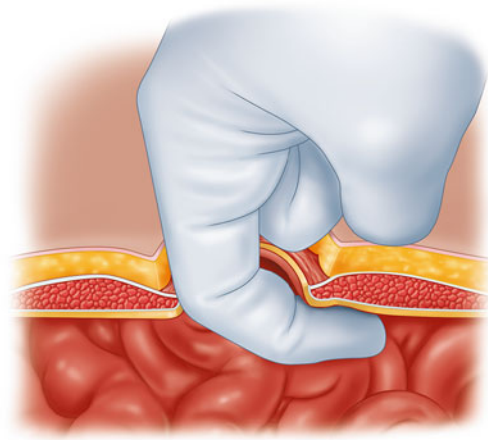

Fig. 19.15 The intra-peritoneal space is cleared of adhesions

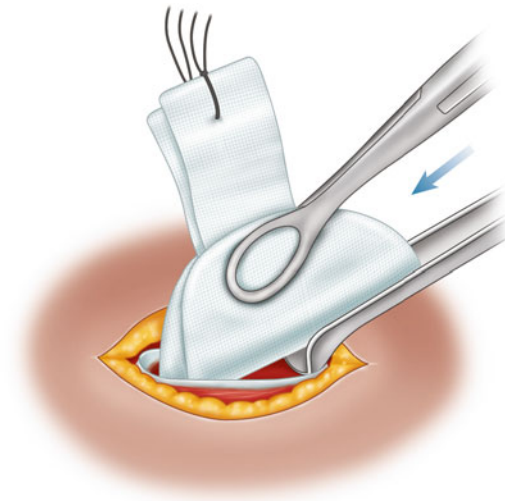

Fig. 19.16 Mesh is deployed into the intra-peritoneal space, just deep to the fascia

to secure the anchoring straps to the fascia. Whether or not to close the defect is at the surgeon's discretion. Some surgeons prefer to separate and fixate the tails of the mesh to the edges of the fascial defect (Fig. 19.22), allowing for a tension-free repair. My personal preference is to close the fascial defect, while incorporating both mesh tails into the fascial closure (as demonstrated in Figs. 19.11 and 19.12). In all cases, the redundant tails of the

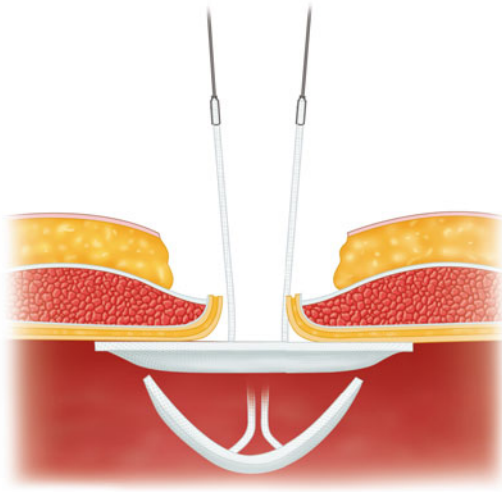

Fig. 19.17 Anchoring straps (mesh tails) are pulled up to bring the mesh patch into direct contact with the abdominal wall

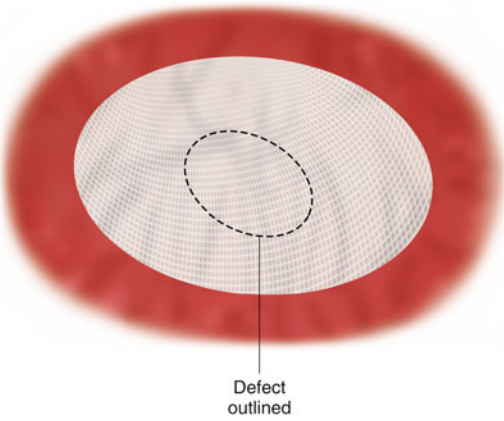

Fig. 19.18 Mesh patch provides wide overlap of the hernia defect

mesh are trimmed down to the level of the fascia and the wound is closed in layers. Care is taken to close the scar and the subcutaneous tissue over the cut tails of the mesh in order to exclude the mesh tails from the skin closure (Fig. 19.23).

Although the currently available umbilical hernia patches are designed with a tissue-separating layer to allow for safe insertion into the abdominal cavity, there is the potential for bowel adhesions to the mesh, particularly if the mesh is not well seated against the peritoneal

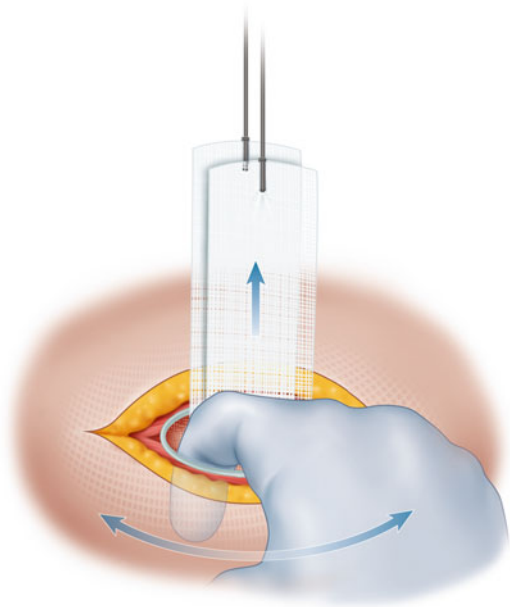

Fig. 19.19 Complete circumferential deployment of the mesh is confirmed

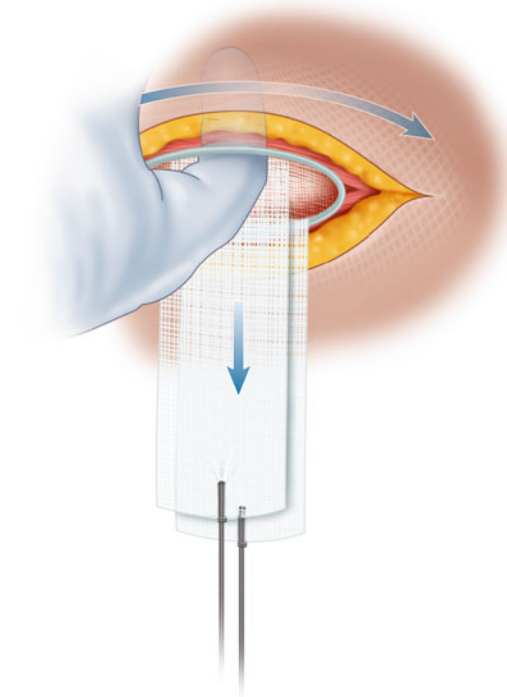

Fig. 19.20 Using the surgeon's finger to circumferentially sweep around the edges of the mesh, the prosthetic is confirmed to lie flat against the parietal side of the abdominal wall

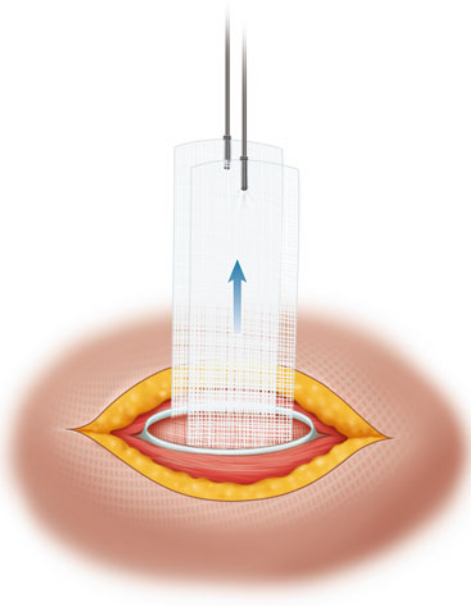

Fig. 19.21 Mesh tails are gently elevated to bring the mesh into apposition with the abdominal wall. Pulling up too aggressively on the anchoring straps is discouraged, as excessive traction can deform the mesh

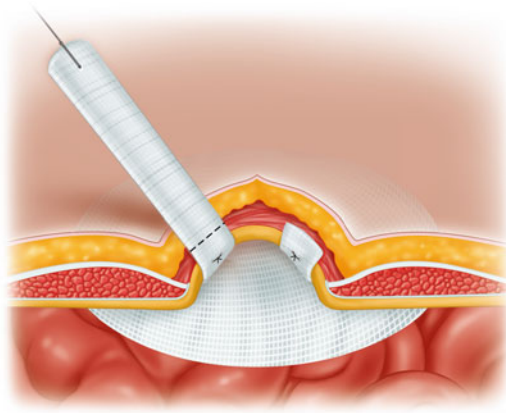

Fig. 19.22 The tails of the mesh are secured to the edges of the defect with permanent suture

surface deep to the abdominal wall musculature. For this reason, many surgeons will take additional steps to fixate the mesh to the peritoneum, either with sutures placed through the hernia defect or by tacking the periphery of the mesh using a laparoscopic-assisted approach. With this technique, the mesh is deployed into

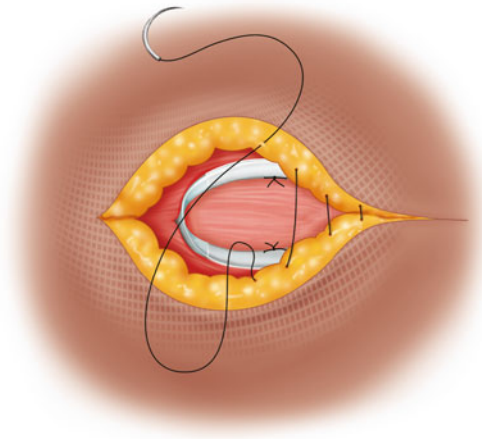

Fig. 19.23 The wound is closed in layers

the peritoneal cavity through the umbilical hernia defect in a standard "open" fashion, but two additional 5-mm laparoscopic ports and a laparoscopic tacker are utilized to fixate the edges of the mesh under pneumoperitoneum using laparoscopic guidance (Fig. 19.24).

Laparoscopic Techniques

While laparoscopic repair of midline incisional/ventral hernias is a standard practice, the laparoscopic approach to umbilical hernias is generally limited to larger defects (>3–5 cm), recurrent umbilical hernias, or fascial defects occurring at the site of prior umbilical surgery, such as the site of a prior laparoscopic access, and would technically be considered small incisional hernias. For these larger, more challenging umbilical hernias, two primary approaches can be considered: laparoscopic-assisted repair with mesh and primary defect closure (as described above) or a standard (purely) laparoscopic repair with mesh.

While strategies vary based upon personal preference, my approach for laparoscopic umbilical hernia repair typically involves a 4-port technique that allows for adhesiolysis and intra-peritoneal mesh deployment with wide overlap of at least 5 cm beyond the edges of the hernia defect. A tissue-separating permanent synthetic mesh is used and is deployed intra-peritoneal as an underlay. Defect closure

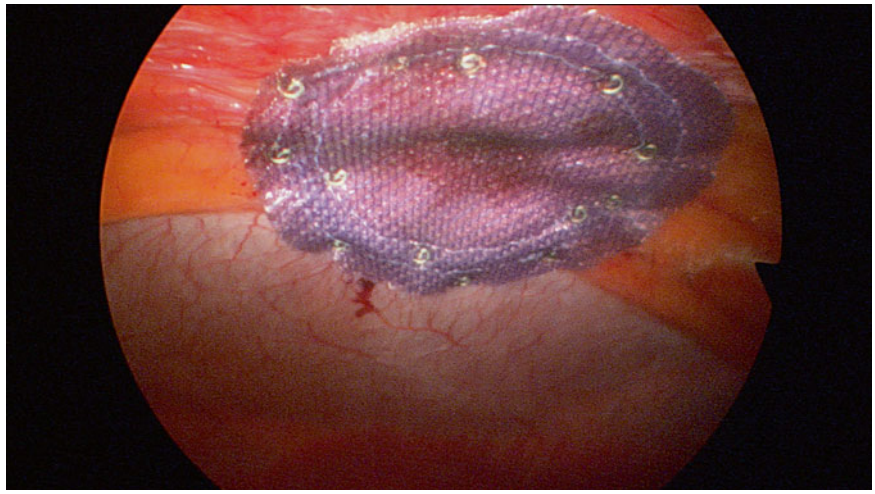

Fig. 19.24 Intra-peritoneal view of umbilical hernia patch and laparoscopic fixation sites

Fig. 19.25 Large chronically incarcerated umbilical hernia prior to repair

Fig. 19.27 Patient positing for laparoscopic repair with arms padded and tucked

Fig. 19.26 Demonstration of 3–5 cm fascial defect

is optional. Four trans-fascial sutures are used to suspend and secure the mesh in the laparoscopic environment and are reinforced by a double crown of tacks for mesh fixation (Figs. 19.25, 19.26, 19.27, 19.28, 19.29, 19.30 and 19.31).

Algorithms for the Management of Umbilical Hernias

As with any surgical intervention, the specific technique utilized in any given patient must be individualized. Ultimately, decisions are based upon

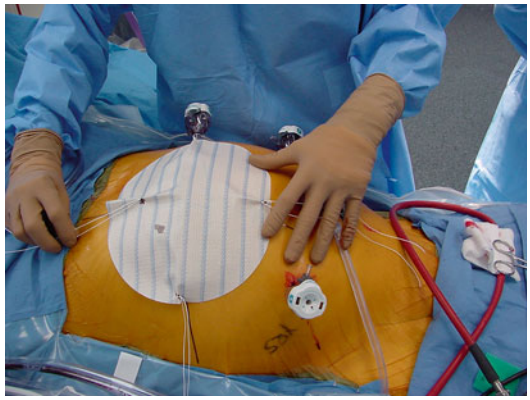

Fig. 19.28 Mesh preparation with four cardinal sutures

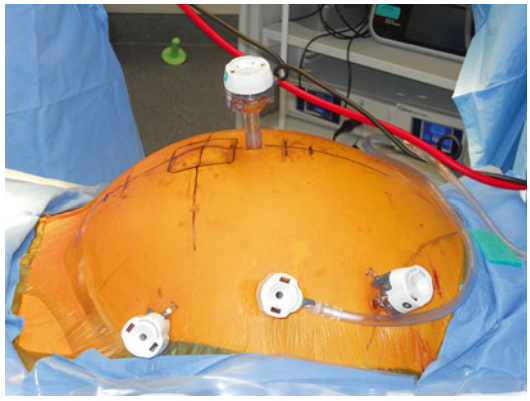

Fig. 19.29 Four-port trocar strategy for laparoscopic umbilical hernia repair

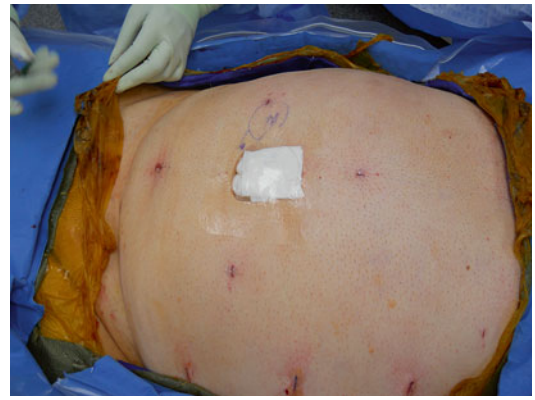

Fig. 19.31 Laparoscopic port and suture fixation sites at conclusion of case

the clinical scenario and the surgeon's own skill set and experience. There are a number of factors to consider in individualizing the treatment of umbilical hernias. These include the etiology of the hernia (primary vs. recurrent/incisional), defect size, body habitus, fascial quality, tension, patient age, vocation, and co-morbidities as well as the risk for wound and or mesh complications.

My general approach to umbilical hernias is as follows: For thin, healthy patients presenting with a small primary umbilical hernia that can be easily approximated without tension, a primary

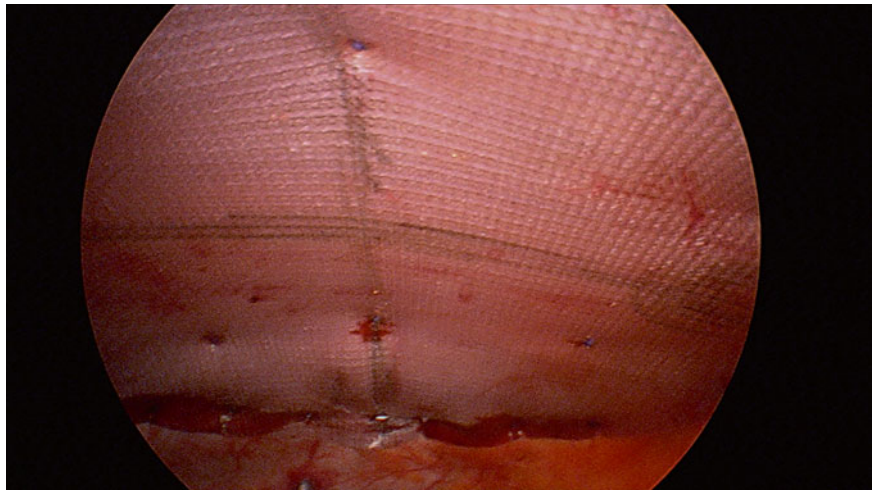

Fig. 19.30 Laparoscopic view of wide intra-peritoneal mesh reinforcement

repair with non-absorbable suture is used. In heavier patients with larger defects and particularly in those who regularly perform strenuous physical labor, I generally recommend mesh reinforcement, utilizing an umbilical hernia patch placed in the pre-peritoneal space. In the morbidly obese patient or in those with large, recurrent hernia defects, a laparoscopic approach often provides for greater mesh overlap and the potential advantage of fewer wound complications. While I believe that it is appropriate to consent every patient for a potential change in operative strategy during the procedure, the algorithms below can guide pre-operative decision-making.

Indications for Primary Repair
- Primary hernia
- "Finger-tip" defect (<1 cm)
- Thin female
- Good fascia
- Minimal tension

Indications for Open Mesh Repair
- Medium-sized defect (2–3 cm)
- Recurrent hernia
- Incisional hernia
- Overweight—mildly obese
- Male
- Laborer
- Thin fascia
- Tension
- Chronic cough

Indications for Laparoscopic Repair with Mesh
- Morbid obesity
- Large defect (>3 cm)
- High risk for wound complications (steroids, diabetes, ascites, smoking)
- Recurrent hernia

Summary

A wide variety of options are available for the repair of umbilical hernias. These surgical techniques range from primary suture repair to reinforcement with mesh and can be performed through open and laparoscopic approaches. At present, there is no accepted gold standard for umbilical hernia repair. Recent studies have shown lower rates of recurrence after mesh repair when compared with sutures alone, although conflicting data exist. The potential disadvantages of synthetic mesh placement (including infection, seroma, foreign body sensation, and adhesions to underlying viscera) must be recognized and considered; however, pooled data demonstrate no significant differences in complication rates when comparing mesh to suture repair. Based upon current evidence, primary repair remains reasonable and appropriate for small primary umbilical hernias. Mesh reinforcement should be considered in patients deemed high risk for recurrence. As always, the specific technique for repair should be tailored to the individual patient.

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