

Retrospective analysis of smaller than 3-cm umbilical hernia repair with the lightweight macroporous mesh

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Abstract

There is evidence that mesh repair for primary umbilical hernias results in fewer recurrences and similar wound complication rates compared to tissue repair. Various devices and surgical approaches are used in umbilical hernia repair. The ULTRAPRO PLUG (UPP) has been adopted for inguinal hernias and femoral hernias with excellent results. However, there are few reports on the use of UPP for umbilical hernia repair. Thus, the aim of this study was to evaluate efficacy and safety in the treatment of smaller than 3-cm umbilical hernias using the UPP.

The medical records of 123 patients who underwent umbilical hernia repair using the UPP between October 2011 and September 2017 were reviewed. All patients were followed-up after 1 month and later in 2018. Demographics, surgical information, and immediate postoperative and long-term complications were assessed.

Out of 123 patients, there were 37 male and 86 female patients with a mean age of 50.6 years. The median duration of hernia surgery was 20.5 min (range, 12–34), and 109 (88.6%) patients underwent day surgery. The median defect diameter was 1.4 cm (range, 0.5–3). No mortality or major complications occurred during the perioperative period. Long-term follow-up data were available for 107 (87.0%) patients. The median follow-up duration was 33 months (range, 5–76 months). Early postoperative complications included 1 case of seroma, 2 cases of fat liquefaction, and 1 case of superficial surgical site infection. During follow-up, there were 2 recurrences, 1 case of chronic mesh infection, and 2 patients with chronic postoperative pain.

The ULTRAPRO PLUG offers a simple and quick means of repairing smaller than 3-cm umbilical hernias with lower recurrence rates and fewer postoperative complications.

Abbreviations: ASA = American Society of Anesthesiologists, UPP = ULTRAPRO PLUG, VAS = visual analog scale.

Keywords: complication, tension-free repair, ULTRAPRO PLUG, umbilical hernia

1. Introduction

Umbilical hernia represents 6% of all abdominal wall hernias in adults.^[1] In most cases, the hernia consists of a rigid and fibrotic hernia gap that does not enlarge, but a hernia sac that enlarges substantially.^[2] When an umbilical hernia becomes symptomatic with a risk of incarceration, surgical repair is usually required. Increasing evidence suggests that the use of prosthetic mesh is a preferable method for hernia repair, since traditional suture repair techniques have a high risk of recurrence of approximately 11% to 54%.^[3–5] A prospective, randomized trial comparing

suture and mesh repair of umbilical hernias in adults demonstrated a recurrence rate of 1% with mesh repair compared with 11% with suture repair.^[6]

The ULTRAPRO PLUG (UPP, Ethicon, Norderstedt, Germany), was introduced in 2007 and comprises 3 parts: a rim, connector, and anchor (Fig. 1). It is a sterile, lightweight, large-pore, self-expanding, and partially absorbable mesh prosthesis. The three-dimensional plug is composed of 25% Prolene (polypropylene) and 75% Monocryl (poliglecaprone 25). The poliglecaprone component is absorbed within 120 days. We used the large UPP plug, in which the diameter of both the unfolded rim and the anchor was 5 cm. The UPP has been used for the repair of inguinal and femoral hernias,^[7–9] but there are few clinical data for its use in umbilical hernias. Thus, this retrospective study aimed to investigate umbilical hernia repair with UPP, especially for hernias measuring <3 cm.

2. Materials and methods

2.1. Patient population

Between October 2011 and September 2017, 147 consecutive patients underwent umbilical hernia repair at the Department of Gastrointestinal Surgery, Hernia Center, West China Hospital of Sichuan University. The exclusion criteria include: younger than 18 years old; recurrent umbilical hernia; underwent emergency umbilical hernia surgeries; and the diameter is larger than 3 cm. After exclusion, 123 patients were enrolled in this study (Fig. 2).

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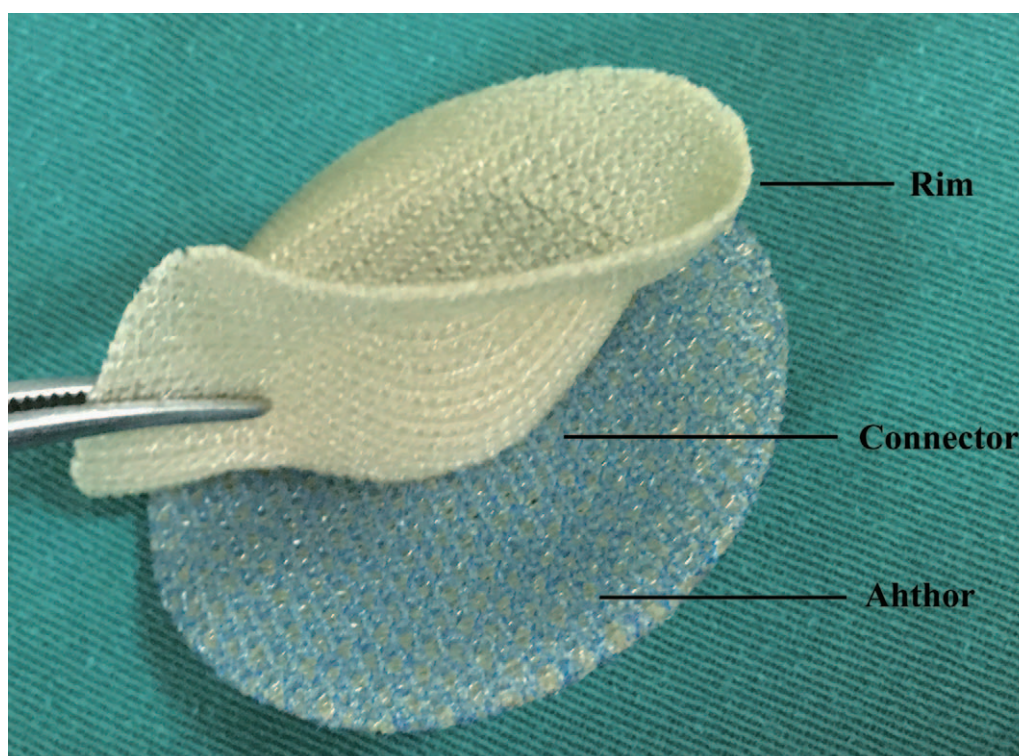


Figure 1. The structure of ULTRAPRO PLUG (UPP). UPP=ULTRAPRO PLUG.

All patients received a standardized procedure by the same surgical team. The study protocol was approved by the Ethics Committee of Sichuan University and relevant institutions for the use of human subjects in research. Written informed consent was obtained from all patients in this study.

2.2. Anesthetic and surgical technique

Local infiltration anesthesia with 0.25% lidocaine was used in all cases. An infraumbilical or supraumbilical semilunar incision of about 4 cm was made. The anesthetic was injected subcutaneously along the surgical incision. The skin was incised down to the subcutaneous tissue and fascia to expose the hernia sac (Fig. 3A). Anesthetic was injected around the hernia ring before we isolated the hernia sac. Generally, the hernia sac was directly returned to the abdomen without opening (Fig. 3B). For those patients with too small hernia ring to return, we would enlarge the umbilical defect. If the hernia sac was broken at the time of separation, we closed any lacerations of the peritoneum to avoid any contact of the plug with the contents of the peritoneal cavity. After reducing the sac, the preperitoneal space around the hernia ring was slightly dissected. The anchor of the UPP was then placed into the preperitoneal space without any suturing as it would automatically unfold due to its elasticity (Fig. 3C). Thus, we did not need to dissect the preperitoneal space extensively. For the relatively larger ring, we reduced the hernia ring around the connector. The rim was then sutured onto the margins of the umbilical defect at 3, 6, 9, and 12 o'clock positions with 3-0 absorbable suture. Excessive plug rim was trimmed to improve postoperative comfort (Fig. 3D). The wound was closed using 3-0 absorbable suture in layers with no drainage. No patients received perioperative antibiotics except for those with

cirrhosis, renal failure, or long-term use of immunosuppressive agents.

2.3. Data extraction

Duration of surgery, length of postoperative hospitalization, complications, and recurrence were recorded. Following standard procedures, patients were scheduled for a follow-up visit 1 month after surgery. Any complications at this time were noted and treated. Patients were also scheduled for an additional follow-up visit in 2018. When patients did not return for follow-up, telephone interviews were conducted. Recurrence was defined as a defect of the midline aponeurosis around the umbilicus at the site where the operation had been performed. Color Doppler ultrasound or computed tomography was performed if deemed necessary for proper diagnosis. The definition of fat liquefaction was that patients had yellow or pale brown exudate on 3 to 7 days after operation, and fat droplets were mixed inside the incision. There were no inflammatory manifestations such as redness, swelling, heat, and pain. After squeezing incision, dressing and compression bandage were all improved. Degree of chronic pain was assessed using a visual analog scale (VAS), in which 0mm represented no pain and 100mm represented unbearable pain.

3. Results

We operated on 123 patients using UPP technique between October 2011 and September 2017. Demographic and clinical characteristics are shown in Table 1. All patients underwent elective procedures under local infiltration anesthesia and none required a change to general or spinal anesthesia. The median

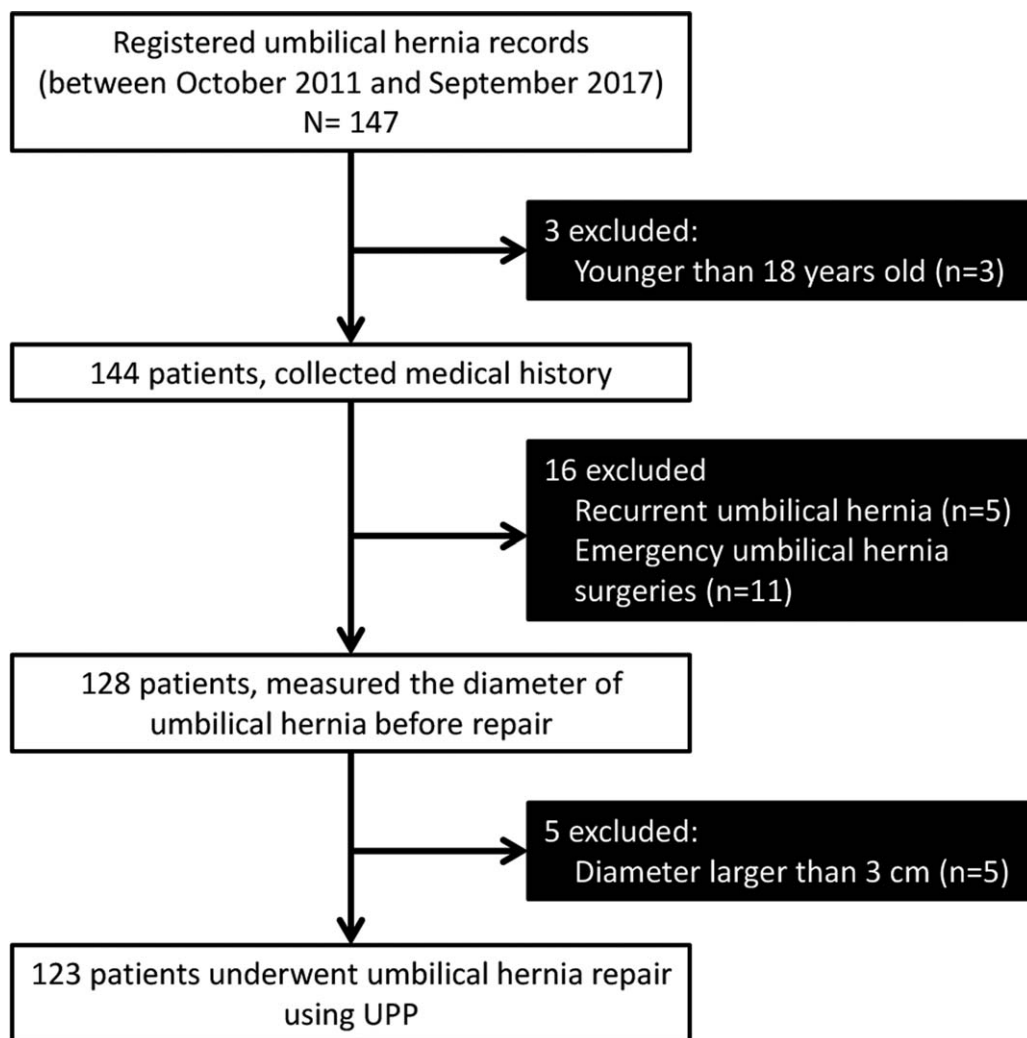


Figure 2. The summary of the patient population included in the study.

defect diameter was 1.4 cm (range, 0.5–3). The median operative time was 20.5 min (range, 12–34). No bowel or vascular injuries occurred during surgery.

Complications of UPP use are shown in Table 2. In the early postoperative period (at 1 month), 1 seroma required needle aspiration, 2 cases had fat liquefaction, and 1 had a superficial surgical site infection that healed with dressings. Most (109/123) patients were discharged within 24 hours. Long-term follow-up data were available for 107 (87.0%) patients. Median follow-up was 33 months (range, 5–76 months). During follow-up, 2 recurrences, 1 chronic mesh infection, and 2 cases with postoperative chronic pain were identified. One patient developed recurrence 7 months after surgery, and another developed recurrence at 13 months. The 2 recurrences were repaired with intraperitoneal mesh. In the second operation, we did not investigate the status of the first repair. The 2 recurrences might have been due to shrinkage of the patch. The chronic mesh infection showed sinus formation 3 months after hernia surgery. Through 3 months' local debridement and dressing treatment, the local sinus formation was still unhealed. So we decided to remove the patch and the patient recovered after removal of the patch. And at this time, the local inflammation and edema reaction had basically disappeared. Follow-up duration in 1

patient with chronic pain was 3 months, with a VAS score of 15 mm at rest and 25 mm during activities; another patient was followed for 12 months, with a VAS score of 10 mm at rest and 20 mm during activities.

4. Discussion

A variety of methods are used to repair umbilical hernias, ranging from simple suture repair to complex laparoscopic hernioplasty. While conventional repair techniques are associated with high recurrence rates, the laparoscopic techniques require a sophisticated setup and long learning curve. Open mesh repair is the middle pathway. Tension-free herniorrhaphies with mesh technique have been popular, especially for larger defects (>3 cm in diameter) because of their lower recurrence rate, decreased postoperative pain, and faster recovery.^[10–12] The question remains as to whether defects smaller than 3 cm should be treated systematically with prosthetic repair. However, as primary closure often fails and as these hernias are prone to complications, mesh repair should be considered even in these smaller hernias.^[12–15] In a cohort study, the number of patients with a small umbilical or epigastric hernia recurrence was reduced by more than 50%, even for very small defects of 0 to 1 cm, using

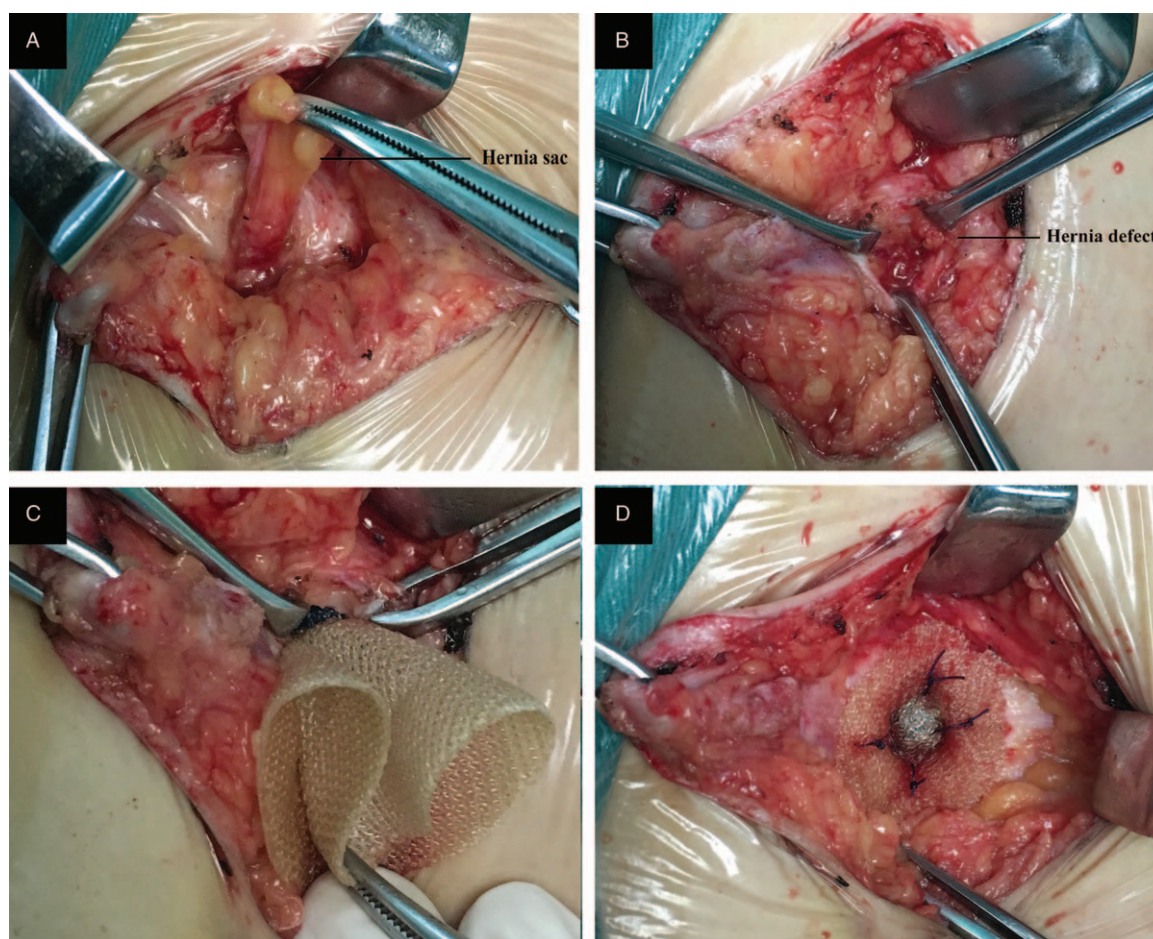


Figure 3. The surgical approach using ULTRAPRO PLUG (UPP) in umbilical hernia repair. (A) Hernia sac. (B) Umbilical hernia defect. (C) Placement of the anchor of the UPP into the preperitoneal space. (D) Sutured to umbilical ring at 3, 6, 9, and 12 o'clock positions. UPP=ULTRAPRO PLUG.

mesh reinforcement (10%) compared with simple suture repair (21%), without increasing the risk of chronic pain (6% and 5%).^[16] A randomised, double-blind, controlled, multicentre trial published in the Lancet showed there were fewer recurrences in the mesh group than in the suture group with small umbilical hernias of diameter 1 to 4 cm (4% vs 12%).^[17] In our study, we

used tension-free herniorrhaphy with UPP to repair umbilical hernias with defects smaller than 3 cm and also obtained a better effect.

Currently, more than 200 mesh products are available, including polytetrafluoroethylene, polypropylene, polyester, and biological products.^[18] The acceptance of UPP for the repair of inguinal and femoral hernias led us to attempt using the same mesh for umbilical hernia repair. Umbilical hernia repair with UPP may have many advantages. First, the innovative three-in-one design, especially the connector, makes it ideal for umbilical hernia repair. The anchor strengthens the back wall of

Table 1
Demographic and clinical characteristics of patients with umbilical hernia repaired with UPP (n=123).

Characteristic	N (%) or median (range)
Gender	
Female	86
Male	37
Age, years	50.6 (19–87)
I: II: III: IV (ASA)*	16: 65:39:3
Duration of surgery, minutes	20.5 (12–34)
Postoperative hospital stay	
<24 hours	109 (88.6)
≥24 hours	14 (11.4)
Size of hernia	
≤1cm	45 (36.6)
>1, ≤2cm	68 (55.3)
>2, ≤3cm	10 (8.1)

* ASA=American Society of Anesthesiologists, UPP=ULTRAPRO PLUG.

Table 2
Complications after umbilical hernia repair with UPP.

Complication	Number (%)
Immediate complication	
Superficial infection	1/123 (0.8)
Seroma	1/123 (0.8)
Fat liquefaction	2/123 (1.6)
Abscess	0
Long-term complication	
Postoperative chronic pain	2/107 (1.9)
Mesh infection	1/107 (0.9)
Recurrence	2/107 (1.9)

UPP=ULTRAPRO PLUG.

the umbilical hernia, the connector blocks the hernia ring, and the rim is fixed in the hernia ring. The sandwich structure of UPP can prevent plug migration and retain the abdominal contents. The recurrence rate is low. Only 2 cases (1.9%) recurred during our follow-up. The recurrence rate can be acceptable, compared with previous reports of recurrence rates of 0% to 14.8%.^[19–21] Second, the approach used in our study proved to be convenient. We did not need to expand the preperitoneal space extensively, because the anchor of the UPP would automatically unfold in the preperitoneal space due to its elasticity. Thus, the surgery became more precise and less invasive. The median duration of surgery was only 20.5 min, which was much shorter than with use of other methods.^[12,22] In our study, all patients successfully completed surgery under local infiltration anesthesia, avoiding unnecessary and extensive dissection of the preperitoneal space. Local anesthesia is preferred to other methods due to a better safety profile, shorter recovery time, reduced urinary morbidity, and lower overall cost.^[23,24] Most (88.6%) of our patients were discharged within 24 hours. Third, compared with traditional plugs, the lightweight, large pore, and partially absorbable hernia repair device was superior because of its increased flexibility and reduction in chronic pain incidence.^[25] Our follow-up found 2 patients with chronic pain and a relatively low VAS score. Our results suggest that the use of the UPP device for umbilical hernia repair may contribute to lower recurrence rates, fewer cases with chronic pain, and lower risk of mesh-related infection.

Although umbilical hernia repair with UPP has many advantages, its application has some limitations. The anchor diameter is only 5 cm. It cannot be used for multiple hernias or larger umbilical hernias. However, the umbilical hernia ring is generally smaller. Porrero et al^[26] reported that the mean defect size of 934 umbilical hernias was 1.9 cm (1.78–1.93). We believe that for umbilical hernias smaller than 3 cm, this method is safe, reliable, and convenient.

5. Conclusions

Repairing umbilical hernia in adults with UPP is a convenient and minimally invasive technique with a lower rate of complications, less postoperative chronic pain, and a lower recurrence rate.

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Author contributions

Contributors: LWZ designed the study. XYY acquired the data and wrote the article. SYH, WY, and MDY translated and revised the article. XYY, ZS, LAQ, and JFS analyzed the data and translated the article. All authors reviewed and approved the manuscript for publication.

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