Modified Laparoscopic Lateral Suspension with A 5 Arm Mesh in Pelvic Organ Prolapse Surgery.

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Research Article

Keywords: Pelvic organ prolapse (POP), Laparoscopic lateral suspension (LLS), T-shaped synthetic mesh, Five Arm Mesh, Posterior compartment repair

Posted Date: March 5th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-271886/v1

Abstract

Background: The LLS procedure is a laparoscopic technique used to treat pelvic organ prolapse (POP), performed with a T-shaped synthetic mesh graft. The posterior compartment is repaired by using a second mesh or a second procedure like posterior colporrhaphy in the LLS procedure. In laparoscopic lateral suspension (LLS) surgery, we want to repair the defect of the posterior compartment in addition to the apical and anterior compartment by using a 5-arm mesh instead of a T-shaped synthetic mesh graft. In this study, we aim to report clinical results of surgeries performed POP repair with a 5-arm mesh.

Method: Data from 37 patients who underwent LLS surgery by using a 5-arm mesh with a diagnosis of advanced stage (≥ stage 3) POP and the defect of the posterior compartment were retrospectively analyzed. The postoperative examination included grading and measurement of the POP-Q stage. Surgical outcomes were reported in pursuance of the International Urogynecological Association recommendations. The results of measurements and examinations, the reoperation rates, the erosion rates, lower urinary tract symptoms (LUTS), and complications were recorded. A p-value of < 0.05 was considered to be statistically significant.

Results: There was a significant improvement in POP-Q ≤ -1 score in all treated compartments with an overall objective cure rate of 95.3% for the apical compartment, 86.1% for the anterior compartment, and 91.1% for the posterior compartment. The mean operative time was 96.27±15.81 minutes. The mean length of hospitalization was 2±0.82 days. A significant improvement was observed in symptoms of the vaginal bulge, urinary urgency, incomplete voiding, urinary frequency after surgery. Also, an improvement occurred in defecation symptoms of patients after POP repair. While 13 of the patients (35.1%) were sexually active preoperatively, this rate was determined to be 59.4% (n=22) postoperatively. De novo stress urinary incontinence developed in 7 patients (18.9%) postoperatively. The POP-related quality-of-life score (PQOL) improved significantly after surgery.

Conclusion: İn advanced stage POP patients undergoing laparoscopic lateral suspension procedure using a 5-arm mesh, damaged compartments including the posterior compartment can be repaired without the need for an additional procedure and the recurrence rate can be reduced.

Introduction

Pelvic organ prolapse (POP) is a downward protrusion of one or more than one of the uterus or vaginal parts [anterior vaginal wall, posterior vaginal wall, uterus (cervix) or the apex of the vagina (vaginal vault or cuff scar after hysterectomy)](1). The prevalence of POP which negatively affects the lives of women is 3–6% in postmenopausal women when defined and graded based on symptoms compared with 41–50% when defined and graded based on examination(2). The lifetime risk of surgery for pelvic organ prolapse of women is 12-19% and 10-30% of women with a diagnosis of POP are required to be operated again(3).

Various vaginal and abdominal surgical approaches using the native tissue or mesh were defined for the treatment of POP. Following the warning of FDA in 2009 and 2011 regarding POP repair with vaginal mesh, trans-abdominal mesh procedures have reached the more favourable(4, 5). Sacrocolpopexy (SCP) is the first laparoscopic technique used to treat POP and it is considered to be the gold standard. The operative time and learning curve of SCP is long. These techniques used for surgery require dissection at the level of the promontory or sacral area, which can be challenging, particularly in obese women and when anatomic variations exist. Sacral area lesions can lead to serious neurological, ureteral or vascular injuries(6, 7).

The laparoscopic lateral suspension (LLS) procedure described by Dubuisson et al. does not require dissection at the level of the promontory or sacral area. Therefore, the risk for the severe complication is less. The LLS procedure is performed with a T-shaped synthetic mesh graft. This procedure can be performed with or without uterus preservation or after hysterectomy(8). Published data on laparoscopic lateral suspension (LLS) in both the anterior and apical compartment show an objective success rate of > 90% after 1 year . The LLS procedure can be an alternative procedure to SCP in the repair of the apical compartment(9, 10).

The posterior compartment is repaired by using a second mesh or a second procedure like posterior colporrhaphy in the LLS procedure(11). In laparoscopic lateral suspension (LLS) surgery, we want to repair the defect of the posterior compartment in addition to the apical and anterior compartment by using a 5-arm mesh instead of a T-shaped synthetic mesh graft in non-hysterectomized patients with advanced-stage (≥ stage 3) POP and to reduce recurrence(Figure 1). In this study, we aim to report clinical results of surgeries performed POP repair with a 5-arm mesh and to contribute to the determination of the most optimal method for surgical treatment of POP.

Methods

Ethical Approval

This retrospective study was performed in the Department of Obstetrics and Gynecology of Mugla Sıtkı Koçman University Faculty of Medicine. This study was carried out under the recommendations of the Good Clinical Practice (ICH/GCP), Ministerial Decree of 1997. The study was approved by the Ethics Committee of Mugla Sıtkı Koçman University Faculty of Medicine with a date and number of January 20th, 2021 and No: 2/II. A written informed consent was received for all subjects gave following the Declaration of Helsinki.

Study Design

We performed LLS surgery by using a 5-arm mesh in 49 patients with a diagnosis of advanced stage (≥ stage 3) POP and the defect of the posterior compartment between March 2016 and January 2020. Thirty-seven patients in whom we could perform urogynecological examination and interrogation at the postoperative >12th month were included in the study. Demographic and clinical characteristics of

patients were gathered from the electronic medical records, preoperative notes, imaging results, intraoperative and postoperative notes.

The followings were documented: preoperative demographic characteristics, POP-Q stage, and prolapse-related symptoms. POP was defined according to the simplified Pelvic Organ Prolapse Quantification grading system (POP-Q) and POP-Q was used to assess the degree of prolapse (points Ba, Bp, C)(1). All of the patients included in the study were patients with stage ≥ 3 uterovaginal prolapse without abnormal uterine hemorrhage and with negative cervical cytology and posterior compartment defect. Patients undergoing sacrocolpopexy or pelvic organ prolapse surgery by using vaginal mesh previously were excluded from the study. All cases were operated by a single surgeon (EA).

Surgical technique

Surgery was performed under general anesthesia in the Trendelenburg position. We used a central 10-mm umbilical trocar for the 0-degree camera and three 5-mm trochars; 1 to be placed in the right lower quadrant, 1 to be placed in the left lower quadrant, 1 to be placed in the left upper quadrant. RUMI (Cooper Surgical, Trumbull, CT) retractor was inserted inside the uterine cavity for uterine manipulation. The vesicovaginal space was tried to be dissected until the 1/3 lower third border of the vagina by directing the uterus, cervix, and partially the vagina with the retractor. The rectovaginal space was dissected and the perineal body and anorectal junction border were tried to be reached. The urinary bladder anteriorly and the rectum posteriorly were become mobilized. A bilateral window with a diameter of 1.5 cm was opened in the avascular area on the ligamentum latum leaves, below the ligamentum rotundum, and distant from the ureter. A polypropylene macropore mesh (Parietene™, Sofradim-Covidien, Trévoux, France) in size of 30×30 cm was cut with scissors and a 5-arm mesh was prepared with following sizes: middle rectangular part approximately in size of 4×6 cm, two long branches in size of 2×18 cm, and two short branches in size of 2×6 cm (Fig 1).

The middle part of the mesh in size of 4×6 cm was placed into the vesicovaginal space and sutured separately to the anterior vaginal wall, cervical, and isthmus part of the uterus with no: 2/0 Prolen (Monofilament Polypropylene Suture, Ethicon) as not to occur shrinkage in the mesh. Two short branches in size of 2×6 cm were passed through windows opened on the ligamentum latum leaves and behind the uterus bilaterally and sutured separately to the rectovaginal fascia, sacrouterine ligament, and posterior vaginal wall with no: 2/0 Prolen (Monofilament Polypropylene Suture, Ethicon). A 5-mm skin incision was performed on both sides 2 cm above the iliac crest and 4 cm posterior to the anterior superior iliac spine. Laparoscopic grasper was advanced in the avascular area by inspecting the large vessels (external iliac artery-vein) in the retroperitoneal area and by passing through under the ligamentum rotundum. Then the tip of one of the long branches in the size of 2×18 cm of a 5-arm mesh was grasped and put out of the skin. The same procedure was repeated on the other side. The symmetrical lateral suspension was performed and lateral arms of the mesh were not sutured to the fascia according to the “tension-free” repair principle. The mesh was then cut at the level of the skin before the closure of the incision. The

parts of the mesh placed into the vesicovaginal space and rectovaginal space were closed by performing peritonization with the use of no: 0 absorbable Vicryl Rapide™ (polyglactin 910) suture.

Postoperative analysis

Urogynecological examinations of 37 patients undergoing surgery by using a 5-arm mesh and completing at least postoperative 12 months were performed in the lithotomy position and additionally by performing Valsalva maneuver in the standing position. The postoperative examination included grading and measurement of the POP-Q stage. Surgical outcomes were reported in pursuance of the International Urogynecological Association recommendations(12). The results of measurements and examinations, the reoperation rates, the erosion rates, lower urinary tract symptoms (LUTS), and complications were recorded.

The anatomic objective cure was defined as satisfactory when POP-Q was ≤ −1. Complications were evaluated with the Clavien-Dindo classification and they were classified by using the joint International Urogynecological Association/International Continence Society (IUGA/ICS) complication classification(13). POP-related quality of life (QoL) of patients was assessed with a validated P-QOL questionnaire(14).

Statistical analysis

The data obtained from the study were analyzed by using Statistical Package for Social Science (SPSS) 20.0 for Windows (SPSS Inc, Chicago, Illinois, USA) program. Shapiro-Wilk and Kolmogorov-Smirnov tests were used to evaluate the conformity of the data to a normal distribution. Continuous data were shown as mean ± standard deviation. Categorical data were shown as number and percentage. The Student t-test was used for the intergroup comparisons of parameters with normal distribution. The Mann Whitney U test was used for the intergroup comparisons of parameters without normal distribution. The Chi-Square test and the Fisher Exact Chi-Square test were used for comparison of qualitative data. The statistical significance level of the data obtained from the study was interpreted with a "p" value. A p-value of < 0.05 was considered to be statistically significant.

Results

Demographic data, preoperative examination findings, and prior POP related surgery histories of non-hysterectomized 37 patients undergoing LLS surgery by using a 5-arm mesh were summarized in Table 1.

Table 1 Preoperative demographic data and findings (n=37).	
Demographic data	All patients
Age, (year)	55.7±4.1 (36-77)
BMI (kg/m^2)	29.1±3.3 (20.4-35.3)
Parity, (n)	3.4±1.2 (1-9)
Number of vaginal deliveries	3.3±0.9 (1-9)
Menopausal status, n (%)	
· Premenopausal	8 (21.7)
· Postmenopausal	29 (78.3)
Prior POP surgery, (n)	
· Colporrhaphy anterior	4
· Manchester Fothergill	2
Prior stress urinary incontinence surgery, (n)	
· Transobturator sub-urethral sling	2
· Kelly-Kennedy	2
POP-Q	
· Stage 3, n (%)	16 (43.2)
· Stage 4, n (%)	21 (56.8)
Values expressed as the mean ± standard deviation (range) or number (%). POP pelvic organ prolapse, POP-Q Pelvic Organ Prolapse Quantification System (simplified).	

Postoperative anatomic outcomes of patients undergoing LLS surgery by using a 5-arm mesh were summarized in Table 2. The mean postoperative follow-up was 20.13±5.83 months (Range: 13-34 months). There was a significant improvement in POP-Q ≤ −1 score in all treated compartments with an overall objective cure rate of 95.3% for the apical compartment, 86.1% for the anterior compartment and 91.1% for the posterior compartment. The mean operative time was 96.27±15.81 minutes (Range: 84-123 minutes). The mean length of hospitalization was 2±0.82 days (Range: 1−4 days).

Table 2 Anatomic outcomes in patients undergoing uterus-preserving laparoscopic lateral suspension with a 5-arm mesh.			
POP-Q	Prior surgery	After surgery (≥ 12 months)	
			p
Point Bp	3.27 ± 0.41	−4.32 ± 0.83	p<0.001
Point C	5.56 ± 0.53	−6.35 ± 0.91	p<0.001
Point Ba	3.45 ± 0.52	−3.96 ± 0.87	p<0.001
Values expressed as the mean ± standard deviation (range) or number (%).			

Preoperative and postoperative lower urinary tract symptoms of 37 patients undergoing LLS surgery by using a 5-arm mesh were compared in Table 3. The most common symptom was palpable swelling in the genital region and walking difficulty due to this swelling. A significant improvement was observed in symptoms of the vaginal bulge, urinary urgency, incomplete voiding, urinary frequency after surgery. Also, an improvement occurred in defecation symptoms of patients after POP repair. While 13 of the patients (35.1%) were sexually active preoperatively, this rate was determined to be 59.4% (n=22) postoperatively. Three of 22 patients (13.6%) who were sexually active postoperatively had dyspareunia. While occult stress urinary incontinence (SUI) was present in 2 patients (5.4%), de novo SUI developed in 7 patients (18.9%) postoperatively. The POP-related quality-of-life score (PQOL) improved significantly after surgery.

Table 3 Comparison of preoperative and postoperative lower urinary tract symptoms.			
Lower urinary tract symptoms, n (%)	Prior surgery n (%)	After surgery (≥ 12 months), n (%)	p
Vaginal bulge	37 (100)	2 (5.4)	p<0.000
Urinary urgency	24 (64.8)	3 (8.1)	p<0.001
Incomplete voiding	29 (78.3)	3 (8.1)	p<0.001
Urinary frequency	27 (72.9)	8 (21.6)	p<0.01
SUI (Stress Urinary Incontinence)	2 (5.4)	7 (18.9)	p<0.05
Constipation	11 (29.7)	3 (8.1)	p<0.05
Fecal Incontinence	4 (10.8)	2 (5.4)	p>0.05
• Sexual activity • Dyspareunia	13 (35.1) 6 (46.1)	22 (59.4) 3 (13.6)	p<0.05 p<0.05
Pelvic pain	11 (29.7)	8 (21.6)	p>0.05
Score PQOL (0–28)	24.6 ± 6.7	1.5 ± 0.8	p<0.01
Data are presented as the number of cases (n), percentages (%).			

Postoperative major complications occurred in none of the patients (Clavien-Dindo grade 1). Postoperative other complications were summarized in Table 4. Cystocele occurred in 2 patients and rectocele in 1 patient. Anterior colporrhaphy was performed in 2 symptomatic patients with cystocele recurrence. One patient with rectocele recurrence was not operated due to being asymptomatic. Anterior vaginal wall mesh exposure was observed in one patient. The grade of vaginal exposure was grade 2 (exposure > 1 cm). The part of the vaginal wall with mesh exposure was determined at the postoperative 5^{th} month and classified as 3bT3S according to the Prosthesis/Graft Complication Classification System (IUGA/ICS). The mesh exposed was resected partially and vaginal mucosa was repaired primarily.

TVT (retropubic tension-free vaginal tape) was performed in 4 of 7 patients (18.9%) developing de novo SUI. Three patients preferred conservative treatment methods.

Table 4 Postoperative complications.	
Complications	n (%)
Repeat surgery for recurrence	
Anterior compartment	2(5.4)
Apical compartment	0
Vaginal mesh erosion	1 (2.7)
Repeat surgery for SUI	4 (18.9)
Data are presented as the number of cases (n), percentages (%).	

Discussion

POP is a condition with anatomical symptoms such as palpable swelling, bruising in the genital region, and causing dysfunctions like difficulty in defecation and miction, incontinence and also psychological effects, deteriorating sexual and social life(15). Repairing compartment defects in POP and approaching it to normal anatomy will result in favorable functional and psychological effects.

We used a 5-arm mesh in 37 LLS procedures in stage ≥3 POP patients. Concerning the anatomical outcome, the analysis of the POP-Q stage outcome shows a statistically significant improvement. The best anatomic result was in the apical compartment and the success rate was 95.3%. The success rate was 86.1% in the anterior compartment. All of the patients undergoing surgery had a preoperative posterior compartment defect and desired anatomical improvement was obtained with a rate of 91.9% postoperatively. While postoperative apical and anterior compartment repair outcomes with a 5-arm mesh were similar to LLS and SCP, our posterior vaginal repair outcomes were better than LLS.

LLS procedure is not indicated in the presence of a significant apical/posterior defect (enterocele, high rectocele)(16). When simultaneous anterior and posterior compartment repair was performed in the patients undergoing apical compartment defect repair, the risk of reoperation has reduced(17). Lateral arms performing suspension in cases used a T-shaped synthetic mesh graft in the LLS procedure do not ensure the closure of the pouch of Douglas. This condition may cause the progression of the posterior defect. To repair the apical compartment defect together with the posterior compartment defect or to prevent the occurrence of de novo posterior defect, posterior colporrhaphy performed with the native tissue or an additional posterior compartment repair procedure using a mesh was added to both SCP and LLS surgery. In hysterectomized POP patients undergoing SCP and LLS surgery in whom the mesh placed in the apical compartment was sutured to the deep posterior vaginal wall into the rectovaginal space, an additional posterior repair procedure are not needed any more(18, 19). Dubuisson et al. performed laparoscopic lateral suspension with 2 meshes in size of 14×3 cm placed in the anterior and posterior compartments[8]. Afterward, while Dubuisson et al. repaired the apical and anterior compartment defects using a T-shaped mesh with the middle part between 5 to 8 cm in length and 4 to 6 cm in width, and arms

3 cm in width, they repaired the posterior compartment defect using a rectangular polyester patch 6 to 8 cm in length and 4 to 6 cm in width fixed on the rectovaginal fascia but not performed suspension[9]. The risk of mesh-related complications increases with the size of mesh used (20). We repaired the posterior compartment defect by suturing 2 short arms of a 5-arm mesh 6 cm in length and 2 cm in width to the sacrouterine ligament, the posterior wall of the cervix, and the posterior vaginal wall. When we elevated the long arms, a symmetrical suspension occurred also in the posterior compartment as it was in the anterior and apical compartments. The point Bp was in average −4.32 ± 0.83 cm distance during at least postoperative 1-year follow-ups of our patients. Recurrent posterior compartment prolapse occurred in none of our patients.

A meta-analysis of sacrocolpopexy with hysterectomy compared to sacrocolpopexy without hysterectomy was associated with four times higher risk of mesh exposure (21). Similarly, the success rate in POP patients undergoing hysterectomy simultaneously with LLS was less and the recurrence and mesh erosion rates were higher compared to patients not undergoing hysterectomy(22). We performed a hysterectomy with the indication of prolapse in none of our patients. A 5-arm mesh could easily be performed in the LLS procedure without the need for hysterectomy.

Correction of the damaged anatomical structure in POP patients provided also improvement in symptoms. A marked improvement occurred postoperatively in symptoms of the preoperative vaginal bulge, urinary urgency, incomplete voiding, urinary frequency, constipation, and fecal incontinence.

While the rate of de novo constipation was reported to be 1.9-11.4% in patients undergoing abdominal SCP, the rate of constipation after LLS suspension was reported to be 5.5-8.4% (10, 23). Constipation was present in 8.1% of our patients in whom we used a 5-arm mesh. The rate of occult SUI (stress urinary incontinence) was reported to be 20% in patients with a diagnosis of POP, but this rate was higher in advanced stage POP patients (24). Veit-Rubin N et al.(25) determined the rate of SUI as 6.6% after LLS surgery. In our study, we determined de novo SUI in 7 patients (18.9%).

LLS seemed to preserve normal sexual function and women were determined to be sexually more active after surgery compared to earlier. Not performing hysterectomy simultaneously in LLS caused more favorable sexual outcomes (25). In our study, while we did not interpret regarding the quality of sexual function, the number of sexually active patients was increased postoperatively and the rate of dyspareunia was reduced.

The use of mesh in pelvic organ prolapse surgery reduced the recurrence rates of prolapse. It is impossible to neglect the complications such as mesh-related vaginal erosion, granulomas, dyspareunia, vesicovaginal fistulas, and an increase in overactive bladder symptoms. Vaginal erosion is the most common mesh-related complication. As it can be treated with conservative methods, it can also require complex repeated surgical interventions (26). The risk of mesh erosion increases 10-folds in smoking individuals, 5-folds in patients undergoing POP or UI surgery. A specific finding was that the posterior mesh was associated with a higher risk of erosion than the anterior mesh(27). A systematic review that

included more than 7000 women found a median mesh erosion rate of 4% during a 2-year follow-up after abdominal POP surgery with a mesh (28). Mesh erosion occurred in the uncomplicated area of the anterior compartment in a size of 1.5 cm in 1 of our patients (2.7%). To reduce the risk of mesh erosion, surgical precautions such as abstaining from aggressive dissection which may deteriorate perfusion, not damaging surrounding organs like the urinary bladder, rectum, and selection of appropriate mesh (macroporous and monofilamentous polypropylene) should be performed (29).

Strenghts and limitations

Limitations of our study are the retrospective design of the study and the inclusion of a relatively small number of patients. The strength of our study is that it reports the results of a method applied for the first time in the literature. Further studies are required to find the optimal surgical method in POP treatment.

Conclusion

İn advanced stage POP patients undergoing laparoscopic lateral suspension procedure using a 5-arm mesh, damaged compartments including the posterior compartment can be repaired without the need for an additional procedure and the recurrence rate can be reduced.

Abbreviations

POP Pelvic organ prolapse

SCP Sacrocolpopexy

LLS Laparoscopic lateral suspension

POP-Q Pelvic organ prolapse quantification system

QQL Quality of life

SUI Stress Urinary Incontinence

TVT Retropubic tension-free vaginal tape

FDA US Food and Drug Administration

Declarations

Ethics approval and consent to participate: This study was carried out under the recommendations of the Good Clinical Practice (ICH/GCP), Ministerial Decree of 1997. The study was approved by the Ethics Committee of Mugla Sıtkı Koçman University Faculty of Medicine with a date and number of January 20th, 2021 and No: 2/II. A written informed consent was received for all subjects gave following the Declaration of Helsinki.

Consent for publications: For undergoing surgery written informed consent was obtained from all participants.

Availability of data and materials: The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing of interest: E.Akbaba, declare that I have no competing of interests.

Funding: None

Authors contribution: Single author. E.A performed surgeries, collected surgery data, interpreted pre-and postoperative patient outcomes data on pelvic organ prolapse, wrote the main draft, read and approved the final text.

Acknowledgements: None

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Figures

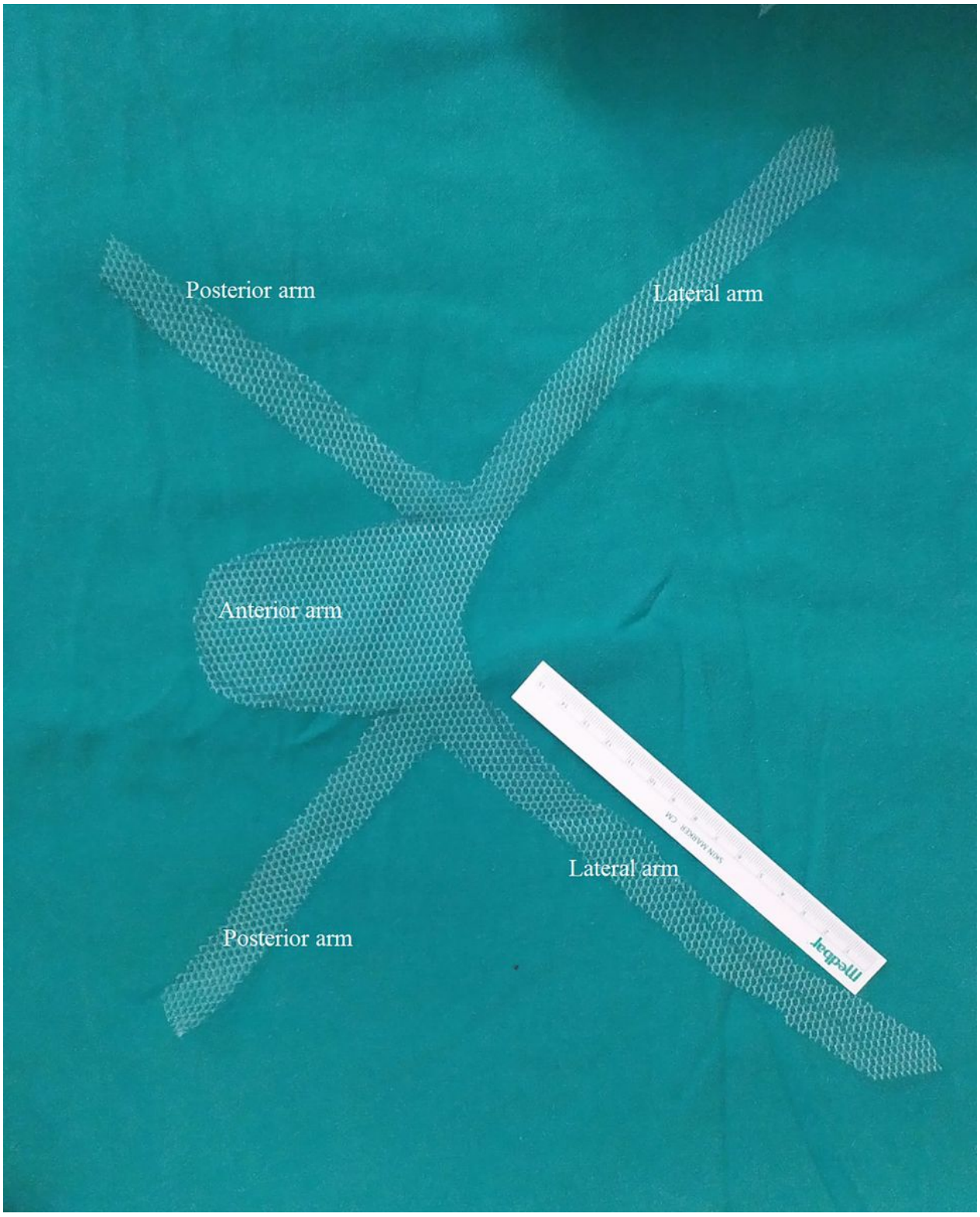

Figure 1

Five-arm, macropore, polipropilen mesh graft.