Original Article

Laparoscopic sacrocolpopexy using barbed sutures for mesh fixation and peritoneal closure: A safe option to reduce operational times

Panagiotis Kallidonis, Abdulrahman Al-Aown[1], Marinos Vasilas, Iason Kyriazis, Vasilis Panagopoulos, Fotini Fligou[2], Anastasios Athanasopoulos, Bagheri Fariborz, Evangelos Liatsikos, Mehmet Özsoy

Departments of Urology and [2]Anesthesiology, University of Patras, Patras, Greece, [1]Department of Urology, Armed Forces Hospital Southern Region, Khamis Mushait, Kingdom of Saudi Arabia

Abstract

Introduction: Laparoscopic sacrocolpopexy (LSC) has established itself as a safe method for the management of pelvic organ prolapse (POP). Laparoscopic suturing is a time-consuming intraoperative task during LSC. Self-retaining barbed sutures (SBSs) are known to reduce the operative time in laparoscopic cases. The current study aimed to evaluate the efficacy and safety of SBS during the performance of LSC.

Materials and Methods: Twenty female patients with symptomatic POP were treated with LSC by an expert surgeon. The preoperative evaluation included the International Continence Society POP-quantification (POP-Q) and the prolapse-specific quality-of-life questionnaire Mesh fixation was performed with SBS anteriorly on the anterior vaginal wall and posteriorly on the levator ani muscle. A 5-mm titanium tacking device was used for promontofixation. The peritoneum was also closed with an SBS.

Results: Mean patient's age was 63 years (range: 50–79 years). According to POP-Q, system 3 patients (15%) had Stage I, 12 patients (60%) had Stage II, 3 patients (15%) had Stage III, and 2 patients (10%) had Stage IV prolapse. Concomitant hysterectomy was performed in 14 patients, respectively. Mean operative time was 99.75 (range: 65–140) min, mean blood loss was 57.75 (range: 30–120) ml. One patient had a bladder perforation intraoperatively, and three patients developed transient fever postoperatively. One patient had a recurrent cystocele and three patients recurrent rectocele.

Conclusions: The current study renders the use of SBS during LSC to be safe and efficient. Further comparative studies would elucidate the impact of the use of SBS in LSC.

Key Words: Complications, laparoscopy, mesh, sacrocolpopexy, self-retaining barbed sutures

Address for correspondence:
Dr. Abdulrahman Al-Aown, P.O. Box: 11740, Abha 61321, Kingdom of Saudi Arabia. E-mail: aown22@hotmail.com
Received: 18.11.2016, **Accepted:** 15.01.2017

Access this article online	
Quick Response Code:	Website: www.urologyannals.com
	DOI: 10.4103/UA.UA_161_16

How to cite this article: Kallidonis P, Al-Aown A, Vasilas M, Kyriazis I, Panagopoulos V, Fligou F, *et al*. Laparoscopic sacrocolpopexy using barbed sutures for mesh fixation and peritoneal closure: A safe option to reduce operational times. Urol Ann 2017;9:159-65.

INTRODUCTION

Pelvic organ prolapse (POP) is a serious burden that significantly diminishes the quality-of-life of the female patients and its treatment is associated with a high cost.[1] The incidence of POP shows an increasing trend.[2] Women in the United States have 11% lifetime risk of being diagnosed with POP or urinary incontinence, and around 200.000 surgical procedures are being performed for the treatment of POP annually.[3] Among several surgical techniques that are available for the treatment of POP, open abdominal sacrocolpopexy (ASC) has been documented as the gold standard surgical treatment. The latter approach is associated with lower recurrence rates and superior outcomes when compared to the transvaginal approach.[4]

Laparoscopic sacrocolpopexy (LSC) has established itself as a safe method for treatment of POP in specialized laparoscopy centers. Urogynecologists worldwide have demonstrated excellent short- and long-term functional and anatomical outcomes.[5] This minimal invasive technique delivers lower morbidity rates and decreased blood loss when compared to conventional ASC.[6] The learning curve lies between 15 and 24 cases, and approximately 40 cases are required to master this laparoscopic technique.[7,8] During laparoscopy, suturing and knot tying are challenging and time-consuming skills related to steep learning curves.[9] Self-retaining barbed sutures (SBSs) have previously been used in other open and laparoscopic operations with safety and efficacy. SBSs are known to reduce operation time, especially during laparoscopy by eliminating the need for knot tying.[10-12] With the current study, we aim to evaluate the efficacy and safety of SBSs during LSC, describe in detail the technique, and present our follow-up data.

MATERIALS AND METHODS

Study population

Twenty consecutive female patients with symptomatic POP were treated by an expert laparoscopic surgeon with LSC.

Indications

The indications for LSC were primary or recurrent POP including deficiency of the posterior (rectocele), middle (vaginal vault prolapse, enterocele), and anterior compartment (cystocele) or combination of them. Symptoms related to the POP were also evaluated for the decision to propose surgery.

Preoperative evaluation

Patient demographics, clinical characteristics including history taking, physical examination, urogenital ultrasound, Pap smear, and urine examinations were recorded. Multichannel urodynamic examinations with and without reduction of the prolapse were performed on patients before surgery. An 1 h weighting pad test took place in all cases that incontinence was diagnosed. Continence was defined as <2 g of urine. Mild to moderate stress incontinence was defined between 2 and 20 g, severe incontinence between 10 and 50 g, and very severe incontinence over 50 g, respectively.[13] International Continence Society POP-quantification (POP-Q) system was used to evaluate the degree of prolapse with the patient in dorsal lithotomy position.[14] The quality-of-life related parameters were evaluated with the use prolapse-specific quality-of-life questionnaire (P-QOL).[15]

Surgical technique

The patient was placed in 20°–25° Trendelenburg position with the hands parallel to the body after the introduction of general anesthesia. The abdomen and the vagina were meticulously scrubbed. A Foley catheter was inserted in the bladder. The sites of trocar placement were identical to the previously described extraperitoneal endoscopic radical prostatectomy technique.[16] Nevertheless, the access was transperitoneal and not extraperitoneal as the latter procedure is performed. In short, the camera trocar was placed according to the Hasson technique through a medial infraumbilical incision. Four other trocars were placed under direct visual control; a 12-mm trocar in the left iliac fossa 3 cm medially to the to the anterior superior iliac spine, a 5-mm trocar in the right iliac fossa at a mirror position to the previous trocar, a 5-mm trocar on the hypothetical line between the umbilicus, and the right iliac spine approximately at lateral margin of the rectus abdominis. Another 5-mm trocar was placed 3 cm caudally to the crossing of the aforementioned hypothetical line with the left lateral margin of the rectus abdominis.

The peritoneum was incised parallel to the right side of sigmoid colon, starting approximately 2 cm above the level of sacral promontory, and extending toward the recto-uterine pouch [Figure 1a]. The right ureter was always recognized to prevent its injury. A malleable retractor was placed into the vagina for the manipulation of the vagina and uterus. This maneuver allows the maximal exposure of these structures for the subtotal hysterectomy with bilateral oophorectomy and preservation of the cervix, which took place in the cases that the uterus was present [Figure 1b]. For the above steps of the procedure, the peritoneum overlying the uterus (or vagina) was incised, and the incision was extended anteriorly to the lower third of the vagina [Figure 2a] and posteriorly to the levator ani

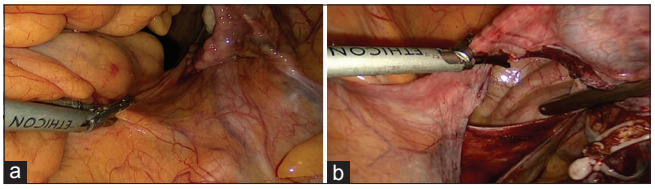

Figure 1: (a) Peritoneal incision. (b) Peritoneal exposure

muscle [Figure 2b]. The uterus and the adnexes were inserted in an endoscopic bag and were placed on the left side on the abdomen over the level of the iliac vessels. Then, the incision of the peritoneum facing the sacral and the incision of the rectovaginal pouch was joined by extending both incisions. A custom-made soft y-shaped polypropylene mesh was prepared. The bifurcated side of the mesh was placed anteriorly in the vesicovaginal space and posteriorly in the prerectal space to the level of the levator ani muscles. Mesh fixation was carried out with SBSs (3-0 V-Loc™ 180 wound closure device, Covidien, Mansfield, USA), starting with the fixation of the posterior portion of the mesh on the posterior of the vaginal wall at the level of levator ani muscle [Figure 3a] and continued with the fixation of anterior portion of the mesh on the anterior vaginal wall [Figure 3b]. The nonbifurcated end of the mesh was then passed toward the sacral promontory [Figure 4a] and fixed on it with a 5 mm titanium tack device (ProTack, Covidien, Mansfield, USA) [Figure 4b]. To prevent erosion of the surrounding tissues by the mesh, the previously opened peritoneum was closed over the mesh [Figure 5a]. The closure was also carried out with the SBS [Figure 5b]. A drain was placed through the lateral right 5 mm trocar, and all trocars were removed under direct vision. It should be noted that patients with very severe incontinence as defined by the pad-weighing test underwent an additional mid-urethral sling procedure.

Postoperative management and follow-up

The drain and the Foley catheter were routinely removed on the 1st postoperative day, and the patient was discharged on the 2nd postoperative day. Intravenous nonopioid analgesics were administered for pain management. Prophylaxis for deep vein thrombosis was administered during the hospitalization (low-molecular-weight heparin). The follow-up of the patients included appointments at 1st and 12th months postoperatively. Evaluation of symptomatology, abdominal and vaginal examination took place at these appointments. Pad-weighting test was also repeated. Anatomical recurrence was defined as the absence of Grade II prolapse at any anatomic site (POPQ Grade ≥II).[17] The quality-of-life of the patients was also accessed according to the P-QOL. In the 2nd year, patients were examined and reevaluated at the urology office on a need basis rather than scheduled appointments.

Data recording and analysis

Recording of the data of the current study took place in a prospective database, which was approved by the Institutional Scientific Board. All patients gave their informed consent. Complications were classified according to the Clavien-Dindo classification.[18] Descriptive univariate statistics was utilized using the IBM SPSS version 20 (IBM Corp., Armonk, NY, USA).

RESULTS

Mean patient age was 63 (range: 50–79) years. Patient demographics and preoperative evaluation of the patients are presented in Table 1. The majority of patients had Grade II prolapse. Lower urinary tract symptoms were reported by 8 patients while incontinence was noted in 17 patients.

Mean operative time was 99.75 (range: 65–140) min. Total and subtotal hysterectomy was concomitantly performed in 4 and 10 patients, respectively. In four patients with very severe stress incontinence, a mid-urethral sling was placed. The aforementioned operative time included the time for any concomitant procedure. Major bleeding was not observed during the procedures of the current series. Mean blood loss for all cases was 57.75 (range: 30–120) ml. Intraoperative complications included one patient having a minor bladder injury which was managed by suturing. Three patients had transient fever episodes postoperatively which resolved

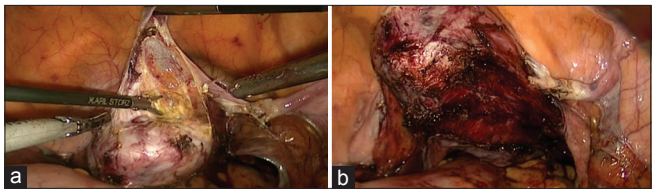

Figure 2: (a) Exposure of anterior vaginal wall. (b) Exposure of posterior vaginal wall

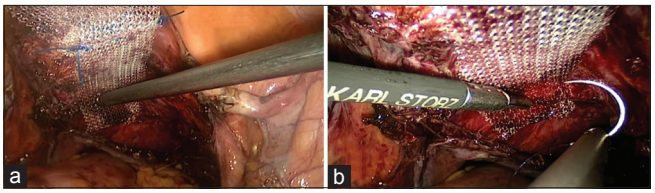

Figure 3: (a) Spreading of mesh in the posterior vaginal wall (b) Fixation of mesh on the posterior vaginal wall

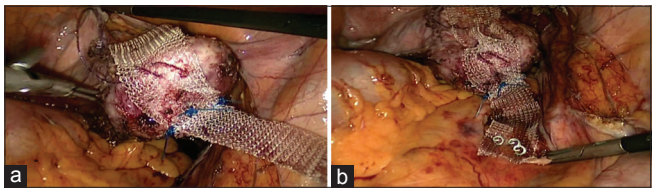

Figure 4: (a) Fixation of mesh over anterior vaginal wall. (b) Fixation of proximal part of mesh over sacral promontory

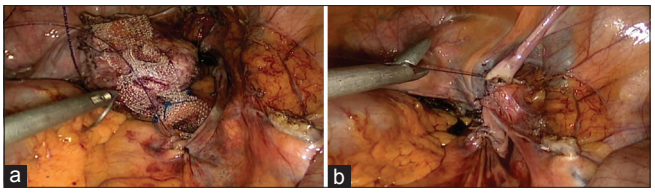

Figure 5: (a) Closure of peritoneum over the mesh. (b) Final appearance of posterior peritoneum after closure

with conservative treatment. Mean hospitalization was 1.65 (1–3) days. The perioperative data of the current series are summarized in Table 2. The mean postoperative follow-up duration was 13.6 months (3–30 months). No complications were reported during this period. One patient had 3 months, and two patients had 6 months of follow-up. The remaining of the patients exceeded the 12 months.

Anatomical outcome

The restoration of the anatomy showed that there was a significant improvement in the measurements of POP-Q between the preoperative and the postoperative values regardless of the follow-up appointment ($P < 0.001$). The values recorded among the follow-up appointments were similar. Table 3 summarizes the POP-Q results. Cystocele recurred in one patient and rectocele recurred in 3 patients. Altogether, no recurrence was observed in 80% of the patients.

Table 1: Summary of patient demographics and preoperative evaluation

Number of patients	20
Mean age (range), years	63 (50-79)
Mean BMI (range), kg/m^2	26.68 (22.12-31.32)
History of pregnancy	
Vaginal deliveries	12 patients
Mean number of pregnancies (range)	2 (0-4)
History of hysterectomy	6 patients
POP-Q stage (percentage of the population)	
Stage I	2 patients (15)
Stage II	12 patients (60)
Stage III	3 patients (15)
Stage IV	2 patients (10)
Symptoms	
Mild frequency	2 patients
Dysuria	1 patient
Dysuria and urgency	1 patient
Constipation	4 patients
Incontinence	
Stress	14 patients
Mixed	3 patients

BMI: Body mass index, POP-Q: Pelvic organ prolapse-quantification

Table 2: Summary of the perioperative data

Mean operative time (range), min	99.75 (65-140)
Mean blood loss (range), ml	57.75 (30-120)
Blood loss >100 ml (%)	3 (15)
Transfusions	0
Mean hospitalization (range), days	1.7 (1-3)
Complications (n)	
Intraoperative	
Bladder injury	1
Minor bleeding during hysterectomy	2
Postoperative	
Fever	3 (Clavien Grade I)
Ileus	1 (Clavien Grade II)
Mesh erosion (%)	0
Mean follow-up (range), months	13.6 (3-30)
Patient satisfaction (%)	95
Recurrence, *n* (%)	
Cystocele	1 (5)
Rectocele	2 (10)
Bowel-related symptoms, *n* (%)	
Constipation	2 (10)
Urinary-related symptoms, *n* (%)	
Urgency	2 (10)
Mild stress incontinence	2 (10)
Mixed incontinence	1 (5)

Functional outcome

Incontinence was resolved in 13 out of 14 patients with stress incontinence. One patient with Grade IV prolapse and stress incontinence showed mild to moderate stress incontinence during the follow-up period. In three patients who were diagnosed to have mixed incontinence before surgery, no incontinence was observed postoperatively. However, two of these three patients required treatment with anticholinergics to suppress urgency symptoms. LSC resolved the symptoms in two of four patients complaining preoperatively for constipation. The quality-of-life was significantly improved after the LSC. There was significant improvement between the preoperative and postoperative P-QOL scores. The improvement was noted soon after the first of follow-up and continued throughout the follow-up period. A summary of the P-QOL results is described in Table 4.

DISCUSSION

LSC represents an alternative to open sacrocolpopexy. Sergent *et al.*[19] performed LSC on 119 patients in a similar fashion to our technique. They placed a posterior reversed Y-shaped prosthesis to the right and left levator ani muscles anteriorly and then to the posterior vaginal wall. An anterior prosthetic tape was placed underneath the bladder and attached to the vagina and the uterine cervix. Mean operative time was 185 ± 24 min. Conversion to ASC was necessary in 5 patients (4%). Mean follow-up was 34.2 ± 20.5 months. Their objective evaluation showed satisfactory results in 103 (89%) patients. Mesh erosion was observed in 5 (4%) patients. Bladder injury and bowel injury were observed in 3 (2.6%) and 2 (1.7%) patients, respectively. In their systematic review on LSC and robotic-assisted LSC, Lee *et al.*[6] screened 378 articles which were published between 1996 and 2013. 11 series of LSC including a total of 1221 patients were considered in their evaluation. The objective success of the LSC ranged between 78 and 100%. The conversion rate to ASC was 0%–11%. Mean operative time was calculated to be 124 (range: 55–185) min. In the current study, shorter operative times were recorded. Laparoscopic suturing and knot tying are challenging and time-consuming skills. Even though our patients were operated by an experienced laparoscopic surgeon, the use of SBSs probably contributed to the shorter mean operative times in comparison to the literature.

The use of SBSs may also facilitate the LSC learning curve of novice surgeons. Current literature suggests that approximately

Table 3: Comparison of the preoperative and postoperative measurement values of pelvic organ prolapse-quantification

	Preoperative	1 month	6 months	12 months	*P*
Aa	0.8±1.79 (−2-3)	−1.85±1.09 (−3-0)	−1.7±1.08 (−3-0)	−1.7±1.38 (−3-2)	<0.001
Ba	4.4±4.41 (−3-12)	−2.35±0.93 (−3-1)	−2.15±1.22 (−3-1)	−2.2±1.2 (−3-1)	<0.001
C	3.65±6.78 (−8-12)	−4.5±3.03 (−8-3)	−4.4±3.07 (−8-3)	−4.3±3.13 (−8-3)	<0.001
Ap	−0.30±1.95 (−3-3)	−1.5±1.19 (−3-1)	−1.4±1.42 (−3-1)	−1.5±1.42 (−3-1)	0.093
Bp	2.8±4.51 (−3-11)	−2.2±1.06 (−3-1)	−2.2±1.19 (−3-1)	−2.2±1.16 (−3-1)	<0.001
D	4.1±7.42 (−9-12)	−6.9±1.29 (−10–−3)	−6.75±2.15 (−10–−3)	−6.65±2.13 (−10–−3)	<0.001
GH	8.6±2.72 (3-12)	3.3±1.08 (2-5)	3.15±1.18 (2-5)	3.15±1.18 (2-5)	<0.001
PB	3.4±1.81 (1-6)	3.3±1.3 (1-5)	3.15±1.42 (1-5)	3.15±1.27 (1-5)	0.748
TVL	7.6±1.93 (5-12)	9.05±1.35 (7-12)	9.05±1.47 (7-12)	9.1±1.41 (7-12)	0.032

Friedman t-test was used for the calculations

Table 4: Comparison of the preoperative to postoperative prolapse quality-of-life domain scores

Prolapse quality-of-life domain scores	Median (IQR)				*P*
	Preoperative	1-month postoperative	6-month postoperative	12-month postoperative	
General health perceptions	50 (55-75)	17 (6-50)	15 (6-50)	15 (6-50)	<0.001
Prolapse impact	100 (66-100)	0 (0-33)	0 (0-16)	0 (0-16)	<0.001
Role limitations	66 (33-83)	0 (0-29)	0 (0-16)	0 (0-16)	<0.001
Physical limitations	66 (33-83)	0 (0-12)	0 (0-9)	0 (0-9)	<0.001
Social limitations	66 (33-83)	0 (0-8.3)	0	0	<0.001
Personal relationships	83 (66-100)	0	0	0	<0.001
Emotions	66 (33-83)	0	0	0	<0.001
Sleep/energy	66 (33-100)	0	0	0	<0.001
Severity measures	58 (44-58)	0 (0-15)	0 (0-8)	0 (0-6)	<0.001

Friedman test was used for the calculations. IQR: Interquartile range

18–40 cases are necessary to overcome the learning curve of LSC.[7,8] Mustafa *et al.*[8] retrospectively reviewed 47 consecutive women undergoing LSC and reported a significant drop in mean operative time from 196 to 162 min between the first 15 and the last 30 cases. Nevertheless, blood loss and complication rates did not change between the two groups. A similar decrease in operative time was also observed by Claerhout *et al.* after 18–24 cases.[7] The current series could not provide any evidence regarding the learning curve as the surgeon was already over their learning curve with LSC by having performed more than 50 LSCs before initiating the use of SBS.

The estimated blood loss of approximately 60 ml was lower than the majority of the series in literature.[6] The conversion rate in literature ranges between 0% and 25%.[6,19] In the current series, there was no need for conversion to open surgery.

Claerhout *et al.* followed a series of 132 women with vaginal vault prolapse undergoing LSC up to 12.5 months.[7] The investigators achieved anatomic correction rate of 98% for the apical compartment, and similarly to our patient cohort, the majority of anatomic failures were at the posterior compartment. Patient satisfaction was 91.7%, and patients reported improved quality-of-life. Similarly, a recent systematic review proposed objective success rates of 83%–100%.[6] The anatomical and quality-of-life outcome were also directly comparable to the results presented in literature.[7,19,20-22] The recurrence rate based on the criteria of the study was 20%. Nevertheless, the patient satisfaction as depicted through the P-QOL scores remained high throughout the follow-up period. The correction of the anatomy may not be optimal but results in relief of the symptoms. It is not uncommon to examine patients with POP without significant symptomatology[23,24] and even a "failed" reconstruction according to the defined criteria may benefit the symptomatology of the patient. Most of the patient series in the aforementioned systematic review did not use a standardized reporting system for complications. However, minimal complication rates were observed. 1221 patients showed 1% (4 patients) mesh erosion, 1% (5 patients) bladder injury, 0.3% (1 patient) bowel injury, 3% (9 patients) *de novo* stress urinary incontinence, 4% (13 patients) lower urinary track symptoms, and 1% (2 patients) dyspareunia. In the current study, bladder perforation took place in 1 case (5%). Mesh erosion is reported in 0%–9% of the LSC cases.[6] In the current series, mesh erosion was not observed. The use of SBSs did not seem to increase intraoperative organ injury or mesh erosion rates and showed similar postoperative complication rates and success rates when compared to conventional LSC.

In the series by Claerhout *et al.*, *de novo* constipation and *de novo* dyspareunia developed in 5% and 19% of the patients.[7] Similarly, Lee *et al.* reported constipation in 0%–19% of the cases.[6] In the current population, bowel-related symptoms such as constipation were reduced after the procedure with 20% of the patients suffering preoperatively and 10% of them postoperatively. Other bowel-related problems, such as ileus, small bowel obstruction, rectal discomfort, or fecal

incontinence were not noted. The low rate of the above issues should probably be attributed to the retroperitonealization of the mesh which is considered as a way to avoid bowel-related complications in the literature[6] and was routinely done in the current series with the suturing of the peritoneum over the mesh with SBS. Dyspareunia was not observed in the current series and is reported in 0%–2% of the cases in contemporary literature.[6] Sexually active patients reported improved sexual activity in their postoperative P-QOL assessments.

The use of SBS has been proposed by other investigators with favorable results. Borahay *et al.* performed robotic-assisted sacrocolpopexy to twenty patients and concluded to the safety and efficacy of these sutures at least during the 1st year after the procedure.[25] The investigators had a mean follow-up period of 17 months and they observed very limited incidence of mesh or suture erosion. Nevertheless, the use of the SBS requires further investigation with follow-up periods overcoming the 1 year.

A limitation of the current investigation is the lack of a comparative group with standard LSC (without the use of SBS). The use of retrospective data on standard LSC would reduce the quality-of-the study, and the authors favored the presentation of high-quality, objective evaluation data. The relative small cohort of patients sets the background for additional investigation on the use of SBS in LSC. The involvement of expert surgeons with a large laparoscopic expertise is another limitation as the currently presented results, especially in terms of operative time and complications may not be reproducible by less experienced surgeons.

CONCLUSIONS

Our initial experience renders the use of SBSs during LSC to be safe and efficient in experienced hands. Improvement in the operative time was observed with the presented technique in comparison to the current literature. Further prospective studies are deemed necessary to affirm its safety, efficacy, and the contribution of SBS in facilitating the learning curve of LSC.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Dowell CJ, Bryant CM, Moore KH, Simons AM. Calculating the direct costs of urinary incontinence: A new test instrument. BJU Int 1999;83:596-606.
2. Vincent GK, Velkoff VA. The Next Four Decades: The Older Population in the United States: 2010 to 2050. Current Population Reports. Washington, DC: U.S. Census Bureau; 2010. p. 25-1138.
3. Boyles SH, Weber AM, Meyn L. Procedures for pelvic organ prolapse in the United States, 1979-1997. Am J Obstet Gynecol 2003;188:108-15.
4. Maher C, Feiner B, Baessler K, Schmid C. Surgical management of pelvic organ prolapse in women. Cochrane Database Syst Rev 2013;4:CD004014.
5. Sarlos D, Kots L, Ryu G, Schaer G. Long-term follow-up of laparoscopic sacrocolpopexy. Int Urogynecol J 2014;25:1207-12.
6. Lee RK, Mottrie A, Payne CK, Waltregny D. A review of the current status of laparoscopic and robot-assisted sacrocolpopexy for pelvic organ prolapse. Eur Urol 2014;65:1128-37.
7. Claerhout F, De Ridder D, Roovers JP, Rommens H, Spelzini F, Vandenbroucke V, *et al.* Medium-term anatomic and functional results of laparoscopic sacrocolpopexy beyond the learning curve. Eur Urol 2009;55:1459-67.
8. Mustafa S, Amit A, Filmar S, Deutsch M, Netzer I, Itskovitz-Eldor J, *et al.* Implementation of laparoscopic sacrocolpopexy: Establishment of a learning curve and short-term outcomes. Arch Gynecol Obstet 2012;286:983-8.
9. Van Bruwaene S, De Win G, Miserez M. How much do we need experts during laparoscopic suturing training? Surg Endosc 2009;23:2755-61.
10. Chamsy D, Lee T. The use of barbed suture in bladder and bowel surgery. Surg Technol Int 2013;23:153-9.
11. Tulandi T, Einarsson JI. The use of barbed suture for laparoscopic hysterectomy and myomectomy: A systematic review and meta-analysis. J Minim Invasive Gynecol 2014;21:210-6.
12. Schauer I, Theimer O, Klatte T, Waldert M, Klingler HC, Margreiter M. Use of self-retaining barbed sutures decreases cold ischemia time in open nephron-sparing surgery. Wien Klin Wochenschr 2014;126:329-34.
13. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, *et al.* The standardisation of terminology in lower urinary tract function: Report from the standardisation sub-committee of the International Continence Society. Urology 2003;61:37-49.
14. Haylen BT, de Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, *et al.* An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Int Urogynecol J 2010;21:5-26.
15. Al-Badr A. Quality of life questionnaires for the assessment of pelvic organ prolapse: Use in clinical practice. Low Urin Tract Symptoms 2013;5:121-8.
16. Stolzenburg JU, Andrikopoulos O, Kallidonis P, Kyriazis I, Do M, Liatsikos E. Evolution of endoscopic extraperitoneal radical prostatectomy (EERPE): Technique and outcome. Asian J Androl 2012;14:278-84.
17. Bump RC, Mattiasson A, Bø K, Brubaker LP, DeLancey JO, Klarskov P, *et al.* The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. Am J Obstet Gynecol 1996;175:10-7.
18. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240:205-13.
19. Sergent F, Resch B, Loisel C, Bisson V, Schaal JP, Marpeau L. Mid-term outcome of laparoscopic sacrocolpopexy with anterior and posterior polyester mesh for treatment of genito-urinary prolapse. Eur J Obstet Gynecol Reprod Biol 2011;156:217-22.
20. Gadonneix P, Ercoli A, Salet-Lizée D, Cotelle O, Bolner B, Van Den Akker M, *et al.* Laparoscopic sacrocolpopexy with two separate meshes along the anterior and posterior vaginal walls for multicompartment pelvic organ prolapse. J Am Assoc Gynecol Laparosc 2004;11:29-35.
21. Leruth J, Fillet M, Waltregny D. Incidence and risk factors of postoperative stress urinary incontinence following laparoscopic sacrocolpopexy in patients with negative preoperative prolapse reduction stress testing. Int Urogynecol J 2013;24:485-91.
22. Sarlos D, Brandner S, Kots L, Gygax N, Schaer G. Laparoscopic sacrocolpopexy for uterine and post-hysterectomy prolapse: Anatomical

results, quality of life and perioperative outcome-a prospective study with 101 cases. Int Urogynecol J Pelvic Floor Dysfunct 2008;19:1415-22.
23. Manchana T, Bunyavejchevin S. Validation of the prolapse quality of life (P-QOL) questionnaire in Thai version. Int Urogynecol J 2010;21:985-93.
24. Flores-Espinoza C, Araya AX, Pizarro-Berdichevsky J, Santos V, Ferrer M, Garin O, *et al.* Validation of the Spanish-language version of the prolapse quality of life questionnaire in Chilean women. Int Urogynecol J 2015;26:123-30.
25. Borahay MA, Oge T, Walsh TM, Patel PR, Rodriguez AM, Kilic GS. Outcomes of robotic sacrocolpopexy using barbed delayed absorbable sutures. J Minim Invasive Gynecol 2014;21:412-6.