Original Article

Anterior and middle pelvic organ prolapse repair using a six tension-free strap low weight transvaginal mesh: long-term retrospective monocentric study of 311 patients

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ABSTRACT

Introduction: Treatment of pelvic organ prolapse is an important public health issue due to the ageing population. The Food and Drug Administration, in 2011, issued a warning on complications after transvaginal insertion of high weight mesh. We evaluated a 6 tension-free straps, light prosthesis made from polypropylene monofilaments.
Materials and methods: This monocentric, retrospective study included patients undergoing anterior or apical prolapse repair surgery by placement of a six tension-free strap low weight vaginal mesh between 2008 and 2017. The surgical history, concomitant surgery, clinical examination results, pre and postoperative results of the Urinary Symptom Profile questionnaire, and intraoperative and postoperative complications were collected from patients' medical records.
Results: 311 patients were included (median follow-up: 33 months). The majority (93%) had stage $\geq$ III cystocele and 26% had stage $\geq$ III hysterocele. Postoperatively, there were nine cases (2.9%) of asymptomatic cystocele recurrence and 11 (3.5%) cases of hysterocele recurrence, among them six underwent reoperation. Vaginal comfort was significantly improved in 92% vs. 17% before surgery (p < 0,0001); two (1,76%) patients had de novo dyspareunia. Preoperatively, 104 patients had stress urinary incontinence (SUI), 45,2% of them were cured postoperatively. There were 62 (30%) cases of de novo SUI. A significant improvement of dysuria (p < 0,0001) and overactive bladder (OAB) was found for all severity stages (p < 0,0001). Severe complications included haematoma (7,4%), mesh exposure (1.3%), retraction (0.6%), bladder injury (0.6%) and chronic pain (0.6%).
Conclusion: Treatment of anterior and/or mid-segment prolapse by transvaginal insertion of a six-strap low-weight mesh is long-term effective, with acceptable morbidity.

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Introduction

The treatment of pelvic organ prolapse (POP) is an important public health issue due to the ageing population; 20% of 80-year-old women has undergone a surgery for POP or stress urinary

incontinence (SUI) during her life [1]. Current surgical techniques can be divided into the laparoscopic sacrocolpopexy (LSC) or the transvaginal repair with or without insertion of a mesh. After the Food and Drug Administration (FDA) warning on serious complications associated with transvaginal placement of surgical mesh for POP, LSC has become the gold standard for the primary apical prolapse treatment. Transvaginal mesh (TVM) repair is now more recommended for complex cases [2]. However, this warning was in 2011 and concerned high-weight mesh, which have since been withdrawn from the market. Further studies are therefore necessary with the new devices available. In our study, we used a 6-straps mesh made from polypropylene monofilaments weighing 22 g/m^2.

Wei and De Lancey [3] and Petros [4] described how fascial structures and ligaments give an anteroposterior and lateral support to the bladder and uterus. Four strap prostheses with

transobturator fixation only give support to the anterior half of the bladder base, it has been proposed to add two trans-sacrospinous straps to allow better spreading of the mesh under the bladder as well as an apical support orientated obliquely from bottom to top and from front to back, reproducing the native fascia. The two lateral straps passing through the posterior part of the obturator foramen give lateral suspension thereby correcting the 'para-vaginal defect'. The insertion of symmetrically opposing straps theoretically decreases the risk of migration and contraction of the mesh.

This article follows a previous publication in 2016 on 74 patients [5] which demonstrated the feasibility and efficiency of this technique after 3 years. The aim of the current study is to confirm the stability of these anatomical and functional results on long term in a larger population and to evaluate its morbidity.

Materials and methods

Study design and patients

This retrospective monocentric study included all patients undergoing surgical treatment for urogenital prolapse with an OPUR prosthesis (Abiss Saint Etienne, France) between January 2008 and January 2017, at Sainte Marie Private Hospital, Chalon sur Saône, France. Inclusion criteria were stage $\geq$ II cystocele and/or stage $\geq$ II hysteroptosis (POP quantification: POP-Q). All patients signed a preoperative consent after being given information on the surgical procedure.

Data collection

The following data were recorded in the patients' medical records before surgery: age, body mass index (BMI), parity, sexual activity (or not), history of pelvic surgery or other significant medical history. Stage of prolapse (classified according to the POP-Q classification) and urinary function (evaluated using the Urinary Symptom Profile (USP) score) were measured before surgery, at the first postoperative consultation and at the last consultation attended. Cystocele and posterior colpocele were evaluated after

reduction of the uterine prolapse to avoid overclassification. Vaginal comfort was defined as the absence of spontaneous vaginal pain or pain during clinical examination (insertion and movement of a vaginal speculum), absence of dyspareunia, and absence of palpable vaginal contraction (even if painless). Pelvic ultrasound and a cervical sample were carried out systematically before surgery.

All patients were operated using the same surgical technique by insertion of an anteroposterior mesh by the same surgeon. This mesh is made of six straps: two apical trans-sacrospinous straps placed by an in-out method, two lateral straps in the posterior part of the obturator foramen and two anterior straps in the anterior part of the obturator foramen placed by an out-in method (Fig. 1). The technique has been described in a previous publication and broadcasted on video [5,6]. A Redon's drain was systematically left in place near the transobturator muscle before 2011 and afterwards only when the surgeon thought there was a risk of haematoma. A urethral catheter was left in place for 24 h post-surgery. When a patient had a post void residue (PVR) >100 ml she learned self-catheterisation and stopped it after two PVR < 100 ml.

Per- and postoperative complications, anatomical and functional results were evaluated at 1, 6, 12, 36 months and beyond. Treatment failure was defined as a recurrence of stage II prolapse or more of a treated compartment.

Statistical analysis

Statistical analyses were performed with SAS version 9.4 (SAS Institute). A Mantel-Haenszel Chi2 test, a paired Student's test or a Wilcoxon rank signed test were used to compare preoperative and postoperative variables. All hypotheses were tested at the two-tailed 0,05 significance level.

Results

Study population

During the study period, 311 patients underwent surgery for POP. Mean follow-up time was 37 months (median 33 [11–51]). A
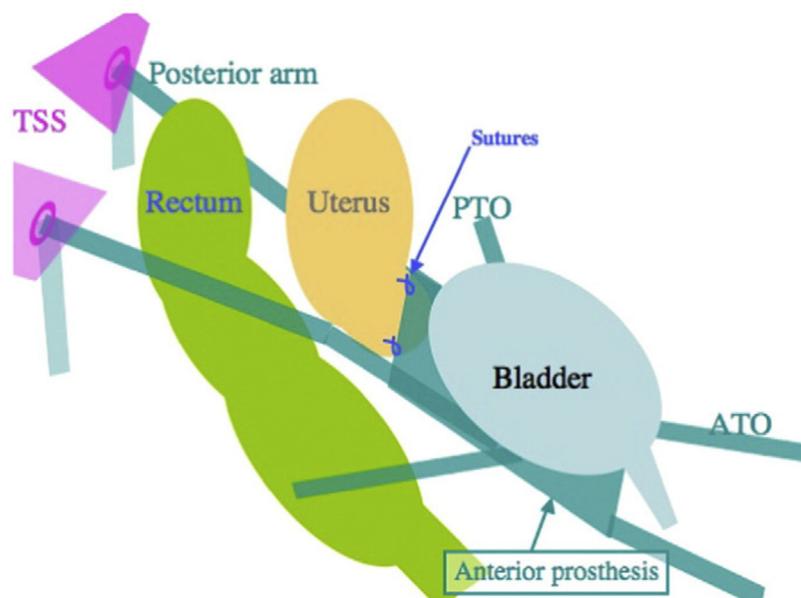

Fig. 1. Position of the prosthesis (anteroposterior mesh with six straps). The prosthesis supports the whole base of the bladder and reduces the possibility of migration and contraction of the mesh.
Abbreviations: TSS, transsacrospinous; PTO, posterior transobturator; ATO, anterior transobturator.

total of 145, 58 and 21 of these patients had a follow-up longer than 36, 60 and 90 months, respectively. The mean age of the study women was 69.4 years, mean BMI was $25,4 \pm 4 \, kg/m^2$ and median parity was 2. Twenty-two per cent of patients had previously undergone hysterectomy, 14,8% a prolapse repair and 10,6% a SUI treatment. The characteristics of the study population are shown in Table 1.

Anatomical results

The anatomical results are shown in Table 2. Among the 311 patients, 93% had stage $\geq$ III cystocele, 26% a stage $\geq$ III uterine prolapse and 10% a stage $\geq$ II posterior prolapse. Vaginal introitoplasty was carried out for patients with a genital hiatus $\geq$40 mm ($n = 151$; 48,6%). The other concomitant operations performed were: rectocele repair ($n = 25$; 8%), hysterectomy ($n = 1$; 0.3%), laparoscopic annexectomy ($n = 2$; 0.6%) and implantation of a midurethral sling (MUS) ($n = 2$; 0.6%).

Nine patients (2.9%) had a stage $\geq$ II cystocele recurrence, none of them were symptomatic. Eleven (3.5%) patients had a stage $\geq$ II hysterocele recurrence: five were asymptomatic and six (1.9%) underwent further surgery (median delay: 31,5 months) by transvaginal sacrospinous fixation with implantation of a trans-sacrospinous strap (Table 3). We observed a recurrence rate for cystocele and hysterocele respectively of 4.1% and 3.4% at 36 months, 5.2% and 1.7% at 60 months, and 9.5% and 4.8% at 90 months. At the end of follow-up, the transvaginal mesh success rate was 97.1% and 96,5% for anterior and apical prolapse respectively.

Thirty-seven (11.8%) posterior prolapse occurred during follow-up, five (1.6%) underwent surgery (two by laparoscopic rectopexy and three via the transvaginal route) within a median time of 26 months.

Total vaginal length (TVL) improved from $9,5 \pm 1,6$ cm before surgery to $10,1 \pm 2,1$ cm after surgery (p = 0,0024).

Functional results

The functional results are shown in Table 4. Among the 104 patients with preoperative SUI, 47 (45,2%) were cured at the 1-month consultation. Over the 206 with no SUI preoperatively, de novo SUI was found in 62 patients (30,1%), only 13 (6,3%) of them needed a MUS implantation. At the end 47 (15%) underwent surgical placement of a MUS with a median delay of 6 months.

A significant improvement of dysuria (p < 0,0001) and overactive bladder (OAB) was found for all severity stages (p < 0,0001).

Table 1
Characteristics of the study population.

Characteristic	
Age	69.4 [38-93]
BMI	25,4 [14.7-36.4]
Parity	2,6 [0-9]
Anti-coagulant used	2.6%
Platelet antiaggregants used	4,8%
History of hysterectomy	22.2%
History of vaginal prolapse repair	7,1%
History of abdominal prolapse repair or LSC	3.2%
History of incontinence surgery	11.5%
Peroperative hysterectomy	0.3%
Peroperative insertion of a SUS	0.6%
Peroperative treatment of rectocele	8%
Peroperative vaginal introitoplasty	48.6%

Values shown are mean [minimum-maximum] or % of patients.
BMI: body mass index; LSC: laparoscopic sacrocolpopexy; SUS: suburethral sling.

Better results were found for patients who had OAB without incontinence (30% cured vs. 17% p = 0,0138). Sixty-eight (27,9%) patients who had preoperative OAB were cured at the last consultation.

Thirty-eight patients had OAB de novo among the 66 patients who had no OAB before surgery. Only one was severe (USP > 11). Severe OAB was treated eight times with Transcutaneous Electrical Nerve Stimulation, four times with sacral neuromodulation without improvement and twice with intra-detrusor injection of botulinum toxin with clear efficiency.

Ten (12,5%) patients had de novo dysuria. Among the 230 patients who had dysuria preoperatively, 50 (21,7%) remain with dysuria.

Vaginal comfort improved significantly (92% vs. 17%; p < 0,0001). Pre-operatively, 113 patients (36.3%) were sexually active; these patients were younger than those who were sexually inactive (63 vs. 73 years; p < 0,0001). Among them 35 (31%) did not recovered sexual activity, for 54% of them it was due to marital reasons; only two (1,76%) had de novo dyspareunia. Among the patients who were not sexually active preoperatively, 15 (8%) recovered sexual activity after surgery. In total 93(29,9%) remained sexually active at the end of the follow-up.

Complications

Sixty-nine (22,2%) patients had PVR > 100 ml. The need for self-catheterisation never exceeded 10 days after surgery. Only one patient remained dysuric for 1 month. She had undergone

Table 2
Anatomical results of the surgical procedure (POP-Q classification).

	Preoperative	Immediate postoperative	p value	Last visit	p value
Cystocele			<.0001		<.0001
$\leq$ I	3 (1.0)	309 (99.4)		302 (97.1)	
II	18 (5.8)	2 (0.6)		8 (2.6)	
III	261 (83.9)	0 (0)		1 (0.3)	
IV	29 (9.3)	0 (0)		0 (0)	
Hysterocele			<.0001		<.0001
$\leq$ I	156 (50,2)	310 (99.7)		306 (98.4)	
II	74 (23.8)	0 (0)		4 (1.3)	
III	55 (17,7)	1 (0.3)		1 (0.3)	
IV	26 (8.4)	0 (0)		0 (0)	
Rectocele			<.0001		0,1885
$\leq$ I	279 (89.7)	304 (97.7)		279 (89,7)	
II	13 (4.2)	3 (1)		25 (8.0)	
III	15 (4,8)	4 (1.3)		7 (2.3)	
IV	4 (1.3)	0 (0)		0 (0)	
TVL (cm)	$9,5 \pm 1,6$	$10,1 \pm 2,6$	0,0024		

All values shown are n (%).
TVL: total vaginal length. (Mean $\pm$ Std).

Table 3
Complications, evolution and further surgery.

Evolution	N (%)	Median [min-max] (months)
Cystocele recurrence	9 (2,9)	31,5 [6-54]
- Asymptomatic	9 (2,9)	
Hysterocele recurrence	11 (3,5)	
- Asymptomatic	5 (1,6)	
- Sacrospinofixation	6 (1.9)	
Posterior prolapse	37 (11,8)	24 [10–26]
- Asymptomatic	32 (10,2)	65 [34-96]
- Vaginal treatment	3 (1,0)	
- Abdominal rectopexia	2 (0.6)	
Persistant SUI	57 (18,3)	6 [2-47]
- Surveillance	23 (7,3)	15 [5-112]
- Insertion of MUS	34 (10,9)	15 [5-112]
De novo SUI	62 (20)	57.5 [23-92]
- Surveillance	49 (15,7)	
- Insertion of MUS	13 (4,2)	
Total of secondary MUS	47 (15,1)	
Persistant or de novo severe OAB (USP > 11)	16 (5)	
- TENS	8 (2.6)	
- Neuromodulation of the sacral nerves	4 (1.3)	
- Intradetrusor injection of botulinum toxin	2 (0.6)	
Retraction	2 (0.6)	25,5 [21–30]
- Removal of the retracted prosthesis strap	2 (0.6)	
Mesh exposure	4 (1,3)	5
- Topic treatment	3 (1)	
- Repeat surgery for mesh exposure	1 (0.3)	
Clinical haematoma or abcess	23 (7,4)	
- Asymptomatic or spontaneous evacuation	13 (4,2)	
- Evacuation under general anaesthesia	4 (1,3)	
- Evacuation under local anaesthesia	6 (1,9)	
Urinary infection	35 (11,3)	
Chronic pain	2 (0,6)	
Peroperative bladder injury	2 (0,6)	

MUS: Midurethral sling.
TENS: Transcutaneous Electrical Nerve Stimulation.

implantation of a MUS simultaneously with the prolapse repair. Postoperative dysuria seems to occur more frequently to patients with BMI > 30 (p = 0,0502) and aged less than 60 years (p = 0,0397). A higher rate of dysuria was found when a concomitant vaginal introitoplasty was performed (33% vs 12% p < 0,001).

Twenty-three (7,4%) clinical haematomas were recorded at various localizations. Four (1.3%) deep hematomas or active bleeding required early surgery under general anaesthesia; among them, three patients were treated with platelet antiaggregants or anticoagulants. Two patients required blood transfusion. Six patients (1.9%) needed vaginal surgery under local anaesthesia for symptomatic vaginal haematoma or abscess evacuation. The haematoma rates were higher when a vaginal introitoplasty was performed (12% vs 6% p = 0,0509). No mesh infection was found, whether there was a surgical drainage or not.

Two-peroperative bladder injury had a favourable evolution; they were sutured immediately after ureteral stent placement. There were four (1.3%) cases of mesh exposures, all before 5 months: three recovered after local topic treatment and one required partial removal of the mesh under local anaesthesia. Two patients had retraction of a mesh strap causing vaginal pain; removal of the retracted strap resulted in total recovery. The risk of bladder injury or erosion wasn't increased by an history of prolapse repair or hysterectomy.

There were two cases of chronic pain, one was mild, atypical and intermittent and was well relieved by medical treatment. However, the other patient had a left perineal neuropathy of variable intensity that began 2 weeks after the surgery, and still causing a handicap.

Discussion

In 2004, Wei and De Lancey [3] demonstrated the role of the uterosacral ligaments in the support of the under-bladder fascia. Since then it has been known that apical fixation of an anterior prosthesis is important for the correction of cystocele. The use of prosthetic trans-sacrospinous straps allows a better quality of apical correction. It has been demonstrated that correcting the mid-segment concomitantly of an anterior prolapse surgery is associated with a lower recurrence rate of the latter (20.2% vs. 11.6%; p = 0.005) [7]. The transobturator straps reproduce the lateral suspension of the pubocervical fascia described by Petros [4] and Wei and De Lancey [3].

The cure of cystocele and/or hysteroptosis with a 6-straps TVM was effective in our study with long-term stable results and with a low recurrence rate of anterior and mid-segment prolapse (2,9% and 3,5%, respectively). Failures of mid-segment repair were observed in the early years from operation (treated with sacrospinofixation at 30 months on average) and then effectiveness remained stable. Conversely, we observed a little progressive deterioration in results for anterior prolapse over time.

Few publications exist on 6-straps prostheses, as used in our study. However, many authors have evaluated 4-straps prostheses implanted on the sacrospinous ligament, Lamblin et al. [8] demonstrated their superiority over a 4 transobturator straps prosthesis, after 2 years, for correction of apical prolapse (92.9% vs. 66.7%; p = 0.0001), without any increase of the complication rate.

LSC is currently the first-line treatment for non-recurrent prolapse [2]. It has a predominant place in the treatment of posterior and apical prolapse, but the TVM allows a better correction of anterior prolapse especially when there is an associated para vaginal defect. Liu et al. [9] found no significant difference in anatomical results between LSC and TVM, but noticed that recurrences after LSC were exclusively anterior whereas those after a TVM were apical. Massou et al. found stage ≥ III cystocele as a risk factor for long-term recurrence after LSC [10]. Gutman et al. [11] compared LSC with the Uphold® prosthesis, 2 straps with sacrospinofixation, in a multicentre prospective study. They found no significant difference in anatomical and functional results or complication rate at 1-year, but a longer operative time for LSC.

Finally the randomised, multicentre, prospective study of Lucot et al. [12] comparing LSC with TVM associated with sacrospinous fixation for the treatment of non-recurrent prolapse over a 12-month period, found similar anatomical and functional results, but better conservation of sexual function and less grade III complications in the LSC group. However, they noticed a conversion rate from laparoscopy to the vaginal route of 5% despite experienced surgeons. LSC and TVM seem to be complementary: TVM has better outcome than LSC on cystocele repair, but LSC has better one than TVM to cure middle prolapse.

In our study 45,2% preoperative SUI recovered after prolapse surgery and among the patients who were continent before surgery we observed 30% cases of de novo SUI. The postoperative prognosis of SUI is therefore unpredictable. We did not analysed the urodynamic data. Sixty-nine (22,2%) patients had temporary dysuria requiring self-catheterisation. In the literature, this occurs in 5–42% of patients after TVM and in 0–37% after anterior native tissue repair [13]. Dysuria after transvaginal treatment of prolapse usually recovers spontaneously within a short period. Conversely, dysuria after implantation of a MUS often needs relaxation of the

Table 4
Functional results at the last visit according to the preoperative status and global results (median 33 months).

	Preoperative	Last visit				Last visit	p
		Cured	Improved	Same	Worse	Total	
							0,0709
No SUI (USP = 0)	206 (66,4)			160 (78)	46 (22)	228 (73)	
Slight SUI (USP 1-4)	88 (28,4)	55 (62,5)	11 (12,5)	11 (12,5)	11 (12,5)	71 (23)	
Severe SUI (USP 5-9)	16 (5,2)	12 (75)	4 (25)	0 (0)		12(4)	
							< 0,001
No OAB (USP = 0)	66 (21,3)			28 (42)	38 (58)	97 (31)	
OAB without incontinence (USP 1-10)	203 (65,5)	61 (30)	88 (43)	20 (10)	34 (17)	200 (64)	
OAB with incontinence (USP 11-21)	41 (13,2)	7 (17)	29 (71)	1 (2)	4 (10)	14 (5)	
							< 0,001
No dysuria (USP = 0)	80 (25,8)			70 (87,5)	10 (12,5)	251 (81)	
Slight dysuria (USP 1-4)	194 (62,6)	150 (77)	19 (10)	24 (12)	1 (1)	60 (19)	
Severe dysuria (USP 5-9)	36 (11,6)	30 (83)	6 (17)	0 (0)		0 (0)	
							< 0,001
Good vaginal comfort	53 (17,1)			50 (94,3)	3 (5,7)	286 (92)	
Poor vaginal comfort	257 (82,9)		235 (91,4)	22 (8,6)		25 (8)	

All values shown are n (%).
SUI: stress urinary incontinence; OAB: overactive bladder.

MUS in the week after the intervention. The uncertainty of urethral continence after prolapse repair, as well as the difficult management of dysuria for patients with concomitant MUS implantation, should discourage the treatment of SUI at the same time of prolapse repair. In our study, only 15% of patients needed implantation of a MUS, within a mean period of 6 months; our study confirms the results obtained by other studies [14,15] which recommend a two-step approach in the management of vaginal prolapse surgery in patients with preoperative SUI.

OAB was considered even with a USP score of 1/21, which explain our high rate of de novo OAB. 15,6% of patients experienced a worsening of their preoperative OAB, 48% improved and 27,9% recovered completely. The meta-analysis of Baessler and Maher found better results with a complete recover in 40% of cases and de novo OAB in 12% [13]. In our experience, questionnaires need a discussion with the patient to have more acurate answer. It is why we observed an increasing percentage of OAB than the patients described firstly in the questionnaires.

In our series, a subgroup analysis showed that the prevalence of OAB increased with age: 59% for women of less than 60 years, 62% for the 60–70 aged, 74% for the 70–80 aged et 82% for the women over 80 years (p = 0.0275). It is therefore difficult to distinguish the natural evolution of OAB in an older woman from de novo OAB due to the prosthesis. There are numerous non-invasive treatments already available for OAB. Among the patients with OAB at the last consultation, 29% had a MUS inserted before, during or after the intervention, compared with 14% in the group without OAB (p = 0.0057). A history of MUS appears to be a risk factor for OAB and once again supports the two-step approach for SUI treatment.

The most severe complications observed in our study were two chronic pain, two bladder injuries and twenty-three haemorrhagic complications. Vaginal introitoplasty was found as a risk factor of haematoma and postoperative dysuria. A prior surgery for prolapse or hysterectomy weren't found as risk factors for these severe complications. There were no complications linked to aspiration drainage, especially no prostheses infection.

The rate of vaginal mesh exposure in our study (1,3%) is less that the 3–19% reported in the literature [9,11,16–22]. These good results may be explained by the experience of the surgeon, by the systematic preoperative hydro-dissection between fascia and mucosa by adrenalin-saline infiltration, that allows blood-free and minimal dissection, and by the prosthesis characteristics (weight 22 g/m^2, knitted, monofilaments with a wide mesh) and its placement without tension with the straps spreading away from

the vaginal wall with apical suspension. It should be noted that colpectomy was never performed. The study of De Tayrac, in which the surgeons were all experienced in vaginal surgery and the prosthesis had similar characteristics, found a similar rate of vaginal mesh exposure [23].

Many studies have found higher levels of mesh exposure but involved prostheses of higher weight and with a different design: free meshes and prostheses with transobturator straps only. The study of Karmakar [22] is interesting as it compares the same kit (Perigee) inserted by the same surgeons with IntePro®(50 g/m^2) and then IntePro Lite® (25.45 g/m^2) prostheses and showed a higher rate of mesh exposure with the higher weight prosthesis (13.4% vs. 4.8%; p = 0.004). However, there is a bias in this study, which is the surgical skill improvement over time with this relatively new type of surgery. But even though it has been demonstrated that the surgeon's experience in vaginal surgery is an important reducing factor for major complications rate [24] (with a risk reduction of 30% every 10 procedures), it does not change the risk of mesh exposure, recurrence or duration of surgery.

Lucot et al. [12] compared LSC with TVM associated with sacrospinofixation with a 12 months follow-up. They found a higher rate of complications linked to the prosthesis in the TVM arm (3.1% vs. 0%, p = 0.06). However, it was a short-term study. Aslam MF and al. studied the delay before mesh exposure following TVM or abdominal sacrocolpopexy, finding a shorter latent period for TVM mesh (23 months) than for the abdominal mesh (60 months) [25]. This was confirmed by the study of Massou et al. [10] with a follow-up time of 20 years after LSC which had a mesh exposure rate of 6%, occurring at 7 years on average (3–12 years), and by the study of Karmakar with a 11.5% mesh exposure at 20 months for TVM [22]. Longer-term studies are therefore necessary to compare the exposure rate after LSC and TVM.

Vaginal surgery is often discredited due to its high rate of complications such as dyspareunia, which varies from 4 to 16% [16,20,24], although other studies have not shown any increased risk of dyspareunia after TVM compared to vaginal surgery with native tissue [17,18,21,26] or to LSC [9,11]. In our study, the rate of de novo dyspareunia was very low (n = 2 (1,76%), one of these was linked to probable contraction of the prosthesis into the vagina, for which the patient did not want any further surgery, and the other occurred in the context of fibromyalgia. This confirms the contraindication of vaginal surgery with prostheses in patients with fibromyalgia [27]. Eight percent of patients who were not sexually active became sexually active postoperatively, thus

Table 5
Comparative table of studies before and after 2010 using highweight or lightweight meshes.

	Date of inclusion	Prothese	n	Follow up (month)	Anterior recurrence (%)	Apical recurrence (%)	Exposure rate (%)	Per operative MUS (%)	De novo SUI (%)	Postoperative MUS (%)	De novo OAB (%)	haematoma (%)
Nieminen 2010 [21]	2003-2005	Parietene light® 38 g/m²	105	36	13	/	19	0	7	5	/	/
Rane et al 2012 [16]	2004-2008	Perigee® intepro 50 g/m²	376	60	5,7	/	11,1	34,2	/	/	/	0,5
De Tayrac 2013 [18]	2005-2009	Ugytex® 38 g/m²	75	12	11	/	9,5	37,3	12	1,3	/	3,9
De Landsheere 2012 [29]	2005-2009	Prolift® 42 g/m²	524	38	3	/	2,7	34	8,3	8,3	/	/
Karmakar 2015 [22]	2005-2009	Perigee®intepro 50 g/m²	158	34	8,1	/	13,4	7,6	8,6	/	1,2	0,6
Karmakar 2015 [22]	2009-2013	Perigee®interprolite 23,9 g/m²	158	34	8,1	/	4,8	7,6	8,6	/	7,2	0,6
Lamblin et al 2014 [17]	2008-2011	Perigee® 23,9 g/m²	33	24	0	0	6	0	/	12	/	/
De Tayrac et al 2015 [23]	2010-2011	Surgimesh® 28 g/m²	94	36	5,1	/	1,3	71,3	/	3,2	/	1,1
Lamblin et al 2016 [8]	2009-2012	Elevate® 26 g/m²/ Perigee® 23,9 g/m²	126	24	26,2/ 11,9	7,1/ 33,3	4,7	0/0	29,8 / 16,7	11,9/11,9	/	/
Liu et al 2014 [9]	2012	Alyte® 20 g/m²	30	24	6,6	13,3	3,3	33,3	20	0	3,6	0
Gutman et al 2017 [11]	2011-2014	Uphold® et Uphold lite® 25 g/m²	76	12	6	15	6,6	61	/	/	/	1,3
Lucot et al 2018 [12]	2012-2014	Multicentric	128	12	1,6		3,1	26,6	/	0,7	/	0,7
Ferry et al 2018 [30]	2013-2016	Restorelle® 19 g/m²	218	3	12,2	4	2,8	25,7	4,6	/	/	2,7
Our study 2018	2008-2017	OPUR® 22 g/m²	312	33	2,9	3,5	1,3	0,2	30	15	12,1	7,4

PVR = post void residue.

transvaginal treatment of prolapse seems to have a favourable impact on sexual activity. Only two cases of retraction were authenticated and confirmed by removal of the retracted strap of the prosthesis. Shrinkage rates have been described in the literature ranging from 4 to 11% [8,17,19,23].

In our study, two patients (0.6%) had chronic perineal pain, which led to a handicap for one of them. In the literature, chronic pain is found in 4% of cases after insertion of a transobturator strap [28] and from 4 to 11% after a TVM depending on the definition used [18,19,21]. The management of chronic pain is complex and requires the advice of specialist centres for pelvic pain.

The limitations of the study should be recognised: it was retrospective, monocentric, it involved only one surgeon and it was not randomised.

In conclusion, we show that transvaginal treatment of primary or recurrent prolapse with insertion of a six-straps prosthesis gives satisfactory and stable anatomical and functional results up to 10 years after surgery (median 33 months). Our study shows a minimal morbidity and it confirms other reports published after the warning of the FDA in 2011, characterised by prostheses of different design, low-weighted, with apical suspension and after improvement of the surgical technique (Table 5) [29,30].

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Conflicts of interest

Camille Duport: none. Céline Duperron: none. Emmanuel Delorme: expert for the ABISS company.

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