Laparoscopic mesh procedures for the treatment of pelvic organ prolapse – review of the literature

Zabiegi laparoskopowe z użyciem materiałów syntetycznych w leczeniu zaburzeń statyki narządu rodnego – przegląd literatury

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Abstract

Objectives: The main aim of the article was to describe laparoscopic mesh procedures for the treatment of pelvic organ prolapse, as well as evaluate their role, outcomes and limitations.

Material and methods: In February 2014, online search of English-language literature in PubMed was performed. This paper presents the analysis of reports published over the last decade that included at least 50 patients with a minimum of 12 months of follow-up.

Results: Numerous laparoscopic techniques to restore proper anatomy in patients with pelvic organ prolapse have been described. Laparoscopy provides a number of important advantages, including enhanced visualization of the pelvic anatomy, reduction of adhesion formation, lower morbidity and blood loss, decreased postoperative pain, smaller incision and quicker recovery. Nonetheless, this access is technically more difficult than an open or vaginal surgery due to two-dimensional vision and decreased degrees of freedom. It requires high level of laparoscopic suturing skills and longer operative time, especially at the beginning of the learning curve.

Conclusions: Laparoscopic sacrocolpopexy, hysteropexy and lateral suspension are interesting and effective options for the treatment of pelvic organ prolapse, providing a number of important advantages characteristic for endoscopic techniques.

Key words: pelvic organ prolapse / laparoscopy / sacrocolpopexy / hysteropexy / laparoscopic lateral suspension

Streszczenie

Cel pracy: Celem pracy jest opis zabiegów laparoskopowych z użyciem materiałów syntetycznych w leczeniu zaburzeń statyki narządu rodnego, ocena ich skuteczności i ograniczeń w stosowaniu.

Materiał i metody: W lutym 2014 roku dokonano przeglądu literatury angielskiej dostępnej w bazie PubMed. W poniższej publikacji poddano analizie wyniki badań opublikowanych w ciągu ostatnich 10 lat, przeprowadzonych na grupie co najmniej 50 pacjentek, u których efekt zabiegu został oceniony po minimum 12 miesiącach od operacji.

Wyniki: W leczeniu zaburzeń statyki narządu rodnego zostało opisanych wiele technik laparoskopowych. Laparoskopia daje możliwość lepszej wizualizacji struktur anatomicznych, redukuje ilość zrostów oraz dolegliwości bólowych po operacji, zmniejsza utratę krwi i przyczynia się do szybszego powrotu do zdrowia. Ten typ operacji jest jednak trudniejszy od zabiegów pochwowych lub wykonywanych z klasycznego dostępu ze względu na dwuwymiarowe widzenie i ograniczoną swobodę ruchów, jak również wymaga umiejętności laparoskopowego szycia i dłuższego czasu operacji zwłaszcza na początku nauki.

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**Introduction**

Pelvic organ prolapse (POP) is an important and common medical problem, affecting 50% of all women worldwide. Disease prevalence varies depending on the study and definitions used by the authors [1]. POP incidence is estimated at 3-6% in case of symptom evaluation, but 41-50% if the evaluation is based on an examination. Mild prolapse is often asymptomatic, thus only 10-20% of patients seek medical care [2]. Epidemiological studies show that 11% of the affected women will undergo surgery for POP or urinary incontinence (UI) [3]. Annually, 200,000 women in the United States (US) undergo reconstructive surgery of the pelvic floor [4]. The problem becomes more common with ageing [1]. It is estimated that by 2050 the number of patients in US with symptomatic POP will have increased to 46% [2,5]. Population trends in Europe are similar so the number of POP procedures and health care costs may be expected to rise as the population ages. The primary objective of any POP surgery is to correct the defects of the pelvic floor and restore vaginal anatomy and support in order to re-establish and preserve normal bladder, bowel and sexual function [6]. Numerous operative abdominal and vaginal techniques to restore proper anatomy by suspending the vaginal vault, uterus, bladder, and rectum have been described [7]. There is a growing interest in the use of minimally invasive procedures to correct POP [6]. The first report of laparoscopic management of pelvic floor relaxation was published in 1991 [8]. The laparoscopic approach has been successfully adopted for many procedures which were previously performed by the abdominal or vaginal route [6]. Laparoscopy provides a number of important advantages, including enhanced visualization of the pelvic anatomy, reduction of adhesion formation, lower morbidity and blood loss, decreased postoperative pain, smaller incision and quicker recovery [7]. Nonetheless, this access is technically more difficult than an open or vaginal surgery due to a two-dimensional vision and decreased degrees of freedom. Also, it requires high laparoscopic suturing skills and longer operating time, especially at the beginning of the learning curve [6, 8, 9].

**Objectives**

The main aim of the article was to evaluate the role of laparoscopy in the treatment of pelvic organ prolapse and to describe available techniques, their outcomes and limitations.

**Material and methods**

In February 2014, online search of English-language literature in PubMed was performed using the terms: pelvic organ prolapse AND laparoscopy. After a review of the available literature, an additional search of the same database was conducted using the following terms: laparoscopic sacrocolpopexy, laparoscopic hysterectomy, laparoscopic lateral suspension.

This paper includes an analysis of reports on laparoscopic mesh procedures for the treatment of POP, published over the last decade, that studied a minimum of 50 patients with at least a 12-month follow-up.

**Results**

Initially, we found numerous publications regarding different techniques of laparoscopic prolapse repairs, but many of them analyzed small groups, with a short follow-up, thus providing insufficient data to evaluate their long-term efficacy. We also discovered a lack of well-designed trials comparing efficacy of different laparoscopic techniques, with the exception of laparoscopic sacrocolpopexy (LSC), whose efficiency and long-term results were reported in many studies and compared with other techniques.

**Laparoscopic sacrocolpopexy**

Abdominal sacrocolpopexy is considered to be the most effective treatment for apical vaginal prolapse with long-term success rate up to 78-100% and patient satisfaction rates of 85-100% [10]. A Cochrane review comparing different surgical techniques for the treatment of POP concluded that the procedure led to lowered rates of recurrent vault prolapse and postoperative dyspareunia as compared to sacrospinous ligament fixation [9]. Promontifxation was first reported in 1889 by Freund, whereas in 1957 Hugier provided a more detailed description of open sacral colpopexy [11]. In 1993, laparoscopic promontifxation mimicking the abdominal procedure was first described [12,13], and ever since the technique has been widely used among gynecologists, who introduced some modifications to improve its effectiveness and reduce complication rates [13]. Indications for sacrocolpopexy vary depending on the region of the world. In Europe, LSC is performed for multicompartement or recurrent prolapse, especially in young, symptomatic women. In the US and the United Kingdom, this procedure is indicated mostly for vaginal vault prolapse [14]. Today, a rapid increase in the number of LSC can be observed [10].

The principle of LSC is based on the need for strong posterior fixation to support the uterus, which would be normally provided by the uterosacral ligaments [15]. The procedure usually begins with a vertical incision of the prevetbral peritoneum and exposure of the anterior longitudinal ligament, at the level of the promontory, setting aside the right ureter laterally and rectum medially [12]. At this stage, the key to a safe surgery is excellent anatomical knowledge of the presacral and pararectal spaces. The next step is proper dissection of the rectovaginal space reaching levator ani muscle, and the vesicovaginal space reaching bladder neck should be performed to prepare a place for the mesh. The posterior part of the mesh is usually fixed to the levator ani
muscles and posterior part of the cervix, while the anterior part of
the mesh is placed between the bladder and the anterior vaginal
wall, and then attached. If two separate meshes are used, they
should be sutured to each other as well as the cervix, and fixed
without tension to the anterior longitudinal ligament. Some
authors recommend vaginal repair of the coincident cystoceles
and rectoceles, before sacrocolpopexy. However, others
suggest that many of these defects may be caused by traction or
displacement, therefore proper fixation of the vault or the uterus
is sufficient to restore anatomy, unless it is a distal defect in which
case additional vaginal treatment may be necessary [16].

The largest series of 363 patients undergoing LSC is
presented in a retrospective study by Rozet et al. After an average
follow-up of 14.6 months, 96% of the patients were satisfied with
the results of their operation and none of the subjects complained
of sexual dysfunction. The authors observed a 4% recurrence
rate of prolapse and only 3 vaginal erosions. Low incidence of
mesh-related complications was reported as a result of tacking the
posterior mesh to the levator ani musculature after careful
dissection of this muscle, and repertonealisation [11].

In another study, the Clermont Ferrand team reported a
series of 138 patients with a 98% satisfaction rate and few
complications after mean follow-up of 33.7 months. Anatomic
and functional recurrence appeared in 11% and 12% of the cases,
respectively. Mesh erosions occurred in 5% of the patients. These
authors emphasized that laparoscopic approach minimizes trauma
during pararectal dissection and prevents rectum denervation,
and consequent defecation problems. Another highlighted
advantage of LSC is preservation of the sexual function, resulting
in the absence of de novo dyspareunia, which is a common
occurrence after laparotomic promontofixation [12]. Granese et
al. demonstrated a 95% success rate after median follow-up of 43
months in a group of 138 women who underwent surgery due to
vaginal vault prolapse. Mesh erosion occurred only in 1 patient,
but 8 intraoperative and 37 cases of postoperative complications
were reported [17]. Claerhout et al., reported the anatomic cure
rate of 98%, with subjective cure rate of 92% during a mean
follow-up of 12.5 months. Anatomic failures were mainly at the
posterior compartment, although no patient required reoperation
for recurrent prolapse [18]. Sergent et al., presented results of a
prospective study of 116 patients with a mean follow-up of 34
months, and reported the anatomical success rates on the apical,
anterior or posterior compartments of 97%, 89% and 98%,
respectively. Also, improved quality of life and sexuality were
noticed [19]. In a prospective study on 101 patients, Sarlos et
al., reported 98% objective cure rate, 93% subjective cure rate
and absence of mesh erosions after a mean follow-up of 12
months. They reported the anterior compartment as the main
site of objective recurrence [20]. Perez et al., reported significant
improvement in the quality of life and sexuality and anatomic
success in 94% of cases in a series of 94 women, 12 months after
the operation [21]. Price et al., demonstrated 88% and Agarwala
presented 97% subjective cure, and 100% objective cure rate, in
the groups of 84 and 74 patients, respectively after mean follow-
up of 24 months [16, 22]. Higgs reported long-term results of LSC
among 66 women after mean follow-up of 66 months assessing
good vault support in 92% of the patients, with 42% recurrence of
vaginal wall prolapse [8]. Mean operative time in the publications
presented above varied between 55 and 190 minutes [12, 17].

The literature offers only a few studies comparing the
outcomes of open vs. LSC procedures. One retrospective,
randomized study compared a group of 794 patients who
underwent open procedure to a group of 176 subjects who
underwent laparoscopy. The laparoscopic approach turned out
to be associated with significantly increased risk of re-operation
for anterior vaginal wall prolapse. However, postoperative
complications were more common in the open group. Mesh-
related complications were more frequent after laparoscopy,
when concomitant hysterectomy was performed, as compared
to open surgery [10]. The results of the LAS study (randomized
controlled trial of abdominal vs. LSC) showed similar outcomes
for both procedures, without any advantage of LSC in terms of
earlier discharge, and return to daily activities [23]. A recent
multicenter retrospective cohort study compared the abdominal
route with minimally invasive sacrocolpopexy in a total of 1124
patients who were analyzed. This comparison indicated that the
abdominal approach (589 patients) was associated with a greater
complication rate compared to laparoscopic or robotic sacral
colpopexy (535 patients); 20% vs. 12.7%. Anatomical results
were similar for all groups. Both minimally invasive techniques
had less blood loss, shorter hospitalization but longer operative
time. When comparing laparoscopy to robotic operation, there
was no difference in anatomic failures but laparoscopy was
associated with more complications compared with robotic
sacrocolpopexy (18% vs. 7%) [24]. In a randomized control trial
published in 2014, which compared laparoscopic and robotic
procedures, the authors found no difference in outcomes and
adverse events between the groups. However, longer operative
times, higher pain scores, and higher costs were noted in the
robotic group [25]. Similar results were noted in a trial carried
out by Paraizo et al., in 2011 [26]. Seror et al., reported shorter
strict operative time for the robotic group, but this time advantage
was nullified when comparing the overall operating room time
[27]. In turn, in a randomized trial carried out by Maher et al.,
comparing LSC versus total vaginal mesh (TVM) for vaginal
vault prolapse at 2 years, the authors reported higher satisfaction
and objective success rate with lower perioperative morbidity
and reoperation rate for the laparoscopic group. Patients who
underwent laparoscopy had quicker recovery and shorter hospital
stay, but their operations lasted longer [28]. Cost analysis of both
techniques revealed LSC to be less expensive than TVM due to
lower consumable, inpatient and reoperation costs [29]. Ganatra
et al., found that laparoscopic sacrocolpopexy reduces the risk of
mesh infection and erosion as compared to the vaginal route [14].

Complications related to laparoscopic sacral colpopexy
are similar to those reported for other laparoscopic
gynecological procedures (i.e. total laparoscopic hysterectomy)
except spondylodiscitis, which is a known complication of
promontofixation, and intraoperative injuries of anatomical
structures during dissection in the sacral area [12, 30].

A multicenter prospective cohort study from the Netherlands
comparing complications between open abdominal surgery
and LSC for the treatment of vault prolapse, reported reduced
blood loss, shorter hospitalization, and fewer procedure-related
complications, in the minimally invasive group [30]. Use of
synthetic material such as prolene mesh in POP surgery is
associated with the presence of specific long-term complications
such as mesh erosion or mesh migration. Reports in the literature
Concerning erosion rates yielded estimates of 0 to 11% with an overall rate of 2.7% per procedure [31]. Mesh migration can be seen in 0.8-19% of cases of abdominal sacral colpopexy [32]. Some studies emphasize differences in the rates of erosion with different materials. Thus, choosing the most appropriate graft material is important [31].

In a meta-analysis of 258 studies assessing rates of recurrence after apical prolapse repair, the authors reported a reoperation rate of 2.3% for sacrocolpopexy with a mean follow-up of 26 months; in comparison to 1.3% after transvaginal mesh repair with a mean follow-up of 17 months; and 3.9% after traditional vaginal vault suspension without synthetic material after a mean of 32 months. However, the total number of reoperations due to recurrence and complications was the highest in the transvaginal mesh group, reaching 8.5% [2].

A large number of studies on laparoscopic sacrocolpopexy procedures demonstrate that the technique is feasible and effective, with low postoperative complications and satisfactory long-term results [12].

**Laparoscopic sacral hysteropexy**

In the laparoscopic sacral hysteropexy, the uterus is suspended to the promontory using a bifurcated mesh. At the beginning of the procedure, each broad ligament is opened at the level of the cervico-uterine junction through the avascular area. After incision of the vesico-uterine peritoneum the bladder is dissected distally [33]. Thereafter, the arms of the mesh are introduced bilaterally through previously created windows, and the mesh is fixed with the sutures to the cervix. Afterwards, both arms are fixed together to the sacral promontory and covered with peritoneum.

The largest study assessing this procedure was described by Rahaman et al., who in an observational study of 140 patients found that 89% of the women were satisfied with the result and experienced significant improvement in all assessed aspects of life after mean follow-up of 2.1 years. The authors reported that 4% of the patients had recurrence of apical prolapse, 25% had anterior prolapse during a 1-to-4-year follow-up. No mesh exposures were observed in the treated group. The authors emphasized the need to inform patients who wish to preserve fertility that, in case of a delivery, cesarian section will be indicated due to inability of the completely encircled cervix to dilate during vaginal labor [34]. The literature lacks data on pregnancies after laparoscopic sacral hysteropexy. There were only a few pregnancies after laparoscopic uterosacral hysteropexy, but based on this publications it is difficult to indicate which type of hysteropexy is better for women who wish to conceive in the future, and guarantees fewer recurrences after pregnancy. Gutman and Maher suggested that sacral hysteropexy is as effective as sacral colpopexy and hysterectomy in anatomical outcomes. However, these procedures were associated with a five times higher rate of mesh exposure than sacral hysteropexy [35].

**Laparoscopic lateral suspension**

The laparoscopic lateral suspension technique is based on a previously performed abdominal procedure. It was first described by Dubuisson in 1998 [36]. Multiple variations of this technique appear in the literature, but the main principles remain the same. After an incision of the peritoneum and dissection of the bladder below the cystocele, a long, narrow mesh with a flap in the middle (whose size depends of the grade of cystocele) is fixed in the midpoint to the anterior cervix. Afterwards, through additional small incisions, which are lateral and above the anterior superior iliac spine or through incisions after withdrawn lateral trocars, tunnels are made bilaterally using blunt dissection [36,37]. The tunnels are dissected in an avascular area, under the control of transillumination, until they pass incision in vesicouterine peritoneum. Then, the free end of the mesh is passed through extraperitoneal tunnel on both sides and pulled out of the abdominal wall to elevate the uterus. The mesh is left tension free and the arms are cut at the level of the skin. This mesh works as a transversal hammock for the vaginal vault and the uterus. In case of coexisting rectocele, the posterior vaginal wall and rectovaginal septum are dissected away from the rectum and additional mesh is placed and fixed to the ischium or the vaginal vault, to reinforce the rectovaginal septum [36]. This procedure can be performed with preservation of the uterus or together with laparoscopic subtotal (SLH) or total hysterectomy (TLH), depending of gynecological situation of the patient [36,37].

Dubuisson et al., in a prospective study of 73 patients with post-hysterectomy symptomatic vaginal vault prolapse, reported a 98.6% success rate in restoring proper anatomy of the vault after a 17.5-month follow-up. They observed recurrent or de novo prolapse in 17.8% of patients, with 11% requiring reoperation. A previous study from the same center reported a 87.7% success rate of lateral suspension in a diverse group of women (with or without preserved uterus), after median 19 months of follow-up. Mesh erosions occurred in 5.5% of cases [37]. The authors emphasized the advantages of lateral suspension which treats genital prolapse, without causing damage to the promontory (no risk of sacral osteomyelitis, vascular injury or nerve damage), and no need for periotonization.

**Uterus – to preserve or not to preserve?**

Recently, uterine-preserving POP surgery has become more popular because many patients, especially younger women, either wish to preserve their fertility or believe that hysterectomy can negatively affect their sense of identity and sexuality. They also fear complications after major surgery [34,35]. Hysterectomy does not address the underlying pathophysiology of poor connective tissue support in patients with POP. Careful screening and evaluation of the affected individuals is crucial to decide whether to perform uterine-preserving surgery. Gutman and Maher, presented the following contraindications to uterine-preserving surgery: fibroids, adenomyosis, endometrial or cervical pathology, abnormal or postmenopausal uterine bleeding, tamoxifen therapy and genetic predispositions or familial cancers [35]. When these conditions are excluded, the uterus can be preserved because many studies show increased risk of mesh erosions in the group of patients after sacrocolpopexy, with concomitant hysterectomy or subtotal hysterectomy. Meta-analysis of comparative studies revealed that the risk of mesh erosion is approximately four times greater if hysterectomy is performed at the time of sacrocolpopexy (8.6%), as comparred to the same procedure without hysterectomy (2.2%), or subtotal hysterectomy (1.7%) [35]. One possible explanation is that with concurrent hysterectomy, vaginal flora may contaminate the vaginal apex incision and increase the risk of infection and mesh erosion [38]. In turn, after analyzing series
of 64 patients 2 years after surgery, Rosen et al., concluded that addition of total hysterectomy to laparoscopic pelvic floor repair adds approximately 35 minutes to surgical time and does not influence the outcome and peri- or postoperative complications. They noted however that preservation of the uterus may lead to cervical elongation, potentially requiring further surgery [39].

Conclusions

A review of numerous techniques for treating POP reported in the literature indicates that there is still no consensus regarding this issue. However, there is common agreement that if surgery becomes necessary, it has to relieve the symptoms and restore pelvic organs to their anatomical position [11]. Minimally invasive techniques provide excellent reconstructive outcomes with decreased morbidity as compared to open and vaginal surgery [40]. LSC is the best described and studied technique in terms of efficacy, safety and long-term results. However, other procedures present interesting alternatives but need further evaluation. The choice between different surgical techniques and approaches depends upon the complexity and level of the symptoms presented, patient concerns, and experience of the surgeon.

References: