International Urogynecology Journal (2019) 30:581–587
https://doi.org/10.1007/s00192-018-3832-y

ORIGINAL ARTICLE

Treatment of vaginal vault prolapse in The Netherlands: a clinical practice survey

Carolien K. M. Vermeulen[1] · Anne Lotte W. M. Coolen[1,2] · Wilbert A. Spaans[3] · Jan Paul W. R. Roovers[4] · Marlies Y. Bongers[1,2]

Received: 6 September 2018 / Accepted: 16 November 2018 / Published online: 4 December 2018

Abstract

Introduction and hypothesis A great variety of conservative and surgical procedures to correct vaginal vault prolapse have been reported. The aim of this study was to describe practice pattern variation—the difference in care that cannot be explained by the underlying medical condition—among Dutch gynecologists regarding treatment of vaginal vault prolapse.

Methods A clinical practice survey was conducted from March to April 2017. The questionnaire was developed to evaluate treatment of vaginal vault prolapse. All members of the Dutch Society for Urogynaecology were invited to participate in a web-based survey.

Results One hundred four Dutch gynecologists with special interest in urogynecology responded to the survey (response rate, 44%). As first-choice therapy for vaginal vault prolapse, 78% of the respondents chose pessary treatment, whereas sacrospinous fixation was the second most common therapy choice according to 64% of the respondents. Preferences on how to approach vaginal vault prolapse surgically are conflicting. Overall, the most performed surgery for vaginal vault prolapse is sacrospinous fixation, followed by laparoscopic and robotic sacrocolpopexy.

Conclusions Gynecologists in The Netherlands manage vaginal vault prolapse very differently. No standardized method could be determined for the treatment of vaginal vault prolapse in The Netherlands, and we observed practice pattern variations.

Keywords Vaginal vault prolapse · Treatment · Sacrocolpopexy · Trans vaginal mesh · Sacrospinous fixation · Pessary

Abbreviations

ASC	Abdominal sacrocolpopexy
IUGA	International Urogynaecology Association
LSC	Laparoscopic sacrocolpopexy
NTR	Dutch Trial Register
POP	Pelvic organ prolapse
PPV	Practice pattern variation
SPSS	Statistical Package for the Social Sciences
SSF	Sacrospinous fixation
RSC	Robotic sacrocolpopexy
VVP	Vaginal vault prolapse

This work was presented as a discussed poster at EUGA conference 2017 in Barcelona, Spain (October 19–21, 2017)

✉ Carolien K. M. Vermeulen
carolienvermeulen@outlook.com

[1] Department of Gynaecology and Obstetrics, Máxima Medical Centre, De Run 4600, 5500 MB Veldhoven, The Netherlands

[2] Department of Gynaecology and Obstetrics, Grow, Research School of Oncology and Developmental Biology, University of Maastricht, Minderbroedersberg 4-6, 6211 LK Maastricht, The Netherlands

[3] Department of Gynaecology and Obstetrics, Maastricht Academic Hospital, P. Debyelaan 25, 6229 HX Maastricht, The Netherlands

[4] Department of Gynaecology and Obstetrics, Academic Medical Centre Amsterdam, Meibergdreef 9, 1105 AZ Amsterdam, The Netherlands

Introduction

Vault prolapse is a problem among hysterectomized women that often results in surgical repair [1]. Hysterectomy is one of the top ten most common surgeries performed among Dutch women and also a risk factor for pelvic organ prolapse (POP); however, the etiology is unclear [2, 3]. The incidence of vaginal vault prolapse (VVP) after hysterectomy is 36 per 10,000 women years [4]. Up to 10% of women who had a hysterectomy because of prolapse symptoms will develop a vaginal vault prolapse that

will need surgical repair [4]. The risk of prolapse following hysterectomy is five to six times higher in women indicated for POP as in those indicated for different reasons [5]. Since the life expectancy is exponentially increasing, the demand for prolapse surgery will grow [6].

Current treatment options for POP include pelvic floor muscle training, use of pessaries and surgery. There is no evidence on the efficacy of pessary treatment for VVP, and other conservative approaches such as pelvic floor exercise are frequently ineffective [7–9]. A variety of different surgical procedures to correct vaginal vault prolapse have been reported [10]. The principle of surgery is to restore the pelvic anatomy, with the purpose to reduce pelvic floor symptoms. The restoration of VVP implies attaching the vaginal apex to achieve level 1 support [11], resulting in improvement of quality of life. The best treatment of post-hysterectomy vaginal vault prolapse remains controversial.

Sacrospinous fixation (SSF), laparoscopic/abdominal/robotic sacrocolpopexy, transvaginal mesh, high uterosacral ligament suspension and colpocleisis are just some of the procedures described to treat VVP surgically. A standard approach or published guideline for the management of VVP is lacking. Therefore, the choice of therapy mostly depends on the former training and personal experience of the surgeon.

The aim of this study was to describe practice pattern variation—the difference in care that cannot be explained by the underlying medical condition—among Dutch gynecologists regarding treatment of VVP. To improve standard care in women with vaginal vault prolapse, one must first know the variety of procedures or therapies performed by practitioners and their preferences. Where there is no consensus, there is lack of clear evidence. We therefore believe this study will help to formulate future research questions and design protocols regarding the treatment of VVP.

Materials and methods

A clinical practice survey was conducted from March to April 2017. The questionnaire was developed to evaluate the management of VVP. All members of the Dutch Society for Urogynaecology were invited by email to participate in a web-based survey.

Questionnaire

The questionnaire addressed the following topics: characteristics of the hospital and gynecologist, conservative treatment options for the treatment of VVP, surgical treatment options and preoperative treatment of patients. To complete the questionnaire, participants had to answer the questions by choosing the treatment option according to the management they usually perform, although their choice in daily practice depends on multifactorial patient-related factors.

Before the start of the study, we consulted three gynecologists with a special interest in urogynecology. Based on the recommendations of these pilot participants, the questionnaire was developed and revised. All questionnaires were treated anonymously. No financial compensation was given to the responders. After 3 weeks, a reminder email was sent to the non-responders.

Statistical analysis

Descriptive statistics were performed using SPSS 22.0 (SPSS Statistics UK, SPSS, Chicago, IL, USA). Results are expressed as mean and range for continuous variables. For ordinal variables, proportions were calculated.

Ethical considerations

Since this survey does not contain any patient data, according to the Declaration of Helsinki, no ethical approval is required. This was confirmed by the Medical Research Ethics Committee of the Màxima Medical Center, Veldhoven.

Results

The response rate consisted of 104 out of 237 Dutch gynecologists with a special interest in urogynecology (response rate 44%). The level of experience was diverse, and most gynecologists appeared to work in a non-academic teaching hospital (Table 1).

Table 2 shows the treatments used for VVP by the respondents. We asked the responders to separately formulate a first- and second-choice VVP treatment. The first-choice treatment was pessary treatment according to 81 respondents (78%).

Table 1 Characteristics of respondents

	N (%) *N* = 104
Years since completing residency	
< 5	16 (15%)
5–10	24 (23%)
11–15	20 (19%)
16–20	19 (18%)
> 20	25 (24%)
Practice type	
Academic hospital	9 (9%)
Non-academic teaching hospital	65 (63%)
Non-teaching hospital	30 (29%)

Table 2 Results of the questionnaire regarding the treatment of vaginal vault prolapse

	N (%) *N* = 104
First-choice treatment for vaginal vault prolapse	
Pessary treatment	81 (78%)
Sacrospinous fixation	14 (13%)
Laparoscopic sacrocolpopexy	4 (4%)
Robotic sacrocolpopexy	4 (4%)
Posterior intravaginal sling	1 (1%)
Abdominal sacrocolpopexy	0 (0%)
Vaginal mesh	0 (0%)
Second-choice treatment for vaginal vault prolapse	
Sacrospinous fixation	66 (63%)
Laparoscopic sacrocolpopexy	13 (13%)
Abdominal sacrocolpopexy	10 (10%)
Pessary treatment	8 (8%)
Robotic sacrocolpopexy	5 (5%)
Vaginal mesh	1 (1%)
Posterior intravaginal sling	1 (1%)
Pessary treatment as treatment for vaginal vault prolapse	
Yes	102 (98%)
No	2 (2%)
Type of pessary (n = 102)	
Ring pessary	80 (78%)
Ring pessary with central support	77 (75%)
Shelf pessary (Falk®, Shaatz)	72 (71%)
Cube pessary	60 (59%)
Donut	38 (37%)
Gelhorn	23 (23%)
Hodge	19 (19%)
Gehrung	5 (5%)
Regula	1 (1%)
Inflatoball	1 (1%)
Non-specified	3 (3%)
Estrogen therapy during pessary treatment in postmenopausal women	
Yes, always	15 (14%)
Yes, usually	23 (22%)
Yes, if indicated	63 (61%)
No	1 (1%)
Surgical treatments for vaginal vault prolapse performed by respondents	
Sacrospinous fixation	95 (91%)
Colpocleisis	67 (64%)
Laparoscopic sacrocolpopexy	38 (37%)
Abdominal sacrocolpopexy	22 (21%)
Robotic sacrocolpopexy	21 (20%)
Vaginal mesh	21 (20%)
Posterior intravaginal sling	4 (4%)
No surgery	6 (6%)
Colpocleisis as surgical treatment for vaginal vault prolapse	
Yes	73 (70%)
No	31 (30%)
First-choice surgical treatment for vaginal vault prolapse	
Sacrospinous fixation	69 (66%)
Laparoscopic sacrocolpopexy	15 (14%)
Robotic sacrocolpopexy	14 (13%)
Abdominal sacrocolpopexy	3 (3%)
Posterior intravaginal sling	2 (2%)
Vaginal mesh	1 (1%)
Colpocleisis	0 (0%)
Second-choice surgical treatment for vaginal vault prolapse	
Laparoscopic sacrocolpopexy	47 (45%)
Sacrospinous fixation	21 (20%)
Colpocleisis	15 (14%)
Robotic sacrocolpopexy	12 (12%)
Abdominal sacrocolpopexy	6 (6%)
Vaginal mesh	3 (3%)
Posterior intravaginal sling	0 (0%)
Preoperative estrogen therapy	
Yes, always	7 (7%)
Yes, usually	22 (21%)
Yes, if indicated	51 (49%)

Table 2 (continued)

	N (%) *N* = 104
No	24 (23%)
Duration of preoperative estrogen therapy (if yes, *n* = 80)	
2 weeks	5 (6%)
4 weeks	19 (24%)
6 weeks	40 (50%)
2 months	8 (10%)
3 months	3 (4%)
> 3 months	5 (6%)
Referral to another center for vault prolapse surgery	
Yes	55 (53%)
For:	
Laparoscopic sacrocolpopexy	39 (71%)
Vaginal mesh	28 (51%)
Robotic sacrocolpopexy	23 (42%)
Posterior intravaginal sling	6 (11%)
Abdominal sacrocolpopexy	5 (9%)
Sacrospinous fixation	1 (2%)
Colpocleisis	1 (2%)
Other	1 (1%)
Combination with rectopexy	1
No	49 (47%)
Follow-up after surgical treatment of vault prolapse	
No follow-up, only in case of complaints	0 (0%)
One postoperative appointment after a few weeks	49 (47%)
A postoperative appointment and after > 6 months	22 (21%)
A postoperative appointment and after > 6 months in case of mesh use	33 (32%)

Thirteen percent of the responders (*n* = 14) considered SSF the first-choice treatment.

Second-choice treatment was SSF for 66 (63%) of the respondents, followed by laparoscopic sacrocolpopexy (LSC) for 13 (13%) gynecologists and robotic sacrocolpopexy (RSC) for 10 (10%). The majority of respondents (*N* = 63, 61%) preferred the combination first-choice 'pessary treatment' and second-choice 'SSF.'

Almost all respondents, 102 (98%), consider pessary treatment an option in women with a symptomatic VVP. Types of pessaries used to treat vaginal vault descent among respondents were: ring pessary (*n* = 80, 78%), shelf pessary (*n* = 72, 71%), cube pessary (*n* = 60, 59%), donut (*n* = 38, 37%), Gelhorn (*n* = 23, 23%), Hodge (*n* = 19, 19%), Gehrung (*n* = 5, 5%), Regula (*n* = 1, 1%) and Inflatoball (*n* = 1, 1%). Pessary treatment was combined with estrogen therapy by almost all of the respondents (always or usually by 36%, if indicated by 61%).

Surgical treatment

Most respondents perform various surgical techniques. Procedures used by respondents to treat VVP were: sacrospinous fixation (*n* = 95, 91%), laparoscopic sacrocolpopexy (*n* = 38, 37%), abdominal sacrocolpopexy (ASC, *n* = 22, 21%), robotic sacrocolpopexy (*n* = 21, 20%), vaginal mesh (*n* = 21, 20%), posterior intravaginal sling (*n* = 4, 4%) and colpocleisis (*n* = 67, 64%). The first-choice surgical treatment of VVP was SSF among 69 (66%) respondents, followed by LSC (*n* = 15, 14%) and RSC (*n* = 14, 13%). The second-choice surgical treatments consisted of LSC according to 47 (45%) respondents, followed by SSF (*n* = 21, 20%), colpocleisis (*n* = 15, 14%) and RSC (*n* = 12, 12%). The most common combination consisted of first-choice SSF and second-choice LSC, reported by 41 respondents (39%). More than half of the respondents (*n* = 55, 53%) occasionally refer patients to another center for a procedure. Mostly, patients were referred for LSC (71%), vaginal mesh (51%) and RSC (42%).

If indicated, 80 (77%) respondents treat their postmenopausal patients preoperatively with estrogen therapy. The treatment period varied from 2 weeks (*n* = 5, 6%) to over 3 months (*n* = 5, 6%). Most gynecologists prescribed vaginal estrogen therapy for 6 weeks (*n* = 40, 50%).

Discussion

Main findings

This survey concludes that there is no consensus regarding the treatment of vaginal vault prolapse in The Netherlands, and the practice pattern variation is high. Pessary treatment is preferred as first-choice treatment by most gynecologists. The first-choice surgical management of VVP is sacrospinous fixation, followed by laparoscopic sacrocolpopexy. These results of our survey are in line with a previous survey by the Urogynaecological Association (IUGA) in 2002 [12]. This survey is however dated before the recent reviews [13–15] and developments in laparoscopic and robotic prolapse surgery.

Strengths and limitations

One of our strengths is that our study provides insight into the daily practice and intention of gynecologists rather than theoretic outcomes. We are content with the response rate of 44%, which is a good representation of the Dutch gynecologist with a special interest in urogynecology.

A limitation of our study lies in the capability of a survey to accurately reflect the way practitioners handle VVP; a national database would provide more reliable data; however, a database is also never 100% complete. Individualized patient care based on the patient's preference and anatomy was deliberately not taken into account in the questions and multiple-choice answers, but in daily practice this plays an important role in decision-making.

Interpretation

Preferences on how to approach VVP are conflicting. The majority of specialists would choose pessary treatment as first choice and, in case of a surgical procedure, would prefer SSF as the first and LSC as the second option.

A variety of utilized pessaries was described, with the ring pessary (with/without central support), shelf and cube pessary the most frequently used types. Pessary treatment is poorly studied in women with vaginal vault prolapse. Only one study mentions pessary treatment in post-hysterectomized women. The failure rate was high in this group; however, interpretation of this finding is difficult since exact numbers and baseline characteristics are not presented [16].

The efficacy and type of pessary for VVP are not evidence-based. It is remarkable that Dutch gynecologists seldom use Gelhorn and prefer the shelf pessary, in contrast to the members of the American Urogynecologic Society who most frequently use the Gelhorn and ring pessary [17]. Since evidence is lacking, the physician's experience or training seems to be decisive in the choice of pessary together with the patient characteristics.

Of utmost importance in the choice of pessary is the woman's anatomy: vaginal length, width of the introitus, presence of combined prolapse with the anterior or posterior compartment, presence of vaginal atrophy, etc.

Some specialists do not use pessary treatment at all unless surgery is not an option, for example, if a patient is not fit enough for surgery or declines the operation. This supports the statement that VVP is treated according to the preference of the gynecologist and patient.

Quite a surprising finding was learning that the posterior intravaginal sling and vaginal mesh are still used as first-choice surgical treatment by some specialists. Use of vaginal mesh is a procedure that has proved very effective [18, 19], but is currently mostly applied in cases of recurrent POP according to a survey of members of the Dutch Urogynaecologists Association in 2012 because of fear of mesh complications resulting in re-operation [20]. It is encouraging to see that the posterior intravaginal sling is only used by a few gynecologists.

Our results are similar to those of a survey performed by the International Urogynaecological Association (IUGA) in 2002, which showed that 78% of the responders mentioned the SSF as the method of choice when treating vaginal vault prolapse [12]. In our survey, the SSF was performed as first-choice surgical treatment by 66% of the respondents. Overall, the SSF has been the most performed procedure over the years and is popular because of its favorable outcomes compared with ASC [21, 22].

In an observational study among women with uterine descent, the SSF had a very high satisfaction rate (84%), no complications and a recurrence rate with subsequent re-operation of 2.3% [23]. However, the question arises whether these results are the same for women with VVP. In three studies comparing SSF with other procedures (ASC and mesh procedures) in post-hysterectomized women, the SSF scored worse in anatomic success rates, dyspareunia and recurrence [23, 24]. There was no difference in patient satisfaction.

Second-choice treatment is laparoscopic sacrocolpopexy, which has gained popularity since it was first reported in 1994 [25]. According to a Cochrane review [13], ASC was described as the first-choice treatment for VVP. However, LSC has advantages over laparotomy. Morbidity, hospital stay, postoperative pain and recovery are all less. Nevertheless, the laparoscopic approach is more challenging and requires more time in the operating room [26].

Where Freeman et al. [27] showed clinical equivalence of the LSC and ASC in 2013, a recent multicenter trial comparing LSC and ASC showed superiority of LSC: no difference in functional and anatomical outcome was found, but less severe complications, less blood loss and shorter hospital stay were reported [28, 29].

Robotic sacrocolpopexy ranks third in surgical procedures for VVP; however, little evidence is available to support this position. A randomized controlled trial by Paraiso et al. [30] comparing RSC and LSC was not very promising: RSC was associated with longer operating time, increased postoperative pain and higher costs. Since this study was performed at the beginning of robot surgery, we might be surprised by the current results; we are looking forward to more evidence in favor of this method. Another method is uterosacral ligament suspension, which is up and coming in The Netherlands, but not yet implemented in daily practice; therefore, it was left out of the questionnaire.

We wonder, has SSF earned its place as first-choice procedure in VVP or is it popular because of its low complexity and accessibility? The recent review of Maher et al. [15] shows that LSC has several advantages over vaginal surgery: a lower re-operation rate, longer vaginal length and fewer sexual

problems. A trial is pending on the treatment of VVP comparing SSF vs. LSC in a multicenter randomized trial (NTR3977). If the results show a significant difference in patient satisfaction and a good balance of efficacy and costs, we should aim for a change in our practice according to the results. However, awaiting more evidence, specialists will have their own preference for the procedure they feel comfortable with.

With this article we would like to create awareness among our colleagues. As clinicians, we are trained to practice evidence-based medicine; however, for much of our work this is not (yet) the case. Logistics, cost-effectiveness, experience and habit play an important role in practice pattern variations. We are interested in more research regarding patient characteristics in relation to treatment options and new data on robotic surgery and long-term outcomes of SSF and LSC. Maybe one day we will reach a consensus.

Conclusion There is no consensus regarding the treatment of VVP in The Netherlands, and we observed practice pattern variations. Pessary treatment is preferred as conservative treatment by Dutch gynecologists; in case surgery is performed, sacrospinous fixation is preferred over laparoscopic and robotic sacrocolpopexy.

Acknowledgements We thank the Dutch Society for Urogynaecology for sending our survey to the gynecologists and to all who contributed to this paper by responding to our questionnaire.

Compliance with ethical standards

Conflicts of interest None.

References

1. Aigmueller T, Dungl A, Hinterholzer S, Geiss I, Riss P. An estimation of the frequency of surgery for posthysterectomy vault prolapse. Int Urogynecol J. 2010;21(3):299–302.
2. Lykke R, Blaakaer J, Ottesen B, Gimbel H. Pelvic organ prolapse (POP) surgery among Danish women hysterectomized for benign conditions: age at hysterectomy, age at subsequent POP operation, and risk of POP after hysterectomy. Int Urogynecol J. 2015;26(4):527–32.
3. Central Bureau for Statistics. Hospital procedures in the Netherlands; hysterectomy 1995–2010. 2014, February 5. Retrieved from http://statline.cbs.nl.
4. Dällenbach P, Kaelin-Gambirasio I, Jacob S, Dubuisson JB, Boulvain M. Incidence rate and risk factors for vaginal vault prolapse repair after hysterectomy. Int Urogynecol J Pelvic Floor Dysfunct. 2008;19(12):1623–9.
5. Marchionni M, Bracco GL, Checcucci V, Carabaneanu A, Coccia EM, Mecacci F, et al. True incidence of vaginal vault prolapse. Thirteen years of experience. Reprod Med. 1999;44(8):679–84.
6. Wu JM, Hundley AF, Fulton RG, Myers ER. Forecasting the prevalence of pelvic floor disorders in US women: 2010 to 2050. Obstet Gynecol. 2009;114:1278–83.
7. Jia. Systematic review of the efficacy and safety of using mesh in surgery for uterine or vaginal vault prolapse, 2010. Int Urogynecol J. 2010;21(11):1413–31.
8. Panman CM, Wiegersma M, Kollen BJ, Berger MY, Lisman-van Leeuwen Y, Vermeulen KM, et al. Effectiveness and cost-effectiveness of pessary treatment compared with pelvic floor muscle training in older women with pelvic organ prolapse: 2-year follow-up of a randomized controlled trial in primary care. Menopause. 2016;23(12):1307–18.
9. Lamers BHC, Broekman BMW, Milani AL. Pessary treatment for pelvic organ prolapse and health-related quality of life: a review. Int Urogynecol J. 2011;22(6):637–44.
10. Uzoma A, Farag KA. Vaginal vault prolapse. Obstet Gynecol Int. 2009;2009:275621.
11. Klauschie JL, Cornella JL. Surgical treatment of vaginal vault prolapse: a historic summary and review of outcomes. Female Pelvic Med Reconstr Surg. 2012;18(1):10–7.
12. Davila GW, Ghoniem GM, Kapoor DS, Contreras-Ortiz O. Pelvic floor dysfunction management practice patterns: a survey of members of the international urogynecological association. Int Urogynecol J Pelvic Floor Dysfunct. 2002;13(5):319–25.
13. Maher C, Feiner B, Baessler K, Schmid C. Surgical management of pelvic organ prolapse in women (review). Cochrane Database Syst Rev. 2013;4:1–161.
14. Coolen AWM, Bui BN, Dietz V, Wang R, van Montfoort APA, Mol BWJ, et al. The treatment of post-hysterectomy vaginal vault prolapse: a systematic review and meta-analysis. Int Urogynecol J. 2017;28(12):1767–83.
15. Maher C, Feiner B, Baessler K, Christmann-Schmid C, Haya N, Brown J. Surgery for women with apical vaginal prolapse. Cochrane Database Syst Rev. 2016;10:CD012376.
16. Fernando RJ, Thakar R, Sultan AH, Shah SM, Jones PW. Effect of vaginal pessaries on symptoms associated with pelvic organ prolapse. Obstet Gynecol. 2006;108(1):93–9.
17. Cundiff GW, Amundsen CL, Bent AE, Coates KW, Schaffer JI, Strohbehn K, et al. The PESSRI study: symptom relief outcomes of a randomized crossover trial of the ring and Gellhorn pessaries. Am J Obstet Gynecol. 2007;196(4):405.e1–8.
18. Maher C, Baessler K, Glazener CM, Adams EJ, Hagen S. Surgical management of pelvic organ prolapse in women. Cochrane Database Syst Rev. 2007;3:CD004014.
19. Jia X, Glazener C, Mowatt G, et al. Efficacy and safety of using mesh or grafts in surgery for anterior and/or posterior vaginal wall prolapse: systematic review and meta-analysis. BJOG. 2008;115(11):1350–61.
20. Lensen EJ, Withagen MI, Stoutjesdijk JA, Kluivers KB, Vierhout ME. The use of synthetic mesh in vaginal prolapse surgery: a survey of Dutch urogynaecologists. Eur J Obstet Gynecol Reprod Biol. 2012;162(1):113–5.
21. Argirović R. Posthysterectomy vault prolapse of vaginal walls: choice of operating procedure. Srp Arh Celok Lek. 2012;140(9-10):666–72.
22. Maher CF, Qatawneh AM, Dwyer PL, Carey MP, Cornish A, Schluter PJ. Abdominal sacral colpopexy or vaginal sacrospinous colpopexy for vaginal vault prolapse: a prospective randomized study. Am J Obstet Gynecol. 2004;190(1):20–6.
23. Dietz V, de Jong J, Huisman M, Schraffordt Koops S, Heintz P, van der Vaart H. The effectiveness of the sacrospinous hysteropexy for the primary treatment of uterovaginal prolapse. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18(11):1271–6.
24. Svabik K, Martan A, Masata J, El-Haddad R, Hubka P. Comparison of vaginal mesh repair with sacrospinous vaginal colpopexy in the management of vaginal vault prolapse after hysterectomy in

patients with levator ani avulsion: a randomized controlled trial. Ultrasound Obstet Gynecol. 2014;43(4):365–71.

25. Nezhat CH, Nezhat F, Nezhat C. Laparoscopic sacral colpopexy for vaginal vault prolapse. Obstet Gynecol. 1994;84(5):885–8.
26. Claerhout F, Verguts J, Werbrouck E, Veldman J, Lewi P, Deprest J. Analysis of the learning process for laparoscopic sacrocolpopexy: identification of challenging steps. Int Urogynecol J. 2014;25: 1153–60.
27. Freeman RM, Pantazis K, Thomson A, Frappell J, Bombieri L, Moran P, et al. A randomised controlled trial of abdominal versus laparoscopic sacrocolpopexy for the treatment of post-hysterectomy vaginal vault prolapse: LAS study. Am J Obstet Gynecol. 2012;207(4):301.e1–7.
28. Coolen AWM, van Oudheusden AMJ, Mol BWJ, van Eijndhoven HWF, Roovers JWR, Bongers MY. Laparoscopic sacrocolpopexy compared with open abdominal sacrocolpopexy for vault prolapse repair: a randomised controlled trial. Int Urogynecol J. 2017;28(10):1469–79.
29. Coolen AL, van Oudheusden AM, van Eijndhoven HW, van der Heijden TP, Stokmans RA, Mol BW, et al. A comparison of complications between open abdominal sacrocolpopexy and laparoscopic sacrocolpopexy for the treatment of vault prolapse. Obstet Gynecol Int. 2013;2013:528636.
30. Paraiso MF, Jelovsek JE, Frick A, Chen CC, Barber MD. Laparoscopic compared with robotic sacrocolpopexy for vaginal prolapse: a randomized controlled trial. Obstet Gynecol. 2011;118(5):1005–13.