International Urogynecology Journal (2019) 30:1771–1773
https://doi.org/10.1007/s00192-019-03985-y

IUJ VIDEO

Teaching learners to raise the roof: a vaginal surgery simulator for apical suspension

Cassandra K. Kisby[1] · Mary V. Baker[2] · Isabel C. Green[3] · John A. Occhino[1]

Received: 7 December 2018 / Accepted: 13 May 2019 / Published online: 6 June 2019

Abstract

Introduction and hypothesis The objective was to discuss the importance of apical suspension following vaginal hysterectomy and demonstrate a surgical model to aide in educating learners on a variety of apical suspension procedures.

Methods Rates of pelvic organ prolapse are not insignificant following hysterectomy. Re-support of the vaginal apex should be performed at the time of hysterectomy in those with or without a diagnosis of prolapse. Exposure to vaginal apical support procedures may be limited owing to declining rates of vaginal hysterectomy and limited trainee work hours. Surgical models are increasingly being used to supplement operating room experience. The model we present was originally developed for hysterectomy, although its design allows for teaching a variety of apical support procedures that incorporate the uterosacral ligament (USL) for support. We demonstrate performing a USL suspension, internal McCall suture, and modified McCall suture using the model.

Results The model is constructed from readily available supplies, is multi-use, and inexpensive. It allows learners to identify relevant anatomy, understand/visualize surgical steps, and practice suturing technique.

Conclusion Pelvic organ prolapse is common in women, although opportunities to teach apical suspension procedures may be limited. The proposed vaginal surgery simulator can be used to supplement the experience of gynecological surgery trainees with apical suspension procedures.

Keywords Vaginal surgery · Surgical simulation · Vaginal vault suspension · Pelvic organ prolapse · McCall culdoplasty · Uterosacral ligament suspension

Introduction

Rates of post-hysterectomy pelvic organ prolapse (POP) are not insignificant: the 20-year cumulative incidence of recurrent prolapse is estimated to be 12.2% for patients who undergo hysterectomy alone for a primary indication of prolapse [1]. At the time of vaginal hysterectomy, re-support of the vaginal apex should also be performed. The American College of Obstetricians and Gynecologists (ACOG) and the American Urogynecologic Society support opportunistic and therapeutic apical suspension procedures at the time of hysterectomy [2]. Despite the evidence behind and endorsement of these procedures, they are not consistently performed at the time of hysterectomy. A retrospective study using a 52-hospital surgical database showed that, in women undergoing hysterectomy for POP, 43.1% had a hysterectomy alone, 32.8% underwent colporrhaphy, and 24.1% underwent colpopexy [3]. Furthermore, a US inpatient database of nearly 3 million women demonstrated that an apical support procedure was performed in only 3.1% of patients undergoing hysterectomy for indications other than prolapse [4].

In the treatment of pelvic organ prolapse, there has been an increase in uterine-preserving apical support procedures (e.g., hysteropexy). This practice is supported by

This video was accepted as a presentation at the 45th Annual Society for Gynecologic Surgeons Meeting in March 2019

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00192-019-03985-y) contains supplementary material. This video is also available to watch on http://link.springer.com/. Please search for this article by the article title or DOI number, and on the article page click on 'Supplementary Material'

✉ Cassandra K. Kisby
Kisby.Cassandra@Mayo.edu

[1] Division of Urogynecology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905, USA

[2] Department of Ob/Gyn, Mayo Clinic, Rochester, MN, USA

[3] Division of Minimally Invasive Gynecologic Surgery, Mayo Clinic, Rochester, MN, USA

a recent meta-analysis indicating that uterine-preserving prolapse procedures had lower blood loss, a shorter operating time, and a lower risk of mesh exposure [5]. However, this practice is only supported by short-term data. In women with indications for hysterectomy (e.g., postmenopausal bleeding, history of cervical dysplasia, abnormal uterine bleeding), performing a hysterectomy with apical suspension procedures would be preferred. It is important to note that hysterectomy alone is not considered adequate treatment for POP [6] and increases a woman's risk of needing future prolapse surgeries [1, 3, 7, 8].

Training in vaginal surgery often emphasizes teaching the hysterectomy alone; yet, it is also important for learners to be able to address/prevent apical support defects at the time of hysterectomy. Exposure to vaginal apical support procedures may be limited owing to declining rates of vaginal hysterectomy, the increasing presence of multiple learners (fellows and residents), restricted trainee work hours, and limited visualization when observing vaginal surgery. To ameliorate the problem with limited vaginal hysterectomy exposure, academic medical centers have turned to supplementing operating room experience with a variety of high- and low-fidelity surgical models [9–12]. A model for apical suspension procedures involving the uterosacral ligament (USL) has not yet been described in the literature. The present model was created by modifying an existing model developed at our institution for vaginal hysterectomy training [12].

Our goal was to create a low-cost, easy-to-use model to increase learner experience with apical support procedures involving the USL, and, more specifically, to aide in identifying anatomical landmarks, performing surgical steps, and practicing suturing and instrument handling techniques.

Materials and methods

The model we present is adapted from a vaginal hysterectomy simulator developed at our institution [12]. Assembly details are available on the ACOG Simulations Working Group Toolkit webpage [13]. The model is constructed from PVC pipe, heat shrink tubing, hosiery, alligator clips, a wooden base with brackets, and Velcro. The first assembly requires 30 min, with each subsequent use requiring 2–3 min to exchange the disposable components. The cost per model is $10. Instruments and supplies that are required, aside from the model, include a needle driver, suture (we suggest Vicryl), suture scissors, and a Mayo needle. Table 1 shows a list of important structures and landmarks and their equivalent in our model.

Table 1 Relevant anatomical structures in the apical suspension surgical model

Structure	Model material
Uterosacral ligaments	Heat shrink tubing
Vaginal cuff	Hosiery affixed to alligator clips
Peritoneum overlying the rectum	Hosiery affixed to Velcro
Introitus and vagina	L-shaped PVC pipe

Results

Considerations regarding simulating apical suspension procedures using the model presented:

1. The presented model is low-cost, multi-use, easy to assemble, and created from readily available materials.
2. Our model can be used to simulate USL suspension and McCall culdoplasty procedures.
3. This vaginal surgery model allows the learner to visualize pertinent anatomy and practice suture placement into relevant structures to complete USL apical suspension procedures. Learners have the ability to see their repair from above and below and the model simulates space constraints associated with vaginal surgery.

Conclusions

Pelvic organ prolapse is common in women, although opportunities to teach vaginal apical suspension procedures may be limited. It is important to teach basic apical support procedures to undifferentiated Obstetrics and Gynecology trainees; their use of prophylactic apical support procedures at the time of hysterectomy could aid in decreasing the incidence of post-hysterectomy POP. Additionally, trainee didactics should include information on preventing and managing complications with these procedures (Supplemental Table 1) and the fact that uterine-sparing apical suspension procedures are an option for women with a uterus presenting for treatment of POP. The proposed vaginal surgery simulator can be used to supplement the experience of gynecologic surgery trainees with vaginal apical suspension procedures involving the USL.

Compliance with ethical standards

Conflicts of interest ICG received an unrestricted educational grant from Intuitive Surgical for 50 K, 2017–2018. Otherwise, the authors have no conflicts of interest or financial disclosures.

Consent Informed consent was not obtained for publication of this video article, as patient cases or images were not included.

References

1. Blandon RE, Bharucha AE, Melton LJ 3rd, et al. Incidence of pelvic floor repair after hysterectomy: a population-based cohort study. Am J Obstet Gynecol. 2007;197(6):664 e1–7.
2. Practice Bulletin No. 185 Summary: Pelvic Organ Prolapse. Obstet Gynecol. 2017;130(5):1170–1172.
3. Fairchild PS, Kamdar NS, Berger MB, Morgan DM. Rates of colpopexy and colporrhaphy at the time of hysterectomy for prolapse. Am J Obstet Gynecol. 2016;214(2):262 e1–7.
4. Ross WT, Meister MR, Shepherd JP, Olsen MA, Lowder JL. Utilization of apical vaginal support procedures at time of inpatient hysterectomy performed for benign conditions: a national estimate. Am J Obstet Gynecol. 2017;217(4):436.e1–8.
5. Meriwether KV, Antosh DD, Olivera CK, et al. Uterine preservation vs hysterectomy in pelvic organ prolapse surgery: a systematic review with meta-analysis and clinical practice guidelines. Am J Obstet Gynecol. 2018;219(2):129–146.e2.
6. Jeppson PC, Sung VW. Hysterectomy for pelvic organ prolapse: indications and techniques. Clin Obstet Gynecol. 2014;57(1):72–82.
7. Lykke R, Blaakær J, Ottesen B, Gimbel H. The indication for hysterectomy as a risk factor for subsequent pelvic organ prolapse repair. Int Urogynecol J. 2015;26(11):1661–5.
8. Forsgren C, Lundholm C, Johansson AL, Cnattingius S, Zetterström J, Altman D. Vaginal hysterectomy and risk of pelvic organ prolapse and stress urinary incontinence surgery. Int Urogynecol J. 2012;23(1):43–8.
9. Greer JA, Segal S, Salva CR, Arya LA. Development and validation of simulation training for vaginal hysterectomy. J Minim Invasive Gynecol. 2014;21(1):74–82.
10. Miyazaki D, Matthews CA, Kia MV, El Haraki AS, Miyazaki N, Chen CCG. Validation of an educational simulation model for vaginal hysterectomy training: a pilot study. Int Urogynecol J. 2018. https://doi.org/10.1007/s00192-018-3761-9.
11. Malacarne DR, Escobar CM, Lam CJ, Ferrante KL, Szyld D, Lerner VT. Teaching vaginal hysterectomy via simulation: creation and validation of the objective skills assessment tool for simulated vaginal hysterectomy on a task trainer and performance among different levels of trainees. Female Pelvic Med Reconstr Surg. 2018. https://doi.org/10.1097/SPV.0000000000000558.
12. Barrier BF, Thompson AB, McCullough MW, Occhino JA. A novel and inexpensive vaginal hysterectomy simulator. Simul Healthc. 2012;7(6):374–9.
13. Green I, et al. SimVHaT Mayo Clinic Vaginal Hysterectomy Trainer. Accessed 3 December 2018. Available from: https://www.acog.org/About-ACOG/ACOG-Departments/Simulations-Consortium/Simulations-Consortium-Tool-Kit.