Constructing a Novel Simple LEEP Training Model

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Abstract

Background Duty hour restrictions and enhanced focus on patient safety have prompted the development of new instruction models for practice of surgical techniques outside the operating room, including models for teaching loop electrosurgical excisional procedure (LEEP), a common procedure that gynecology residents perform to diagnose and manage cervical disease.

Objective We sought to develop an inexpensive and reusable training model for guided practice opportunities that will improve gynecology residents' LEEP technique.

Methods Polyvinyl chloride, foam, and a polish sausage are used to simulate the basic anatomy of the vagina and cervix. A 2-in-diameter polyvinyl chloride pipe and high-density foam are used to create a realistic representation with the sausage simulating the cervix. An electrosurgical pad is attached to the sausage and a standard operating room electrosurgical generator is used.

Results After a brief lecture and demonstration of the LEEP procedure, gynecology residents are positioned at individual stations. Use of 2 to 3 instructors allows for the provision of directions and feedback to residents as they perform the simulated LEEP. During the last 6 years, this model has continued to improve residents' confidence and skills with the procedure.

Conclusions An anatomically accurate LEEP model can not only improve resident knowledge, skills, and confidence, but also improve quality and patient safety. This training model allows residents to refine their surgical skills through guided practice and instructors to monitor performance before residents to perform the procedure on patients.

Editor's Note: The online version of this article contains additional photos of the construction of the LEEP training model.

Introduction

Traditionally, instruction in surgical technique has been conducted in a Halstedian fashion in the operating room, an environment that may prove less than ideal for several reasons. Reductions in resident duty hours and enhanced focus on patient safety have prompted the development of new instruction models for practice of surgical techniques outside the operating room. In addition, the prospect of learning a new procedure on a patient can be intimidating to surgical trainees, including gynecology interns. The Yerkes-Dodson law, a theory endorsed by many educators, states that environments of low or high stress are suboptimal for learning and performance, and most resident programs have developed new models of instruction to allow residents to practice surgical techniques outside of the operating room.

Many "dry lab" methods for surgical techniques have been developed in the past 2 decades. Creativity has led to the use of gelatin molds in instruction on amniocentesis, computer programs for training in laparoscopy and cystoscopy, and animal models in lieu of human patients.[1–3] In addition, written curricula are used to bolster resident knowledge in the basics of surgical skill before performance of procedures in the operating room. Overall, it is thought that simulation and curricula contribute to resident confidence and skill level.[4]

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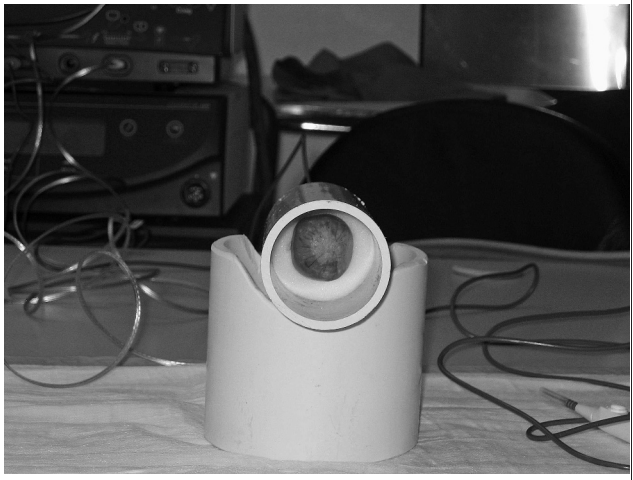

FIGURE **Common and Inexpensive Items Are Used for Model Construction**

The loop electrosurgical excisional procedure (LEEP) is the preferred method of diagnosis and treatment of high-grade cervical intraepithelial neoplasia. It is often preferred over a cold knife cone since it affords less blood loss, is performed more quickly, and can be done in an office setting.[5] A LEEP procedure can be difficult to teach in the outpatient setting when the patient is awake and able to converse. In addition, operating in a narrow field such as the vagina poses a challenge unique to gynecologists. Cervical procedures such as the LEEP require specific stereotactic skills that can be challenging to learn. As the relative number of LEEPs is decreasing owing to changes in cervical screening and management, the need for simulation training is more important. As patients become increasingly aware of the apprentice system used in training programs, they may experience more anxiety over a resident "practicing" on them. As a consequence, graduate medical education relies increasingly on the use of simulation.[6]

Methods

The LEEP model is built with common and inexpensive items. Construction begins by cutting a 12-cm segment of 2-in-diameter polyvinyl chloride (PVC) pipe with an electrical saw. Next, 2 circular pieces of high-density foam are cut to the same diameter as the PVC pipe and a 3-cm hole is cut in the center of each piece of foam. The pieces of foam are wedged within the PVC pipe approximately 2 cm away from each other and 5 cm away from their respective ends of the exterior PVC pipe. A 3-cm-diameter polish sausage is inserted into the holes in the foam (FIGURE). The sausage serves as a realistic representation of the cervix with the PVC pipe serving as the vaginal sidewalls. The distance between the sausage and PVC pipe simulate the vaginal fornices. Additional photos of the construction of the model are provided as online supplemental material.

A pediatric electrosurgical grounding pad is wrapped around the end of the sausage to facilitate the use of an electrosurgical generator. Using a 2×1-cm electrical wire electrode and an electrosurgical generator set to 40/40 cut-coagulation blend, electrocautery is performed and a portion of the "cervix" is removed. The sausage is "reprepped" by cutting off the coagulated end and rewrapping the electrosurgical pad. A stand is also fashioned by cutting a crescent into a 4-in-diameter PVC pipe. The 2-in PVC pipe rests on the crescent PVC pipe for stability. The model can also be modified by using a 3-in PVC pipe, which allows the instructor to more easily monitor the surgeon.

The major benefit of this model is that the materials can be reused. A sufficient amount of PVC pipe and high-density foam to construct 8 models can be purchased at a local hardware store for approximately $60. The electrosurgical unit was a previously used model and can be purchased for $500 to $1,500. The pediatric grounding pads range from $100 to $140. The electric wire loop is priced at approximately $10. The only item that is not reusable is the sausage, which is purchased for approximately $6.

The simulation session is held in the graduate medical education's simulation training laboratory at the University of Alabama at Birmingham, and all current gynecology interns participate in the session. As a part of a surgical skills curriculum, the instructor begins the session with a 30-minute lecture followed by a demonstration of the LEEP technique. The indications for a LEEP are reviewed as well as the basic steps to the procedure. Each intern is given instructions and receives performance feedback as he or she individually performs the LEEP procedure, using the model.

In addition, the instructor scores the interns by using a 7-item "essential knowledge and skills for LEEP" checklist. The knowledge portion of the checklist includes discussion of correct materials needed for the procedure, the placement of the speculum, the use of cervical staining solution, and the injection of lidocaine/epinephrine. The skills portion of the checklist includes the resident's demonstration of a right-to-left LEEP, description of a top-hat LEEP, and methods for obtaining hemostasis after LEEP. Interns are encouraged to ask questions throughout the session. All 45 interns to date have successfully completed the simulation procedure while under direct supervision of the instructors.

Results and Discussion

The model has been used for the past 6 years and interns' response in posttraining surveys has been positive and

supportive of this simulation training. Respondents report excellent comprehension of the model and decreased anxiety when performing the procedure. Instructors have reported that interns have excellent communication and technical skills when they perform LEEP procedures in the colposcopy clinic.

We acknowledge that a formal assessment with pretest scores compared to posttest scores would provide additional support that this model improves resident education. Our subjective data during 6 years suggests that this LEEP model should continue to be used in our residency training program. We believe that this LEEP model not only improves patient safety and an intern's LEEP skills, but also allows for an assessment of skills in a nonclinical setting.

Conclusion

Our novel LEEP model facilitates resident education in a low-stress, high-yield environment. It is accepted by interns and instructors as an excellent education tool. While a previous model has been described in the literature, it used more expensive and less reusable materials.[7] We believe that the use of inexpensive and reusable materials makes the PVC model an ideal tool for teaching gynecology interns the proper technique of the LEEP procedure.

References

1 Kirby TO, Numnum TM, Kilgore LC, Straughn JM. A prospective evaluation of a simulator-based laparoscopic training program for gynecology residents. *J Am Coll Surg*. 2008;206(2):343–348.

2 Levine RL, Kives S, Cathey G, Blinchevsky A, Acland R, Thompson C, et al. The use of lightly embalmed (fresh tissue) cadavers for resident laparoscopic training. *J Minim Invasive Gynecol*. 2006;13(5):451–456.

3 Zubair I, Marcotte MP, Weinstein L, Brost BC. A novel amniocentesis model for learning stereotactic skills. *Am J Obstet Gynecol*. 2006;194(3):846–848.

4 Goff BA. Training and assessment in gynaecologic surgery: the role of simulation. *Best Pract Res Clin Obstet Gynaecol*. 2010;24(6):759–766.

5 Martin-Hirsch PPL, Paraskevaidis E, Bryant A, Dickinson HO, Keep SL. Surgery for cervical intraepithelial neoplasia [review]. *Cochrane Database Sys Rev*. 2010;6:CD001318.

6 Okuda Y, Bryson E, DeMaria S Jr, Jacobson L, Quinones J, Shen B, et al. The utility of simulation in medical education: what is the evidence? *Mt Sinai J Med*. 2009;76(4):330–343.

7 Vella PV. A simple trainer for the loop electrosurgical excision procedure. *Aust N Z J Obstet Gynaecol*. 2002;42(3):289–291.