Adolescent Foley Catheter Technique for Visualizing Hymenal Injuries in Adolescent Sexual Assault

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Abstract

Objectives: To determine the usefulness of the Foley catheter balloon technique for visualizing injuries of the estrogenized hymen in adolescent sexual assault victims compared with supine labial traction. **Methods:** A prospective clinical trial of 20 adolescent (age 13–16 years old) victims of sexual assault evaluated at a free-standing Nurse Examiner Clinic was conducted over a four-month study period. The clinic, affiliated with an emergency medicine residency program, is staffed by registered nurses who have been specially trained to perform medicolegal examinations using colposcopy with digital imaging. The Foley catheter technique uses an inflated balloon in the distal vaginal vault to expand the estrogenized hymen to its full capacity so that the edge may be readily visualized for signs of trauma. The Foley technique was compared with gross inspection, using supine labial traction, to photodocument hymenal abnormalities. Photographs of the hymen were obtained using the labial traction technique and then with the Foley technique. Three emergency physicians independently examined each pair of photographs with high interrater agreement for the presence of injury ($\kappa = 0.88$). **Results:** Twenty adolescent sexual assault victims volunteered for the study; mean age was 14.8 years. Gross inspection of the hymen using supine labial traction identified hymenal injuries in three patients (15%). Use of the Foley catheter balloon technique allowed identification of hymenal abnormalities in nine additional cases (60%). The common injuries to the hymen included lacerations (30%), followed by ecchymosis and abrasions. One patient (5%) voiced discomfort (mild pressure sensation) during inflation of the balloon. **Conclusions:** The Foley catheter balloon technique is a simple method allowing improved photodocumentation of hymenal trauma in adolescent sexual assault victims compared with supine labial traction.
Key words: Foley catheter; sexual assault; adolescent; diagnosis; hymen. ACADEMIC EMERGENCY MEDICINE 2003; 10:1001–1004.

Examination of the female adolescent genitalia for evidence of sexual assault is often a difficult task for the emergency medical practitioner.[1] The hymens of Tanner III through Tanner V adolescents are normally estrogenized and become redundant. They are characterized by abundant tissue folded over itself with an irregular configuration.[2] Estrogen also may result in thickening in some areas of the hymen before other parts, creating a temporarily asymmetric appearance. These apparent irregularities of the estrogenized hymen are normal variants and may mask areas of trauma.[2] Labial traction is often not enough to allow for visualization of the entire hymen.[3,4]

In 1995, Ferrell[5] briefly described an examination technique to document physical findings of sexual abuse using a Foley catheter in adolescent girls with an estrogenized hymen. The inflated balloon in the distal vaginal vault puts pressure on the hymen, effectively stretching it out and allowing for a more accurate view of the hymen edges. Although photocolposcopy is not mandatory with this technique, it provides a unique opportunity for documentation of hymenal disruptions. The purpose of this study was to determine the usefulness of the Foley catheter balloon technique for visualizing injuries of the estrogenized hymen in adolescent sexual assault victims compared with labial traction.

METHODS

Study Design. This was a prospective clinical study to assess for evidence of trauma to the estrogenized hymen with and without the Foley catheter balloon technique. Colposcopy and computer imaging were used for magnified visualization of the hymen. The study protocol was approved by the hospital's institutional review board before initiation.

Study Setting and Population. The Nurse Examiner Program (NEP) is located in downtown Grand Rapids, Michigan, at the YWCA. It is staffed by registered nurses trained to perform a medicolegal examination on victims of sexual assault. Education of

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Received November 25, 2002; revisions received February 25, 2003, and March 10, 2003; accepted March 11, 2003.
Presented at the ACEP Research Forum, October 1999, Las Vegas, NV.
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doi:10.1197/S1069-6563(03)00321-X

the nurse examiner consists of approximately 40 hours of training in all aspects of caring for this population, including physical examination, forensic preservation of evidence, documentation, and courtroom testimony. Approximately 275 assault victims are evaluated at the clinic each year.

Female sexual assault victims age 13 years or older who consented to a forensic evaluation at the YWCA NEP during the four-month study period were included in the study. The examination included colposcopy, nuclear staining, and photographic documentation of injuries using digital camera. All of the patients met the following criteria to be included in this study: Tanner genital stage III or higher, nullipara, history of vaginal penetration during the assault, and availability of good-quality colposcopic photographs of the genital area.

Study Protocol. Before the insertion of the Foley catheter, the nurse examiner attempted to visualize the hymen using standard procedures (i.e., labial traction with the patient in the supine position on a gynecologic table using elevated foot stirrups). Examination was performed using a Seiler colposcope (Seiler Instrument, St. Louis, MO) under 16× magnification. Photographs were taken of the hymen using a digital camera attached to the colposcope. A 14F Foley catheter was inserted through the hymen orifice to the point where the balloon was estimated to be midway in the vagina. The balloon was inflated with 40 to 50 mL of air (water is not used because it is so heavy that it decreases the buoyancy of the balloon and decreases the visualization of the posterior hymen). The index finger was used to guide the balloon to the hymen edge, while tugging gently on the Foley catheter with the other hand. The hymen was expanded to its full capacity, and the edge of the hymen was examined and photographed for the presence or absence of trauma (Figures 1 and 2). Patients were asked about any discomfort experienced during the procedure. The balloon was deflated and removed.

Data Analysis. The primary outcome of interest was the presence or absence of trauma to the estrogenized hymen. Significant signs of injury were defined as abrasion, ecchymosis, or tears of the hymen. Definitions of findings used by the nurse examiners were those presented by Crowley.[6] Digital photographs taken before and after catheter insertion were examined independently by three practitioners (2 emergency physicians and a nurse examiner) for evidence of trauma. Interrater reliability was determined by the κ reliability test. A sample estimate of 20 patients was necessary to detect a 50% difference in physical findings using the Foley catheter balloon technique (β of 0.80 and α of 0.05).

Figure 1. Hymen of a 15-year-old nullipara after a sexual assault. Note what seems to be a small laceration at the 9-o'clock postion.

RESULTS

Twenty adolescent sexual assault victims volunteered for the study. The mean age (± SD) was 14.8 ± 2.0 years (age range 13–19 years). All of the patients reported vaginal penetration (penile, digital, or foreign body). The most victims were examined within 72 hours of assault (85%). Ninety percent denied a history of sexual intercourse before the assault; 50% of the study population had used tampons at one time.

Three investigators independently evaluated digital photographs taken before and after the Foley catheter balloon insertion. The interrater agreement was 0.88, indicating excellent reproducibility beyond that expected by chance. Photodocumentation of the hymen using supine labial traction identified hymenal injuries in three patients (15%). Use of the Foley catheter balloon technique allowed identification of hymenal abnormalities in nine additional cases (60%). The types

Figure 2. Hymen of the same 15-year-old girl as in Figure 1 with obvious laceration shown using the Foley catheter balloon technique.

TABLE 1. Types of Hymenal Injury

	Lacerations	Abrasions	Ecchymosis	Total Injuries
Labial traction	2	0	1	3
Foley catheter	7	3	4	14

of hymenal trauma are summarized in Table 1. A total of 14 hymenal injuries were documented in 12 patients using the Foley catheter. The most common injury was lacerations, present in 30% (6 of 20) of the patients; one 14-year-old had two hymenal lacerations. Eight patients had no evidence of hymenal injury.

Six patients with redundant hymens required manipulation of the catheter to visualize the hymenal folds clearly. Pulling the catheter tubing to the right caused the balloon to delineate the left lateral hymenal margin. Alternatively, left catheter placement viewed the right hymenal side. Pulling the catheter anteriorly delineated the posterior rim, allowing inspection for any injuries in this area. Insertion and manipulation of the Foley catheter was painless. Only one patient (5%) voiced any discomfort (mild pressure sensation) during inflation of the balloon.

DISCUSSION

The recognition of abnormal physical findings in an adolescent victim of sexual assault must be based on an understanding of ''normal.'' The victim's age, stage of sexual development, state of relaxation, and methods used during the examination all contribute to the variable appearance of this anatomy.[7] Knowledge of the changes that occur naturally in the genitalia and perianal tissues as the adolescent matures is important for proper interpretation of the physical findings. The best example of this phenomenon is the effect of hormones on the hymen. Our results suggest that the Foley catheter technique can improve the visualization of hymenal injuries in the adolescent.

The advantage of the Foley catheter balloon technique over other conventional methods (e.g., cotton swabs, labial traction, knee-chest positioning) is the depth of field provided, allowing the hymenal rim to be delineated, while attenuating the redundant folds.[2,3] During the four-month study period, use of the catheter technique allowed identification of hymenal injuries in nine additional cases that were not visualized using labial traction. The opportunity for photodocumentation is shown in Figure 2. Examiners familiar with adolescent forensic examinations should find the technique easy to use with some practice. As with any sexual assault examination, all forensic specimens and cultures should be collected before the Foley technique is used.

Insertion of the catheter was painless, although patients should be prepared for the possibility of a mild pressure sensation when the balloon has been inflated. Care should be taken to fill the balloon to capacity and avoid extreme traction on the tubing. Inadequate filling of the balloon may cause it to pull through the orifice during these maneuvers, stretching the hymen and causing discomfort to the patient. In six patients requiring manipulation of the inflated catheter, the examination was painless. The Foley catheter technique should not be used in prepubertal girls because of their atropic hymenovaginal tissue and lack of tissue elasticity.[2]

LIMITATIONS

Several limitations are noted in this pilot study, including the sample size ($n = 20$), use of a single urban clinic setting, and the enrollment of only adolescent volunteers in the study population. In addition, our study compared the Foley catheter technique only with supine labial traction. A cotton-tipped swab may used to explore the hymenal margins; however, this technique offers little advantage if the hymen is excessively redundant.[2] A prone knee-chest position also has been recommended as an examination technique in prepubertal girls; however, this position may be uncomfortable for older children and adolescents.[8]

The Foley catheter technique requires some manual dexterity to maintain labial traction, keeping gentle traction on the tubing, while taking adequate photographs. We found this technique to be useful in defining and photodocumenting acute injuries of the hymen that authorities interpret as clear evidence of sexual assault.[3,9] Clinical findings such as partial clefts, hymenal notches, edema, erythema, and the width of the hymen potentially could be altered, however, by the inflated balloon. Interpretations of nonspecific clinical findings using this technique must be made with care and deserve further evaluation.

CONCLUSIONS

The Foley catheter balloon technique is a simple, inexpensive method allowing improved photodocumentation of hymenal trauma in adolescent sexual assault victims compared with gross visual inspection and labial traction. During a four-month period, 20 adolescent menarcheal girls were examined using this technique. Only one complained of any discomfort—a mild pressure sensation during inflation of the balloon. Emergency medical practitioners may want to consider its use for selected adolescent patients.

References

1. Girardin BW, Faugno DK, Seneski PC, Slaughter L, Whelan M. Color Atlas of Sexual Assault. St. Louis, MO: Mosby-Year Book, 1997.

2. Starling SP, Jenny C. Forensic examination of adolescent female genitalia: the Foley catheter technique. Arch Pediatr Adolesc Med. 1997; 151:102–3.
3. Persaud DJ, Squires JE, Rubin-Remer D. Use of Foley catheter to examine estrogenized hymens for evidence of sexual abuse. J Pediatr Adolesc Gynecol. 1997; 10:83–5.
4. McCann J, Wells R, Simon MD, Voris J. Genital findings in prepubertal girls selected for nonabuse: a descriptive study. Pediatrics. 1990; 86:428–39.
5. Ferrell J. Foley catheter balloon technique for visualizing the hymen in female adolescent sexual assault victims. J Emerg Nurs. 1995; 21:585–6.
6. Crowley SR. Sexual Assault: The Medical Legal Examination. New York, NY: McGraw-Hill, 1999.
7. Chadwick DL, Berkowitz CD, Kerns D, McCann J, Reinhart MA, Strickland S. Color Atlas of Child Sexual Abuse. Chicago, IL: Year Book Medical Publishers, 1989.
8. Rimza ME, Niggemann EH. Medical evaluation of sexually abused children: a review of 311 cases. Pediatrics. 1982; 69:8–14.
9. Adams JA, Knudson S. Genital findings in adolescent girls referred for suspected sexual abuse. Arch Pediatr Adolesc Med. 1996; 150:850–7.