

Outside–in transobturator midurethral sling and the dorsal nerve of the clitoris

Susan B. Tate · Patrick J. Culligan · Robert D. Acland

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Abstract

Introduction and hypothesis An anatomical study on fresh cadavers was done to determine the vulnerability of the dorsal nerve of the clitoris to injury during “outside–in” transobturator sling procedures.

Methods The dorsal nerve of the clitoris was identified bilaterally in ten fresh cadavers. Transfixing needles marked the inferomedial border of the obturator foramen. The distance between the foramen border and the nerve was measured.

Results The nerve ran medially in close approximation to the ischiopubic ramus and inferior to the obturator foramen in all specimens. In no instance did the nerve follow an aberrant course traversing the obturator foramen. The mean distance between the inferomedial border of the obturator foramen and the nerve was 9.3 mm, range 3–14 mm.

Conclusions When the “outside–in” technique is used, the introducer cannot come into contact with the dorsal nerve of the clitoris because the introducer would have to pass through the ischio-pubic ramus. This is not anatomically possible.

Keywords Clitoris · Dorsal nerve · Midurethral sling · Nerve damage · Stress urinary incontinence · Transobturator

Introduction

The transobturator sling was developed to avoid passage in the retropubic space so as to reduce the risk of bladder, bowel, and vascular injury. However, the close proximity of the passage of the transobturator introducer needle to the dorsal nerve of the clitoris raises concern regarding the safety of the procedure [1].

The dorsal nerve of the clitoris branches from the pudendal nerve near the ischial spine and travels along the medial surface of the ischiopubic ramus. Near the pubic symphysis, it travels under the ischiopubic ramus and then superiorly along the anterior aspect of the pubis to join the clitoris. As the needle is being passed through the tissues around the ischiopubic ramus, the question of the nerve’s vulnerability arises.

Previous studies have measured the distance between the pathway of the needle and various anatomical structures. These studies show that, with proper technique, the pathway of the needle is always “well away” from the dorsal nerve of the clitoris [2, 3]. However, no published studies have measured the distance between the inferior border of the obturator foramen and the nerve.

Our objective was to determine the closest anatomically possible passage of a needle in relation to the dorsal nerve of the clitoris.

Materials and methods

In ten fresh cadavers, we divided the pelvis at the midline in the sagittal plane and performed a dissection to identify

S. B. Tate (✉)

Division of Urogynecology and Reconstructive Pelvic Surgery,
Department of Obstetrics, Gynecology, & Women’s Health,
University of Louisville School of Medicine,
315 E. Broadway M-18,
Louisville, KY 40202, USA
e-mail: sbtate01@louisville.edu

P. J. Culligan

Division of Urogynecology, Atlantic Health System,
Morristown, NJ, USA

R. D. Acland

Division of Plastic and Reconstructive Surgery, Department of
Surgery, University of Louisville School of Medicine,
Louisville, KY, USA

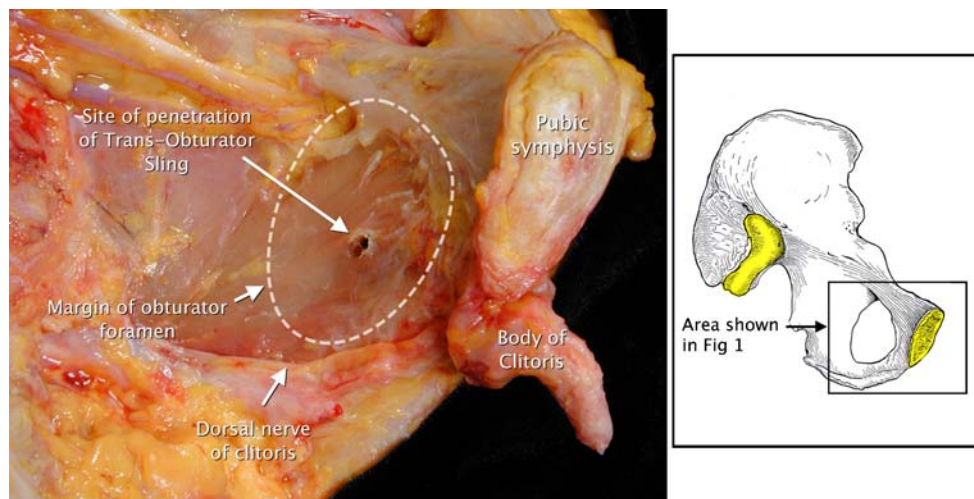


Fig. 1 The first dissection that was done. In this cadaver, we placed a transobturator sling with the specimen in the dorsal lithotomy position as one would do clinically. This dissection was done following placement of the sling and illustrates the location of the penetration of the introducer needle, the dorsal nerve of the clitoris, and the border of the obturator foramen. The distance between the site of passage of the

the dorsal nerve of the clitoris (Figs. 1 and 2). The dissection preserved lateral attachments to enable accurate measurements.

The inferomedial border of the obturator foramen along the border of the ischiopubic ramus represents the closest possible anatomical distance to the nerve when passing a needle from outside to inside. We placed transfixing needles along this border at right angles to use as reference point for our measurements.

We measured the distance between the marked border of the foramen and the nerve at their closest apposition (Figs. 3 and 4).

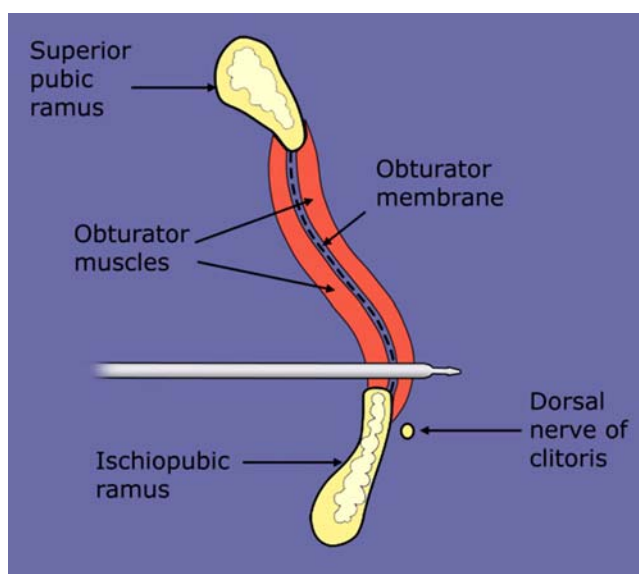


Fig. 2 Cross-section of Fig. 1

needle and the dorsal nerve of the clitoris has been examined in previous studies. We did not pass a transobturator needle in subsequent dissections but marked the margin of the obturator foramen instead to examine the closest possible anatomical placement of an introducer in relation to the dorsal nerve of the clitoris

The mean distance from the border to the nerve was estimated with 95% confidence intervals for each side (left and right). We also identified the minimum of the left and right distances per specimen and calculated the mean of this quantity with a 95% confidence interval. The difference between the left and right side distances was tested with a paired *t* test. The relationship between the border-to-nerve distance and age was tested with a linear mixed effects model. A simple linear regression model was not appropriate in this setting given the repeated measurements per specimen (left and right sides). The linear mixed effects model tests this relation-

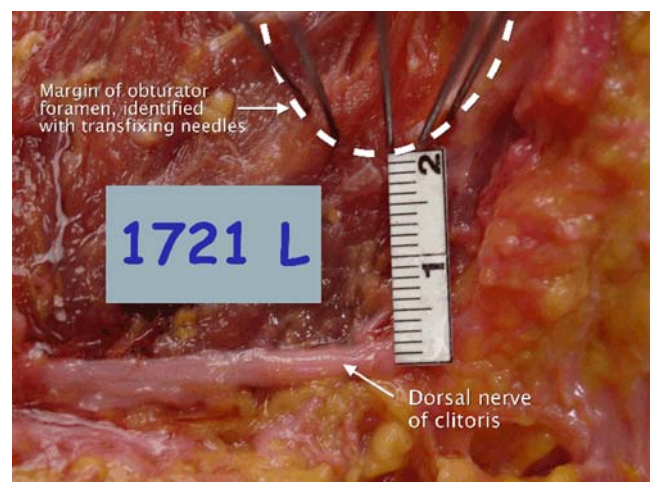


Fig. 3 The measurement technique used to identify the closest possible anatomical distance from the inferior medial border of the obturator foramen to the dorsal nerve of the clitoris

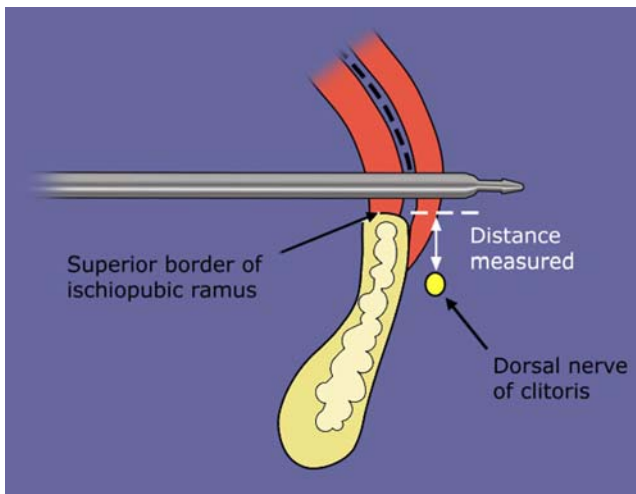


Fig. 4 Cross-section of area in Fig. 3

ship as in a simple linear regression while accounting for the added variation of repeated measurements per specimen. All analyses were conducted using the open source R software package (R: A language and environment, v. 2.8.0. The R Foundation for Statistical Computing, Vienna, Austria).

Results

The mean age of the fresh cadavers was 80.9 years (62–100). Eighteen hemi-pelvis specimens were used. The first two right-sided specimens were excluded because over-

Table 1 Distances between the inferomedial border of the obturator foramen and the dorsal nerve of the clitoris in ten fresh cadavers

Specimen	Age (years)	Left-side measurement (mm)	Right-side measurement (mm)	Minimum
1	92	5	3	3
2	91	14	13	13
3	83	7	NA	7
4	64	13	11	11
5	66	13	12	12
6	75	12	5	5
7	92	9	13	9
8	100	8	9	8
9	62	9	3	3
10	84	9	NA	9
Mean	80.9	9.9	8.6	8.0
(95% CI)	(74.8, 87.0)	(7.8, 12.0)	(5.0, 12.3)	(5.5, 10.5)

Right-side measurements in specimens 3 and 10 were excluded because over-dissection resulted in disruption of the lateral attachments of the nerve, making accurate measurements impossible

dissection resulted in disruption of the lateral attachments of the nerve making accurate measurements impossible.

The dorsal nerve ran medially in close approximation to the ischiopubic ramus and was inferior to the obturator foramen in all specimens. In no instance did the nerve follow an aberrant course such that it traversed the obturator foramen.

The average distance between the border and nerve was 9.9 mm (7.8, 12.0) on the left side and 8.6 mm (5.0, 12.3) on the right side. The difference between the left- and right-side distances was not significant ($p=0.20$). The average per-specimen minimum distance between the border and the nerve was 8.0 mm (5.5, 10.5). Age was not significantly associated with the border-to-nerve distance ($p=0.73$; Table 1).

Discussion

Several authors have studied the anatomy associated with an outside-in transobturator sling technique. Whiteside reported on an anatomic dissection of the obturator region regarding distance of the passage of an outside-in transobturator sling needle to the obturator nerve and vessels [3]. Achdari also measured the distance between the passage of several needles including outside-in and inside-out and the obturator nerve and vessels but also studied the distance between the passage of the same needles and the course of the dorsal nerve of the clitoris [2].

Rather than measure the distance between the passage of a needle and the nerve, we measured the distance between the inferomedial border of the obturator foramen and the nerve. The introducer cannot pass through the bony ischiopubic ramus but must pass superior to it through the obturator muscles and membrane filling the obturator foramen. Because of the anatomy—the intervening ischiopubic ramus—the needle cannot be passed any closer to the nerve than the distance we measured.

Our dissections were consistent with published literature describing the dorsal nerve of the clitoris running along the medial surface of the ischiopubic ramus. If the nerve were to take an aberrant course such that it passed across the obturator foramen, then injury from insertion of the introducer would be possible. We were unable to find any description in the literature of the dorsal nerve of the clitoris following an aberrant course passing across the obturator foramen. It is possible that additional cadaver dissections might have shown an aberrant course. However, all our dissections confirmed previous findings as well as those of a recently published study in six cadavers [4] that the dorsal nerve of the clitoris was inferior to the obturator foramen and therefore out of harm’s way from an outside-in introducer.

Our measurements represent the closest possible distance from an introducer needle passed from outside–in to the dorsal nerve of the clitoris.

The introducer cannot pass through the ischiopubic ramus but must pass superior to it through the obturator foramen. Therefore, with passage of an outside–in introducer needle through the obturator foramen, the dorsal nerve of the clitoris is protected by the ischiopubic ramus.

Another site of potential injury to the dorsal nerve of the clitoris is where the nerve emerges from the posterior aspect of the ischiopubic ramus and passes under the pubis to join the clitoris. Two points of proper technique can protect the nerve in this area and make injury at this site unlikely: first, placing a finger on the tip of the introducer as soon as it is palpable after passing through the obturator foramen and guiding the tip out through the vaginal incision; and second, preventing the introducer tip from scraping the inferior surface of the ischiopubic ramus when bringing the introducer out through the vaginal incision.

A weakness of this study is the assumption that the needle must make contact with the nerve in order to cause damage. Other mechanisms of injury, such as compression exerted from a hematoma, tissue reaction, or fibrosis may cause damage even without direct contact.

Our measurements represent the closest possible distance from an introducer needle passed from outside–in to the dorsal nerve of the clitoris. The introducer cannot pass through the ischiopubic ramus but must pass superior to it through the obturator foramen. With passage of an outside–in introducer needle through the obturator foramen, the dorsal nerve of the clitoris is protected by the ischiopubic ramus. Therefore, we conclude from these dissections that the dorsal nerve of the clitoris is not in danger of damage from the introducer when performing an outside–in trans-obturator sling.

These conclusions apply only to the outside–in sling technique. With the inside–out technique, the passage of the needle is such that the nerve is exposed on the medial surface of the ischiopubic ramus. With the outside–in technique, the nerve is protected by the intervening bone.

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Conflicts of interest Susan B. Tate, Consultant, Paid Instructor: C. R. Bard. Patrick J. Culligan, Consultant, Paid Instructor: C.R. Bard; Research support: Solace Therapeutics; Research support, Consultant, Paid Instructor: Boston Scientific; Consultant, Paid Instructor: Intuitive Surgical

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