MRI scouts novel approach to urinary incontinence

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MR imaging is helping radiologists and surgeons plan and monitor a novel surgical procedure developed to treat stress urinary incontinence. The transobturator tape approach uses a different pathway than previous approaches, thereby reducing the risk of serious complications such as bowel and bladder perforation.

Beginning in the 1930s, various procedures have been designed to treat stress incontinence, all fraught with poor long-term success rates.¹⁻⁴ Tension-free tape (TVT) and other midurethra sling approaches have been successful at treating genuine stress urinary incontinence. Unfortunately, some extremely dangerous complications, such as bowel or bladder perforation, have been associated with the treatments.⁵⁻¹⁰

The TVT is positioned either transvaginally or transabdominally over and behind the pubic bone. The procedure thus—unnecessarily and dangerously—perforates the endopelvic fascia, exposing the pelvic viscera and increasing the possibility of postoperative complications and infection. Among the safety precautions required for a TVT are catheterization, inpatient hospitalization, and cystoscopy. Transobturator tape, or TOT, the newest sling approach, uses the obturator foramen, a lesser known anatomical area that obviates the dangers of damage to abdominal viscera during pelvic surgery due to its location below the endopelvic fascia.⁵,⁶,¹¹,¹² This area had not been described until 1998, when Dr. Emanuel Delorme pioneered a technique for placing a midurethral sling through this space.¹³,¹⁴ Since then, MR imaging has been used to describe the pelvic anatomy.¹⁵⁻¹⁸

The TOT approximates a more natural U shape, rather than the V shape seen with the TVT, thus yielding better postoperative urinary flow rates (Figure 1). The TOT approach avoids the risk of bladder or bowel perforation, so cystoscopy is often considered unnecessary, saving the surgeon much time. Almost all TOT patients leave the hospital soon after the surgery without any catheterization or postoperative discomfort. Early postoperative complications have been minimized by woven polypropylene slings that resist erosion and infection while promoting tissue in-growth.

At our facility, we have undertaken an ongoing study to identify the anatomy of this area and correlate it with cadaver specimens and with MR images of patients, both pre- and postoperatively. We examined patients undergoing TVT, TOT, or a combination of either procedure with concomitant pelvic prolapse surgery via MRI. Those undergoing TOT were imaged both preoperatively and three to six weeks postoperatively. Those undergoing TVT were imaged only postoperatively. MR images, performed with a 1.5T scanner, were obtained in sagittal and axial orientations using a body coil, first with the patient at rest and then again during maximum pelvic strain. The scans were downloaded onto a dedicated workstation for radiologist review.¹⁶

Preoperative MR images of a patient complaining of stress urinary incontinence at rest and during the Valsalva maneuver clearly show cystocele (Figure 2). Cystocele is caused by weakening of the levator ani muscles and stretching of the associated connective tissues, usually due to pregnancy and vaginal delivery. Genuine stress urinary incontinence is the major symptom of cystocele because of the weakened support. A midurethral sling can be used to reconstruct urethral support and aid in reestablishing continence. A postoperative MR image confirms the placement of the TOT (Figure 3).

The surgery is performed entirely below the endopelvic fascia. Unlike TVT, the TOT approach keeps a safe distance from important vessels and nerves. The sling passes through the obturator foramen at a distance of 3 to 4.5 cm from the obturator vessels and nerve and approximately 8 cm away from the great saphenous vein. TOT has been successfully performed in conjunction with a wide variety of pelvic organ repairs, but combination TOT anterior-posterior repair surgeries are complex and have the possibility of unforeseen complications.

MRI allowed us to successfully discern the anatomy of the pelvic diaphragm, pelvic viscera, and
associated conditions such as nabothian cysts (Figure 4) and cystocele. MRI was also able to confirm the position of the TOT as being midurethral and below the pubococcygeal line. The TOT approach seems to be the most logical and appropriate surgical treatment option for genuine stress urinary incontinence. Clinical trials have been under way for years, and preliminary results have been promising. It will be interesting to study the long-term patient satisfaction and economic relief attributed to TOT and see if these measures of success reflect its anatomical and surgical benefits.

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**References**


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