

Osteomyelitis of the Pubis Following Suspension of the Neck of the Bladder with Use of Bone Anchors

A REPORT OF FOUR CASES*

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We report on four patients who had a retropubic abscess (three with osteomyelitis) with involvement of the adjacent soft tissues following a procedure to correct stress urinary incontinence with use of pelvic bone screws to serve as anchors for sutures that were placed to support the bladder neck. The ages of the patients ranged from seventy-one to eighty years old. None of the patients had a known previous urinary tract infec-

after the original procedure. Computerized tomography scans of the pelvis showed soft-tissue swelling behind the symphysis pubis and erosion of the adjacent bone. The abscess was drained in all patients, and infected bone was excised, with removal of a total of two to three centimeters of bone, in three patients. In all patients, the sinus tract was excised, extensive soft-tissue débridement was performed, and the suspension sutures and



FIG. 1-A

Figs. 1-A, 1-B, and 1-C: Case 3.

Fig. 1-A: Radiograph, made four weeks after a bladder suspension performed with use of titanium bone anchors and a suburethral sling, revealing severe erosion of bone at the symphysis pubis.

tion. Two of the procedures were performed at our institution, and two were performed at different outside institutions. The patients were seen because of suprapubic pain, swelling, and erythema between four and twenty-four weeks after the procedure. Two had received courses of orally administered antibiotics because of wound drainage within a week to ten days

bone anchors were removed. In one patient, débridement was necessary on two occasions. Cultures were positive for *Pseudomonas aeruginosa* and *Staphylococcus aureus* in one patient, *Pseudomonas aeruginosa* and coagulase-negative *Staphylococcus* in one patient, *Staphylococcus aureus* in one patient, and *Citrobacter* species and a gram-positive coccus in one patient. Each of the four patients was managed intravenously with antibiotics, with the dosage determined according to her age and renal function, for six weeks. Suspension of the bladder with use of pelvic screws as suture anchors may increase the risk of osteomyelitis because the screw-suture combination passes through the vaginal lumen before it is anchored into bone.

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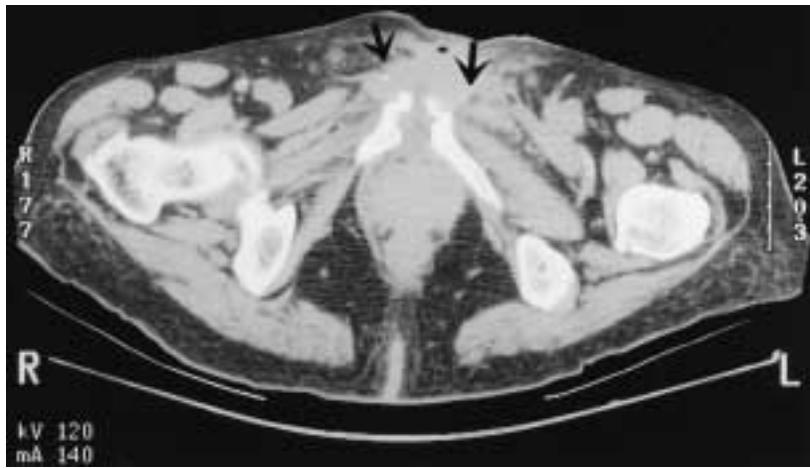


FIG. 1-B

Computerized tomography scan showing swelling of the soft tissues behind the symphysis pubis and the bone anchors (arrows) out of the symphysis pubis.



FIG. 1-C

Radiograph showing the symphysis pubis after the osseous resection.

Case Reports

CASE 1. A seventy-four-year-old woman with a long history of stress urinary incontinence had a suspension of the bladder neck performed with use of titanium bone anchors and a suburethral sling at another hospital. There was swelling and pain over the pubis immediately after the operation. One week after the procedure, the wound was probed and a seroma was diagnosed. Tetracycline was administered orally for fifteen days. Four weeks postoperatively, green purulent material drained from the suprapubic wound. An underlying abscess was drained, and *Pseudomonas aeruginosa* grew on culture of drainage. The patient received intramuscular injections of gentamicin and oral administration of carbenicillin for seven days. Purulent material continued to drain from the wound, and the pelvic pain increased. Eight weeks after the procedure, a computerized tomography scan of the pelvis showed an abscess behind the symphysis pubis, with osseous irregularity of the symphysis. Two weeks later, the patient was seen at our hospital. A needle aspiration of the abscess was performed, and ciprofloxacin-resistant *Pseudomonas aeruginosa* grew on culture of the aspirate. Two days later, the abscess was de-

brided and a total of two to three centimeters of bone was excised. The screws and the attached suture material were removed, and the wound was closed. *Pseudomonas aeruginosa* and coagulase-negative *Staphylococcus* grew on culture of operative specimens. The patient was given piperacillin, tobramycin, and vancomycin, with the dosage determined on the basis of her age and renal function, for six weeks. At the fifteen-month follow-up visit, she was doing well and had no symptoms related to the previous infection, but she had persistent urinary incontinence.

CASE 2. An eighty-year-old woman with a history of stress urinary incontinence had a suspension of the bladder neck with use of titanium bone anchors and a suburethral sling performed at another hospital. Ten days later, she was readmitted to the hospital with fever, swelling, and an infection of the wound. Methicillin-resistant *Staphylococcus aureus* grew on culture of samples of blood and purulent wound drainage. One of the screws was removed, and vancomycin was administered intravenously for six weeks; the dosage was based on the patient's age and renal function. The pelvic pain persisted, and

the patient was seen at our institution. Radiographs indicated pelvic osteomyelitis. In the operating room, the retropubic abscess was drained, the symphysis pubis was debrided (a total of two to three centimeters of bone was removed), and the remaining screw was removed. The wound was packed tightly with Kerlex rolls (Kendall, Mansfield, Massachusetts) that had been soaked in saline solution, and it was covered with a wet-to-dry dressing. *Pseudomonas aeruginosa* grew on culture of operative specimens. The patient received ceftazidime, tobramycin, and vancomycin for six weeks, and the dressings were changed twice a day. Twelve months later, the patient was doing well and had no symptoms related to the previous osteomyelitis of the pubis, but she had persistent urinary incontinence.

CASE 3. A seventy-one-year-old woman with a history of stress urinary incontinence had a bladder suspension performed with use of titanium bone anchors and a suburethral sling. She returned four weeks postoperatively because of suprapubic cellulitis and pelvic pain. The patient was managed empirically with antibiotics, but the symptoms did not decrease. Marked erosion of bone was noted on radiographs (Fig. 1-A). Computerized tomography and magnetic resonance imaging scans revealed evidence of osseous erosion, swelling of the soft tissues behind the symphysis pubis, and evidence of the anchors out of the symphysis pubis (Fig. 1-B). One week after the patient was admitted to the hospital, she was taken to the operating room for débridement, at which time a total of two to three centimeters of necrotic bone was resected, a retropubic abscess was drained, and the wound was closed (Fig. 1-C). During the débridement, the anchors were found to be floating in purulent material and unattached to the symphysis pubis. Intraoperative gram-staining revealed gram-positive cocci and gram-negative rods, and *Citrobacter* species grew on culture. The patient was managed with ceftazidime, ciprofloxacin, and vancomycin, with the dosage based on her age and renal function, for a total of six weeks. Fifteen months later, she was doing well and had no symptoms related to the previous osteomyelitis of the pubis, but she had persistent urinary incontinence.

CASE 4. A seventy-six-year-old woman who had a history of stress urinary incontinence had a bladder suspension performed with use of titanium bone anchors and a suburethral sling. She was seen twenty-four weeks postoperatively because of pain in the pelvis and fever. Methicillin-susceptible *Staphylococcus aureus* grew on culture of blood. Magnetic resonance imaging and computerized tomography scans of the pelvis showed retropubic fluid and inflammation of the symphysis pubis. The abscess was drained, a total of two to three centimeters of necrotic bone was debrided, and the bone anchors were removed. The wound was packed tightly with sterile Kerlex rolls that had been soaked in saline solution, and it was covered with a wet-to-dry dressing that was changed twice a day. Cefazolin was administered intravenously for six weeks, with the dosage based on the age and renal function of the patient. The patient had a prolonged and complicated course in the hospital. Twelve months postoperatively, she was doing well, with no symptoms related to the previous osteomyelitis of the pubis, but urinary incontinence persisted.

Discussion

Stress urinary incontinence is the most common form of urinary incontinence in women. Ma interviewed 363 women who were at least eighteen years of age and found that 34 percent (123) had stress urinary incontinence and 19 percent of those who had such incontinence reported associated social problems⁷. While there are many nonoperative approaches to the treatment of stress urinary incontinence, operative treatment is often recommended. All operative procedures designed as treatment for stress urinary incontinence involve the correction of urethral hypermobility. These

procedures stabilize the urethra in a neutral position and offer support during increases in intra-abdominal pressure, such as those that occur during coughing, lifting, and laughing.

There are two basic varieties of these procedures: use of a suburethral sling and urethropexy. As the name suggests, use of a suburethral sling involves the placement of permanent material under the urethra at the junction of the urethra and the bladder (or the bladder neck). The sling material is fastened either to a fixed point, such as the pubic bone, or to the Cooper's ligament or rectal fascia with permanent sutures. Urethropexy involves the placement of permanent sutures from the periurethral fascia at the bladder to a fixed point in the pelvis. Many women who have a procedure for stress urinary incontinence need repair of prolapsed pelvic organs at the same time. Because these procedures do not involve large abdominal incisions, bone-anchoring has recently increased in popularity as a way to fix slings and permanently placed sutures during urethropexy procedures, especially during concomitant repair of prolapsed pelvic organs.

All of the patients in the present report had placement of bone anchors for fixation of suburethral sutures along with repair of the vaginal prolapse. The goal of all suspension procedures associated with hypermobility of the urethra is to return the poorly supported, hypermobile urethra to a well supported, stabilized position⁴. Many procedures, as well as modifications to these procedures, have been described. In percutaneous stabilization of the bladder neck for urinary incontinence, nonabsorbable material is sutured to or through the vaginal wall and fixed to the soft tissues of the retropubic space to elevate the bladder neck. Recently, the procedure has been modified to include titanium bone screws, which anchor the suture material to the pelvis¹.

In 1977, Osborne and Wright reported that sterile scrubbing could not fully sterilize the vagina⁹ and therefore intravenous antibiotics should be administered preoperatively. Preoperatively, all patients receive antibiotics such as gentamicin and ampicillin or cephalosporin, with the dosage based on age, weight, and renal function, unless a patient is allergic to these medications. The procedure may be performed with the patient under local or general anesthesia. The patient is placed in the lithotomy position, and, after preparation and draping, two separate one-inch (2.5-centimeter) transverse incisions are made directly over the pubic bone. The dissection is carried down to the area of the rectal fascia. In order to decrease vaginal exposure, care is taken to keep the sutures that are attached to the bone anchors completely away from the vaginal field until the time of fixation to the sling. Using a specialized needle at the time of placement of the sling, the surgeon places one arm of each suture into the vaginal field and then brings it back up through one of the suprapubic incisions. Two holes are drilled into the pubis, one on each

side, approximately one centimeter from the midline. The anchors are then attached to the sutures and are placed into the holes with use of the appropriate inserter. The sutures are tightened and tied down to elevate the bladder neck. After placement of the bone anchors, the wounds are closed and are irrigated with a bacitracin solution. Antibiotics are administered for ten days postoperatively. The described procedure may increase the risk of osteomyelitis, as the screw-suture complex passes through the vaginal lumen before being anchored into bone.

We know of only one other case report of osteomyelitis developing after the placement of bone anchors in a procedure to correct stress urinary incontinence⁸. The true prevalence of this problem is not known. Despite this potential concern, Leach reported no cases of osteomyelitis in a study of 115 patients in whom transvaginal needle suspension had been performed in a two-year period⁵. Benderev reported on fifty-three women in whom a modified endoscopic suspension of the bladder neck had been performed with use of bone anchors, and he noted no cases of osteomyelitis of the symphysis pubis². He reported that when suprapubic infection was suspected, symptoms resolved after approximately three weeks of administration of antibiotics. However, this was a rare complication². Sirls et al. also reported no cases of osteomyelitis of the symphysis pubis in 102 patients who had suspension of the bladder performed with use of bone anchors¹⁰. Leach and Appell performed percutaneous suspension of the bladder with use of bone anchors in forty patients; only one patient needed to have a bone anchor removed and another patient needed drainage of a pelvic abscess related to the suprapubic placement of a catheter⁶. Excessive tensioning of the bladder, superficial wound infection, and pelvic abscesses related to suprapubic catheters have all been reported in the literature, but osteomyelitis of the pubis and its treatment have not been reported, to our knowledge¹⁻⁶.

During the year preceding the writing of this report, we managed four women in whom a retropubic abscess had developed following suspension of the bladder neck performed at our institution (two patients) or at another institution (two patients). The two procedures resulting in infection that were performed at our institution were among 127 procedures for urinary incontinence performed with use of bone anchors at our institution over the two years preceding the writing of this report. (In an attempt to determine the true prevalence of this problem in our institution, we were, at the time of writing, contacting all of the patients who have had bone anchors placed for the treatment of stress urinary incontinence in our hospital.) The four patients ranged in age from seventy-one to eighty years old, and none had other medical problems. They were seen because of suprapubic pain, swelling, and erythema between four and twenty-four weeks after the operation.

Two had previously received courses of orally administered antibiotics for treatment of a draining wound.

Severe erosion of bone and widening of the symphysis were noted on plain radiographs of three patients who had osteomyelitis. Computerized tomography scans of the pelvis were also made and revealed swelling of the soft tissues behind the symphysis pubis in all four patients and erosion of adjacent bone in three patients. The patients were taken to the operating room, where the urogynecologist or urologist and the orthopaedic surgeon performed the débridement. A transverse incision including the sinus tract was excised, and the suspension sutures and anchors were removed; the abscess cavity was debrided. The inner aspects of the symphysis pubis were debrided, as was the medial aspect of both the right and the left side, down to the level of the urethral fascia. An image intensifier was used to verify the extent of the débridement. A total of approximately two to three centimeters of bone was debrided, and the image intensifier was used to be certain that the area of débridement was accurate. Care was taken, during the débridement of bone around the symphysis pubis, not to destroy the ligamentous complex that envelops the symphysis pubis and stabilizes the anterior arch of the pelvis. The thick inferior pubic (arcuate) ligament is the most important part of this complex and forms an arch of strong fibers that stretches from both inferior pubic rami. It is important to be aware of this, and the surgeon should preserve the integrity of the anterior arch during the wedge resection⁶. Bone biopsies were performed, and the samples were sent for culture, gram-staining, and pathological analysis. In all three patients who had infection of bone, the anchors were found to be disengaged from the pubis and surrounded by purulent material. A Hemovac drain was placed deep in the defect and brought out through a separate stab incision. A second drain was also placed in the subcutaneous tissue and carried out through a separate stab incision. The rectal fascia was closed with 1-0 Vicryl sutures (polyglactin; Ethicon, Somerville, New Jersey), subcutaneous tissues were closed with 2-0 Vicryl sutures, two of the wounds were packed with sterile Kerlex rolls that had been soaked in sterile saline solution and were covered with a wet-to-dry dressing, and two other wounds were closed with 3-0 nylon suture. The open wounds were repacked twice a day with a wet-to-dry dressing.

Cultures were positive for *Pseudomonas aeruginosa* and *Staphylococcus aureus* in one patient, *Pseudomonas aeruginosa* and coagulase-negative *Staphylococcus* in one patient, *Staphylococcus aureus* in one patient, and *Citrobacter* species and a gram-positive coccus in one. Some of these bacteria are commonly present in the vaginal flora, but others are not. The presence of these uncommon bacteria may be related to the preoperative administration of antibiotics, which may cause a shift in the normal vaginal flora. All patients needed intra-

venous administration of antibiotics for a prolonged period (at least six weeks). At the time of follow-up, none of the wounds were draining and the radiographs showed no further erosion of bone. The longest duration of follow-up was fifteen months, but osteomyelitis may recur; therefore, it is crucial that these patients be monitored closely for any signs of infection.

Osteomyelitis of the pubis is a recognized complication and may be due to the migration of flora from the

vagina or skin along the suspension sutures and bone anchors as they pass through these structures before they are placed in the pubis. However, additional studies are necessary to determine the prevalence of, and the risk factors associated with, this complication. Prompt recognition of the problem and the combination of open débridement and administration of appropriate antibiotics appear to have eradicated the infection in our patients.

References

1. **Apell, R. A.; Rackley, R. R.; and Dmochowski, R. R.:** Vesica percutaneous bladder neck stabilization. *J. Endourol.*, 10: 221-225, 1996.
2. **Benderev, T. V.:** Anchor fixation and other modifications of endoscopic bladder neck suspension. *Urology*, 40: 409-418, 1992.
3. **Benderev, T. V.:** A modified percutaneous outpatient bladder neck suspension system. *J. Urol.*, 152: 2316-2320, 1994.
4. **Grace, J. N.; Sim, F. H.; Shives, T. C.; and Coventry, M. B.:** Wedge resection of the symphysis pubis for the treatment of osteitis pubis. *J. Bone and Joint Surg.*, 71-A: 358-364, March 1989.
5. **Leach, G. E.:** Bone fixation technique for transvaginal needle suspension. *Urology*, 31: 388-390, 1988.
6. **Leach, G. E., and Appell, R.:** Percutaneous bladder neck suspension. *Urol. Clin. North America*, 23: 511-516, 1996.
7. **Ma, S. S.:** The prevalence of adult female urinary incontinence in Hong Kong Chinese. *Internat. Urogynec. J. and Pelvic Floor Dysfunct.*, 8: 327-331, 1997.
8. **Matkov, T. G.; Hejna, M. J.; and Coogan, C. L.:** Osteomyelitis as a complication of vesica percutaneous bladder neck suspension. *J. Urol.*, 160: 1427, 1998.
9. **Osborne, N. G., and Wright, R. C.:** Effect of preoperative scrub on the bacterial flora of the endocervix and vagina. *Obstet. and Gynec.*, 50: 148-151, 1977.
10. **Sirls, L. T.; Keoleian, C. M.; Korman, H. J.; and Kirkemo, A. K.:** The effect of study methodology on reported success rates of the modified Pereyra bladder neck suspension. *J. Urol.*, 154: 1732-1735, 1995.