Indium-111-White Blood Cell Detection of Postradiation Vescicocutaneous Fistulas

Lawrence C. Swayne, Dan Peterson, James Collins and Craig A. Disse

Departments of Radiology and Pathology, Morristown Memorial Hospital, Morristown, New Jersey

We present a case of urinary bladder fistulization which occurred approximately 25 yr after successful radiation therapy for uterine carcinoma. The extensive fistulas were detected with $^{111}$In-oxine-labeled white blood cell scintigraphy and were confirmed with a fistulogram, computed tomography and surgery. Scintigraphy was valuable for both initial detection as well as staging the extent of inflammation for subsequent diagnostic studies and surgical resection.

Key Words: indium-111-leukocytes; radiotherapy; fistula; uterine carcinoma


Clinically significant damage to the pelvis following radiation therapy occurs in only 5%-10% of patients (1). Chronic radiation injury involving the bladder usually results in perivesical fibrosis, bladder wall thickening and loss of volume (1-5). Rarely, fistula formation may occur, usually between the bladder and vagina, and less commonly between the bladder and colon or small bowel (1-2). We present a case of extensive radiation-induced urinary bladder fistulas initially detected with $^{111}$In-oxine-labeled white blood cell scintigraphy.

CASE REPORT

A 62-yr-old, white female was admitted to the hospital complaining of nausea, vomiting and diarrhea. Three years earlier, the patient had undergone surgical drainage of a chronic abscess of her left thigh at another institution. Past medical history was significant for endometrial carcinoma treated with radiation therapy involving both an external (cobalt) beam as well as intracavitary radium. Since the therapy had been delivered in the remote past at another institution, the patient's total radiation dose remained unknown.

Physical examination revealed an obese, elderly female with a low-grade (38°C) fever. Examination of her pelvis showed an erythematous groin with a small, scarred, thickened vaginal introitus and a normal rectum. Examination of the medial aspect of her left thigh revealed a small punctate orifice with minimal drainage. Vaginoscopy revealed diffuse scarring without evidence of a mass or fistula. Initial laboratory data showed a white blood cell count of 48,800 mm$^3$ without a shift, consistent with a leukemoid reaction. Urine cultures were positive for both Group D enterococcus and Enterococcus faecalis.

An $^{111}$In oxine-labeled autologous white blood cell scan was ordered to rule out a recurrent thigh abscess and showed bilateral, symmetric uptake in the medial aspects of the proximal thighs. These collections communicated with an ill-defined pelvic collection via faintly visualized fistulas (Fig. 1). No other scintigraphic abnormalities were identified. A fistulogram, performed via the orifice in the left thigh, demonstrated a large left thigh collection communicating with the base of the urinary bladder and a second large collection in the right thigh, corresponding to the scintigraphic abnormalities (Fig. 2). There were also changes of postradiation necrosis involving the symphysis pubis. A postfistulogram CT as well as cystoscopy confirmed these findings and suggested a third communication between the bladder and the peritoneal cavity.

Exploratory laparotomy revealed a chronic walled-off inflammatory cyst with a fistulous communication to a small fibrotic bladder. Frozen sections revealed chronic inflammatory changes with no evidence of recurrent tumor. Surgical repair consisted of drainage of both thigh abscesses, excision of the pelvic inflammatory cyst containing several hundred milliliters of thick chocolate-colored fluid and primary closure with an omental flap interposition. Anterior prevesicle dissection in the vicinity of the destroyed symphysis pubis was specifically avoided, the patient had strongly expressed a desire to avoid a possible urinary diversion procedure.

Cultures of the pelvic inflammatory cyst were positive for Group D enterococcus, while the thigh abscesses grew Enterococcus faecalis. Pathologic examination of biopsies of the bladder revealed fibrosis and scarring with a chronic inflammatory reaction (30% lymphocytes, 20%-25% macrophages, 30% plasma cells, 15%-20% neutrophils) and no evidence of recurrent tumor. Biopsies of the pelvic inflammatory cyst and fistulous tracts revealed both acute and chronic inflammatory changes (40%-50% neutrophils, 20% lymphocytes, 20% macrophages, 10% plasma cells). The patient did well postoperatively and was discharged on a multivitamin regimen as well as intravenous antibiotics.
DISCUSSION

External beam radiation therapy of the pelvis is frequently the treatment of choice for cervical, prostate and urinary bladder carcinoma. With the advent of modern radiation therapy, long-term survivals are often achieved. Unfortunately, modern, curative and higher radiation doses are accompanied by a 5%-10% risk of clinically significant damage to the pelvis (1). The incidence of complications from radiation therapy is dependent upon the total radiation dose, dose fractionation scheme and the volume of irradiated tissue (1) and is increased in patients undergoing retreatment (4). Additional predisposing factors include: prior surgery, chemotherapy, hypertension, atherosclerosis, diabetes, adhesions, PID and recurrent tumor (1,3).

Although the urinary bladder is the most radiosensitive organ in the urinary tract (1,2), bladder complications from radiation therapy in the pelvis occur less frequently (4,5) and develop later than those involving the gastrointestinal tract (4). Acute radiation injuries (<3-6 mo) are due to epithelial damage and present with symptoms of cystitis, including dysuria, irritability and hematuria (1,3). In the chronic phase (>6-12 mo), fibrosis and vascular sclerosis result in a small volume bladder with urinary frequency and occasional incontinence (1,3). Ureteral obstruction and fistula formation rarely occurs. Radiation-induced fistulas of the urinary bladder usually extend to the adjacent vagina and less commonly involve bowel (1,2). Overall, there is a 2.2% incidence of fistulas in patients undergoing radiation therapy for gynecologic tumors (3) occurring primarily when the dose exceeds 6000 rads (3,4).

For this patient, 111In-white blood cell scintigraphy was useful for both the initial detection of extensive postradiation fistulas as well as providing an accurate staging of the extent of inflammation, including a second, previously unsuspected, large collection in the right thigh. Fistulas involving the urinary bladder have been reported to occur as much as 25 yr following curative radiation therapy to the pelvis (5). Other reported genitourinary tract fistulas detected with scintigraphy include: 99mTc-DTPA detection of a ureterovaginal fistula (6) and scrotal extravasation (7); bone scan detection of a vesicoenteric fistula (8); bone and gallium scan detection of urinomas (9,10); and 111In-leukocyte detection of a cutaneous-cecal-vaginal fistula (11) and a pyloduodenal fistula (12).

REFERENCES