Original Study

Radiotherapy in Prostate Cancer Patients With Pelvic Lymphocele After Surgery: Clinical and Dosimetric Data of 30 Patients

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Abstract

Our study, which included 30 prostate cancer patients, showed that postoperative radiotherapy in the presence of pelvic asymptomatic lymphocele is feasible with acceptable acute and late toxicity. In all but 2 patients, lymphoceles remained asymptomatic. The volume of lymphocele decreased during radiotherapy (median reduction of 37% of the initial volume) and this phenomenon might require intermediate radiotherapy plan evaluation.

Introduction: The purpose of the study was to evaluate the feasibility of irradiation after prostatectomy in the presence of asymptomatic pelvic lymphocele. **Patients and Methods:** The inclusion criteria for this study were: (1) patients referred for postoperative (adjuvant or salvage) intensity modulated radiotherapy (IMRT; 66-69 Gy in 30 fractions); (2) detection of postoperative pelvic lymphocele at the simulation computed tomography [CT] scan; (3) no clinical symptoms; and (4) written informed consent. Radiotherapy toxicity and occurrence of symptoms or complications of lymphocele were analyzed. Dosimetric data (IMRT plans) and the modification of lymphocele volume during radiotherapy (cone beam CT [CBCT] scan) were evaluated. **Results:** Between January 2011 and July 2013, in 30 of 308 patients (10%) treated with radiotherapy after prostatectomy, pelvic lymphocele was detected on the simulation CT. The median lymphocele volume was 47 cm^3 (range, 6-467.3 cm^3). Lymphocele was not included in planning target volume (PTV) in 8 cases (27%). Maximum dose to lymphocele was 57 Gy (range, 5.7-73.3 Gy). Radiotherapy was well tolerated. In all but 2 patients, lymphoceles remained asymptomatic. Lymphocele drainage—because of symptom occurrence—had to be performed in 2 patients during IMRT and in one patient, 7 weeks after IMRT. CBCT at the end of IMRT showed reduction in lymphocele volume and position compared with the initial data (median reduction of 37%), more pronounced in lymphoceles included in PTV. **Conclusion:** Radiotherapy after prostatectomy in the presence of pelvic asymptomatic lymphocele is feasible with acceptable acute and late toxicity. The volume of lymphoceles decreased during radiotherapy and this phenomenon might require intermediate radiotherapy plan evaluation.

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Introduction

The role of irradiation after prostatectomy in prostate cancer has been recently established.[1-4] Postoperative radiotherapy should be offered to the patients with adverse pathologic findings at prostatectomy (ie, seminal vesicle invasion, positive surgical margins, extraprostatic extension), and salvage radiotherapy should be proposed to the patients with increasing prostate-specific antigen (PSA) or local recurrence after prostatectomy (with no adjuvant irradiation) in whom there is no evidence of distant metastatic disease.[1-4]

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Recent research suggests also a benefit of pelvic irradiation in patients with positive lymph nodes.[5,6]

Previous abdomino-pelvic surgery is one of the well known risk factors for radiotherapy toxicity.[7] In particular, prostate surgery might lead to early postoperative complications (hematoma, symptomatic pelvic lymphocele, development of lymphedema, ileus, deep venous thrombosis, and pulmonary embolism) requiring delay or even precluding radiotherapy. Lymphocele, occurring as a result of lymph leakage from afferent lymphatic channels transected during lymph node dissection, is one of these events. It occurs in up to 8% of patients who undergo prostatectomy and pelvic lymph node dissection.[8] The potential risk factors include extended lymph node dissection, open surgery, extraperitoneal surgical approach, ligation technique and hemostatic agents, perioperative anticoagulation, patient age, surgeon experience, and tumor-related variables (involvement of lymph nodes or seminal vesicles, extracapsular extension).[8-12] As reported for seroma in breast cancer radiotherapy,[13] pelvic lymphocele theoretically, might also create clinical problems in the treatment planning and delivery. In our Department since 2011, the information of presence of pelvic lymphocele on simulation computed tomography (CT) scan is routinely registered in the patient radiotherapy chart.

A Medline search using "lymphocele," "radiotherapy," and "prostate cancer" shows no report dedicated to this topic. Therefore, we performed this study to evaluate the feasibility of irradiation after prostatectomy in the presence of asymptomatic pelvic lymphocele, in terms of radiotherapy toxicity, occurrence of symptoms or complications of lymphocele, and dosimetry evaluation including lymphocele volume modification during radiotherapy.

Patients and Methods

Inclusion Criteria

The inclusion criteria for this study were as follows: (1) patients referred for postoperative (adjuvant or salvage) irradiation after surgery for prostate cancer between January 2011 and July 2013; (2) detection of postoperative pelvic lymphocele at the simulation CT scan; (3) no clinical symptoms of lymphocele such as pelvic pressure, urinary urgency, leg pain or weakness, and no secondary complications of lymphocele such as infection, edema, deep venous thrombosis, nerve injury, and ileus at the beginning of radiotherapy; and (4) written informed consent for the radiotherapy.

The study was notified to the Ethical Committee of the European Institute of Oncology, Milan, Italy (notification regarding clinical and dosimetric aspects of image-guided radiotherapy for prostate cancer, Nr 79).

Surgery

Surgery consisted of the open or robot-assisted laparoscopic retropubic approach including radical prostatectomy with pelvic lymph node dissection. A modified limited lymph node dissection was performed in patients with lymph node involvement risk ranging from 4% to 7%, and the extended approach was chosen if the estimated risk exceeded 7%.[14] A unilateral or bilateral nerve-sparing technique was applied provided the procedure did not increase the risk of macroscopically positive surgical margins.

Radiotherapy Protocol

In all cases the indication for irradiation and the decision to start radiotherapy with the presence of asymptomatic pelvic lymphocele was established in our multidisciplinary tumor board after careful urological evaluation.

All patients were informed about lymphocele and asked to inform the clinician if any of the following symptoms occurred: pelvic pressure, fever, abdominal pain, leg edema, bowel, and urinary symptoms. During radiotherapy all patients were seen on a weekly basis by a radiation oncologist and every 6 to 12 months thereafter (based on the PSA evolution and clinical symptoms).

Institutional guidelines for simulation CT and contouring were used.[15] Prostatic bed and pelvic lymph node volumes were contoured according to the international guidelines.[16-18] If necessary, lymphocele was partially included in planning target volume (PTV). Dose–volume histograms were computed. No formal constraint was established for lymphocele, however, the dose was kept as low as possible with no compromise to the PTV coverage.

All patients were treated using image guided intensity modulated radiotherapy, using 2 systems: IG-Volumetric Modulated Arc Therapy (RapidArc, Varian Medical Systems) and IG-Static Step and Shoot intensity modulated radiotherapy (IMRT) by Vero (BrainLab, D/MHI, Japan). Optimization was performed using an Eclipse version 8.6 (analytical anisotropic algorithm, calculation module) and iPlanRT version 4.5 for RapidArc and Vero plans, respectively. Patients were treated with full urinary bladder and empty rectum.

The prescribed dose depended on the radiotherapy intent (adjuvant or salvage in case of detectable PSA) and followed the International Commission on Radiation Units and Measurements Report 83 recommendations.[19] The dose prescribed to the prostatic bed was 66 or 69 Gy in 30 fractions for adjuvant and salvage irradiation (2.2-2.3 Gy per fraction, 5 fractions per week), respectively. Pelvic radiotherapy was added in case of pN1 or pNx in patients with advanced tumors (pT3), up to the dose of 51 Gy and 54 Gy in 30 fractions (1.7-1.8 Gy per fraction) to the negative and positive lymph node areas, respectively. In patients with >1 PTV, a simultaneous integrated boost technique was used. The institutional target positioning guidelines based on the cone beam CT (CBCT) manual soft tissue registration were followed.

Clinical and Dosimetric End Points

For each patient, clinical data were collected including age, concomitant disorders, initial and postoperative PSA, tumor histology, Gleason score and stage, and information on the surgical procedures and radiotherapy (duration, toxicity). All radiotherapy plans were reviewed, lymphoceles were contoured, and their volume and side were defined (Figure 1). The dosimetric data regarding lymphoceles included: maximum dose (Dmax), mean dose, and dose administered to 90% and 10% of its volume.

To evaluate the lymphocele volume modification during radiotherapy, the initial volume (simulation CT scan) was compared with the volume at the end of treatment (last CBCT). The lymphoceles were in divided into the "in-PTV" (partially included in PTV) and "out-PTV" (not included in PTV) groups. The comparison of the initial and final volume was performed first for all lymphoceles (with