Rectal Injury during Permanent Seed Implantation for Prostate Brachytherapy

Masaru Ishida1,*, Akitomo Sugawara2, Masashi Matsushima1, Rei Ohara1, Michiaki Katayama3 and Yosuke Nakajima1

1Department of Urology, Saiseikai Yokohamashi Tobu Hospital, Yokohama, 3Radiology, Saiseikai Yokohamashi Tobu Hospital, Yokohama and 2Department of Radiology, Keio University school of Medicine, Tokyo, Japan

*For reprints and all correspondence: Masaru Ishida, Department of Urology, Saiseikai Yokohamashi Tobu Hospital, 3-6-1 Shimosueyoshi, Tsurumi-ku, Yokohama 230-8765, Japan. E-mail: m-ishida@kc5.so-net.ne.jp

Received July 15, 2012; accepted September 17, 2012

Serious complications have not been previously reported during seed implantation for prostate brachytherapy. We present an unreported case of rectal injury caused by an ultrasound probe. A 67-year-old male presented with a serum prostate-specific antigen level of 5.50 ng/ml, a Gleason score of 7 (3 + 4) and clinical T2a adenocarcinoma of the prostate. A transperineal permanent prostate brachytherapy implantation was performed. The patient subsequently complained of abdominal pain postoperatively. A gastrointestinal perforation was suspected based on an abdominal X-ray obtained on the day after the brachytherapy. Rectal injury was recognized during an exploratory laparotomy, and a primary closure and temporary diversion ileostomy were performed. The healing of the injury was confirmed by colonoscopy and an ileostomy closure was performed 2 months after the temporary diversion. The investigating committee for this accident concluded that the ultrasound probe had perforated the rectum. This is the first case of a rectal injury during seed implantation for prostate brachytherapy.

Key words: brachytherapy – prostate cancer – rectal injury – ileostomy

INTRODUCTION

Permanent seed implantation for prostate brachytherapy is an effective treatment for localized prostate cancer (1–3) and transperineal seed implantation is a widely used technique (4,5). Although patients often experience urinary, bowel and/or erectile complications during the medium-to-long-term postoperative courses (6,7), major complications other than urinary retention are rare immediately after the brachytherapy (8,9). We present the first case of a rectal injury that occurred during transrectal ultrasound-guided transperineal seed implantation for prostate brachytherapy.

CASE REPORT

A 67-year-old male who had no history of gastrointestinal problems or surgery presented with a prostate-specific antigen value of 5.50 ng/ml, a Gleason score of 7 (3 + 4) and adenocarcinoma of the prostate as diagnosed using an ultrasound-guided biopsy involving a single core taken from the right lobe. A magnetic resonance imaging examination did not reveal any gross extracapsular extension of the disease, suggesting cT2a disease. He was diagnosed with cT2aN0M0 prostate cancer and opted to undergo permanent iodine-125 seed brachytherapy. The patient was placed in an extended lithotomy position under general anesthesia and was prepared and draped in the usual sterile fashion in the usual manner. A Foley catheter was inserted and the bladder was filled with 50 ml of diluted contrast media. Twenty-one needles were inserted through the perineum into the prostate under transrectal ultrasound (Prosound SSD-3500SV, probe; UST-672-5/7.5; Hitachi Aloka Medical Ltd, Mitaka-shi, Tokyo, Japan) guidance, inserting 65 seeds for a total activity of 25.335 mCi. The operating time was

© The Author 2012. Published by Oxford University Press. All rights reserved. For Permissions, please email: journals.permissions@oup.com
88 min. In the post-implant assessment, D90 and V100 were 182.33 Gy and 97.56%, respectively. The immediate post-operative course was uneventful with the exception of perineal pain, which was resolved using flurbiprofen. On the next day, he complained of a lower abdominal pain and irritation of the bladder. Urinary retention was suspected and a urethral catheter was introduced. However, the patient’s symptoms did not disappear. In the meantime, abdominal distention was noted, and an abdominal X-ray showed free air under the diaphragm (Fig. 1). A gastrointestinal perforation was suspected and an emergency exploratory laparotomy was performed. A rectal transverse laceration perforating the peritoneal reflection and \( \approx 2 \text{ cm in diameter} \) was found (Fig. 2) and a primary closure of the perforation was performed. A double-barrel ileostomy was established in the right lower quadrant of the abdominal wall. Two months after the operation, a colonoscopy was performed to confirm the healing of the perforation, followed by the closure of the ileostomy. In the colonoscopy, there was neither an abnormal diverticula nor the Haustra valve. No cancer recurrence was observed at the time of a follow-up examination performed 12 months after the brachytherapy.

**DISCUSSION**

Prostate brachytherapy is a minimally invasive treatment modality for localized prostate cancer (2). Urinary retention is a typical major complication during the early post-operative course (8,9); however, no other complications presenting immediately after brachytherapy and requiring surgical intervention have been previously reported, this is the first report of rectal injury during prostate brachytherapy.

Both the needle insertion to the prostate through the perineum and the transrectal insertion of the ultrasound probe are regarded as invasive procedures during the operative manipulations required for prostate brachytherapy. We reconstructed a sagittal image from a computed tomography (CT) scan obtained before the exploratory laparotomy to analyze the distance between the injured site and the perineum or the anus (Fig. 3). In the figure, the arrowhead indicates the
intraperitoneal inflammation surrounding the perforated rectum, and the estimated distance between the site of perforation and the perineal skin was \( \approx 130 \) mm. During implantation, the patient was placed in an extended lithotomy position; therefore the distance might have been shorter than that. The length of the needle (BrachyStar\textsuperscript{®}; C.R. Bard, Inc., Murray Hill, NJ, USA) excluding the plastic tail and the thicknesses of the brachytherapy template grid (CIVCO Medical Solutions, Kalona, IA, USA) were 177 and 20 mm, respectively. Since there was at least one fingerbreadth, \( \approx 15 \) mm, or more between the perineal skin and the template grid, even if the needle had been introduced to its utmost extent, the length of the needle would have been just long enough to reach the perforation site. However, in our experience, we have never introduced a needle to its maximum extent. Furthermore, the rectal injury was laceration but not puncture wound. Therefore, the needle could not anatomically reach the injured site, even if the needle had accidentally penetrated the prostate.

Thus, we concluded that the other invasive procedure, the transrectal ultrasound, may have been the cause of injury in this patient. The estimated distance between the site of the perforation and the anus was \( \approx 100 \) mm. Before the fixation of the stepping unit, we usually confirm that the base of the prostate is clearly visualized in a sagittal view. During the contouring of the prostate after the fixation of the stepping unit, the probe is inserted 1 cm beyond the base of the prostate as viewed axially. The tip of the ultrasound probe device is blunt, but the center of the axial probe is 17.5 mm away from the tip of the device; furthermore, the edge of the sagittal probe is further away (25 mm). On the sagittal-reconstructed CT image, the injured site was not distant from the base of the prostate, and the tip of the ultrasound probe could have easily reached the site. Therefore, in a typical procedure, the tip of the probe can reach the site that was injured in this patient. In addition, since the valve of Houston, which is a transverse fold of the rectum, is present at the level of the peritoneal reflection, we speculated that the ultrasound probe tip may have torn this fold. The above considerations have some anatomical limitations, since the patient was in a supine position during the CT scan but was in an extended lithotomy position during the brachytherapy. However, after also considering the intraoperative findings, we finally concluded that the ultrasound probe had lacerated the rectum.

Transrectal ultrasound in brachytherapy is not same as that in other procedures such as prostatic examination and biopsy of the prostate. In those procedures, we do not insert the probe as ahead as in brachytherapy. In general, prostatic examination and biopsy of the prostate are performed under the only local anesthesia by lubrication gel or periprostatic nerve block, therefore, if the physician pressed the probe to the rectal wall, the patient would feel severe pain and this kind of accident would not occur. Since there are such differences, this case is characteristic morbidity of brachytherapy.

To our knowledge, no other reports of rectal injury during brachytherapy procedures or transrectal ultrasound have been made. Meanwhile, the rate of intestinal perforations caused by colonoscopy and barium enema, which are also a transrectal procedures, are reported to be around 0.01–0.02% (10–12) and 0.02–0.04% (13–14). We consider that the risk of intestinal perforation caused by transrectal ultrasound during brachytherapy may be lower than that of colonoscopy because of the shapes of the devices’ tips and the extents of the observation.

We could not detect the definitive reason of this accident in this case. However, we must not allow the same situation to happen. Since this accident, we take particular care not to insert the ultrasound probe ahead more than where the base of the prostate appears. When we feel any resistance during the procedure, we pull back the probe. We also inject 10 ml of lubrication gel into the rectum before the insertion of the probe in order to decrease the friction between the rectum and the probe.

**CONCLUSION**

We reported the first case of rectal injury by an ultrasound probe during seed implantation for prostate brachytherapy. This complication is characteristic morbidity of brachytherapy but not of other procedures. Brachytherapist should keep in mind that this major acute complication of brachytherapy could occur, although the incidence is extremely rare.

**Conflict of interest statement**

None declared.
References


