CASE REPORT

Prostatic Marker Needles to Define the Anterior Dissection Planes during APR for Rectal Cancers in Patients with Previous Radiotherapy for Prostate Cancer

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Introduction

In low rectal cancers for which the sphincter mechanism proves unsalvageable, the abdominoperineal resection (APR) is frequently used. The most critical portion of APR is the anterior dissection because of the proximity of the urethra. This requires a perineal dissection wherein the anterior dissection should proceed dorsally to the bulbocavernosus muscle to avoid injury to the membranous urethra. In males, though the rectum and prostate curve away from one another as two convex surfaces, approximately up to half of the posterior prostate surface is in close contact with anterior rectum. This makes the anterior dissection more difficult, because the anorectum is closely apposed to the membranous urethra, prostate, and seminal vesicles.

Irradiation induces a premature terminal differentiation process of the fibroblast/fibrocyte cell system resulting in the enhanced synthesis of interstitial collagens. This severe fibrotic reaction leads to obliteration and destruction of anatomical and surgical planes. Thus, the anterior dissection of the rectum becomes even more challenging in the setting of previous radiation to the prostate. These patients run a higher risk of urethral or prostatic injury while performing such dissection.

Technique

The patient is placed in the lithotomy position, and the rectum is irrigated to remove any fecal material. An endorectal ultrasound is then performed. The ultrasonic probe is mounted and stabilized on a calibrating device with the holes in grid guiding the exact position to introduce the needles and define the plane between the rectum and the prostate/seminal vesicle superiorly and the rectum and genitourinary diaphragm (membranous urethra) inferiorly. After the needle is placed up to the level of the seminal vesicle, the trocar is taken out. The needle is then cut flush with the skin and taped down to it. Depending on the size of the prostate, four or five of these needles are placed. The needles are placed in the prostatic tissue anterior to the Denonvilliers’ fascia. In case of an anterior rectal tumor, the needles can...
be placed even more anteriorly depending on the location of the tumor with relation to the prostatic tissue. The prostatic urethra is clearly visualized on ultrasound, and a plane within the prostate can be defined that would allow deeper resection of anterior rectal tumors abutting the prostate without violating the prostatic urethra. These needles are then taken out from the perineal skin after anterior dissection is completed. The total time taken for placement of the needles is about 10 min.

At the time of surgery, the surgeons use these needles as a marker by the feel and keep the dissection posterior to the needles. Once the anterior dissection is completed, the needles are taken out. There are theoretical risks of infection, abscess, and bleeding with the introduction of these needles. Also if the patient’s position is changed after placement of the needles, then there is a possibility of migration of the needles.

Our Experience

We used this technique in three patients who had T3 low rectal cancer 6–8 years following radiotherapy for prostate cancers. Two of these patients had external beam radiotherapy, and one patient had brachytherapy seeds implanted. The Mick® needles placed by the radiation oncologist helped in the identification of the anterior dissection plane, and the patients had an R0 resection at the anterior border without injuries to the prostatic and membranous urethra. These patients did not develop any urinary complications post-operatively.

Discussion

Surgeries in patients with pelvic radiotherapy is associated with complications such as reduced perineal wound healing and increased frequency of pelvic abscess. Radiotherapy causes induction of tissue fibrosis which has the potential to obliterate tissue planes and make surgical resection more challenging. Hence, surgery is generally performed within 6 weeks of the patient receiving neo-adjuvant radiotherapy to avoid operating in fibrotic planes. The surgeon has to contend with fibrotic obliterated planes when treating patients that have received radiotherapy much further in the past for previous pelvic malignancy such as prostate cancer.

While performing APR, the most challenging steps involve the perineal dissection from below, where dissection is carried out through non-anatomic planes. Anteriorly, there is no plane through which dissection can be carried out bluntly, making this the most technically difficult and critical step of the operation. In male patients, the anorectum is closely apposed to the membranous urethra, prostate, and seminal vesicles thus making this dissection difficult. In addition to having an intimate understanding of perineal regional anatomy, authors have suggested measures to avoid urethral injury including starting the anterior dissection from the side and not the midline and angling dissection downwards in an imaginary line towards the sacral promontory with intermittent palpation of a urinary catheter as a guide to stay in the safe plane. To avoid injury to the membranous urethra, the transverse peronei and bulbocavernosus muscle must be clearly delineated, and dissection should remain dorsal to it. Any misjudgement during sharp dissection may result in the inadvertent opening of the membranous urethra or the

Fig. 2 Schematic representation of coronal section anatomy showing the position of the Mick® needle
rectum even in the hands of experienced surgeons. Studies have demonstrated a high perforation rate ranging from 8% to 26% in APR. These usually occur in the low rectum and are associated with poor oncologic outcomes.

Denonvilliers’ fascia is an important anatomic structure in males, running almost vertically between the peritoneal reflection of the rectovesical pouch and the pelvic floor. It lies posterior to the prostate and seminal vesicles and anterior to the extraperitoneal rectal wall, anterior mesorectum, and fascia propria. The operative appearance of Denonvilliers’ fascia varies considerably, from a fragile translucent layer to a tough leathery membrane. It tends to be more prominent in younger patients, becoming less so with increasing age. It often is more prominent after preoperative radiotherapy in the pelvis or in the presence of transmural rectal inflammation as in Crohn’s disease. To ensure complete removal of the rectum and prevent perforation of the rectum, the needles are placed in the prostatic tissue to ensure that the Denonvilliers’ fascia is included in the resection specimen.

Urethral injury is a potential risk, being identified in 0.5% to 0.7% of patients during APR, with the potential sequelae of urethral–perineal fistula if unidentified intraoperatively. In fact, it has been postulated that missed urethral injuries occur more often than is reported, with the presentation being averted by the use of urinary catheters post-operatively. Urinary leak from these undiagnosed injuries may contribute to cases of protracted perineal wound sepsis and delayed wound healing. In addition, membranous urethral stricture with associated bladder outlet obstruction may also contribute to observed post-operative urinary retention in previous series as high as 39%.

The challenges involved in performing anterior dissection during the perineal phase of APR in males who received radiotherapy for prostate cancer provided the rationale for developing the technique using prostatic needles to define the plane and provide a useful surgical boundary. Bearing in mind the opinion that sharp dissection as opposed to blunt dissection during TME reduces recurrence, it becomes even more imperative that the planes of dissection are better defined to avoid potential damage to surrounding structures.

Rectal ultrasound with calibration and grid is used by radiation oncologists for the placement of brachytherapy seeds in the prostate. Placement of blunt needles by this technique helps to guide surgical dissection across difficult dissection planes. The use of this technique may be extended to other conditions which are associated with extensive pelvic fibrosis including inflammatory bowel diseases, rectal/perineal trauma, and previous pelvic abscess.

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References