BRIEF REPORT

Resection of Inferior Pubic Ramus Tumors through a Femoribus Internus–Perineal Approach

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An operative approach to the inferior pubic ramus that was utilized in four patients with various bone tumors in the inferior pubic ramus is described here. These patients were successfully managed through a femoribus internus (inner thigh)–perineal approach. Data concerning preoperative and postoperative symptoms, surgical procedures, and outcomes are presented. There was no recurrence in the four cases and the pain associated with an initial pelvic floor had completely resolved except one case. The slight limitation in range of motion of the left hip joint and pain were performed in the same case postoperatively. The Musculoskeletal Tumor Society scores were 28, 15, 25, and 18 at the final follow-up. A typical case is described in full and our experience concerning surgical indications, and intraoperative issues in tumor patients discussed. The purpose of this paper is to recommend that the femoribus internus–perineal approach be used to resect the inferior pubic ramus, whether affected by osteomyelitis, bone tumor, or tuberculosis, but especially in patients with tumors.

Key words: Bone tumor; Femoribus internus–perineal approach; Inferior pubic ramus

Introduction

Bone tumors located in the inferior pubic ramus are very rare. This deep part of the pelvis is relatively difficult to approach^{1–9}. The inferior pubic ramus passes laterally and downward from the pubic symphysis; it becomes narrower as it descends and joins with the inferior ramus of the ischium below the obturator foramen. The inferior pubic ramus is thin and flat and its anterior surface is rough, because the origins of various muscles are here—the gracilis, part of the obturator externus and the adductors brevis and magnus. The posterior surface is smooth, and gives origin to the obturator internus and the external urethral sphincter muscles. The pubic border is 6–8 mm thick and everted. It presents two ridges which extend downward and are continuous with similar ridges on the inferior ramus of the ischium. Two ridges attach only slightly to the fascia, allowing for easy stripping when desired. This anatomical structure provides a theoretical basis for approaching tumors in the inferior pubic ramus through intramuscular spaces.

This report reviews the technical literature concerning the location and characterization of pubic tumors and the

approach to them; these published reports, fails to describe an appropriate surgical approach to the inferior pubic ramus. The purpose of this report is to describe our successful management of four patients using a femoribus internus–perineal approach. This approach involves a shorter operative time and less blood loss and soft-tissue injury than other approaches. In addition, we recommend this approach for resection of the inferior pubic ramus.

Materials and Methods

Data on four patients who had had bone tumors in the inferior pubic ramus and had undergone resection via a femoribus internus–perineal approach in our institution between July 2008 and June 2013 were retrospectively analyzed. There were 2 men and 2 women aged 22, 27, 32, and 45 years, respectively. The clinical features these four cases had in common included localized pain and restricted movement of the hip joint. Physical signs included deep tenderness and soft tissue masses. Except for one case of chondrosarcoma, preoperative imaging findings (X-ray films, CT and MRI scans) were similar, showing osteolytic changes and partial

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bony destruction with focal bone erosions and expansion at the affected sites.

In two of the cases soft tissue masses had formed and invaded the cortex. The tentative diagnoses were giant cell tumor of bone, chondrosarcoma, desmoplastic fibroma and bone metastases.

Surgical Technique

Under epidural anesthesia and with urinary catheterization, the patients were placed in the lithotomy position. To prevent contamination of the operative region, temporary stitches were inserted from the anus to the vagina and a gauze pack soaked in physiologic saline put in place. Through a femoribus internus–perineal approach, an approximately 10 cm incision was made medially from the base of the lateral aspect of the penis (pubic mound), along the lateral border of the scrotum (labia majora) and above the inferior ischial ramus, and finally to the ischial tuberosity (Fig. 1a). The skin, subcutaneous tissue, and deep fascia were incised layer by layer. The adductor group of muscles and the obturator externus were separated subperiosteally by sharp or blunt dissection from their pelvic attachments, thus exposing the lateral border of the inferior pubic ramus (Fig. 1b). When the tumor and involved bone had been completely exposed, care was taken to ensure that the plane of resection fell outside the affected zone. A high-speed saw was used to perform a segmental osteotomy that began at least 1 cm distal to each end of the tumor and the involved bone removed. The nerves, vessels and pelvic organs of operative region were divided and preserved where possible (Fig. 1c). The bone in the resected specimens measured 5.8×3.1 cm, 9.1×4.1 cm, 6.9×3.8 cm and 7.0×2.5 cm. The operative area was soaked with 60 °C sterile saline for 10 min and the area then washed with normal saline. The operative times were 36, 42, 39, and 33 min and blood loss 40, 80, 70, and 50 mL, respectively. Pathological examination of the resected specimens revealed giant cell tumor of bone, chondrosarcoma, desmoplastic fibroma, and bone metastases (poorly differentiated squamous cell carcinoma, Table 1).

After 5–7 days of routine nursing and scheduled dressing changes, moderate weight bearing exercise were allowed. The stitches were taken out two weeks postoperatively. The four patients were followed up for 40, 3, 29, and 10 months. There were no recurrences and initial pain associated with pelvic floor or limited joint mobility during passive stretching had completely resolved in three of the cases. One case had persistent slight limitation in range of motion of left hip joint and pain. Musculoskeletal Tumor Society (MSTS) scores were 28, 18, 27, and 22 at the final follow-up (Table 2)¹⁰.

Typical Case

A 45-year-old woman presented with progressive pain localized in the left pelvic floor that was aggravated by exertion or excessive exercise but did not occur at night and limited range of motion of the hip. On clinical bony physical examination no masses were felt in the left pelvic floor, posterior extension of the left hip joint was limited and the “4” test was weakly posi-

Fig. 1 Diagram of the femoribus internus–perineal approach demonstrating: (a) Lithotomy position, the incision (dotted red line) begins about 10 cm from the base of the lateral aspect of the penis (pubic mound) and extends along the lateral border of the scrotum (labia majora) and inferior ischial ramus to the ischial tuberosity. (b) The inferior pubic rami is identified and exposed. (c) A bone defect remains after removal of the inferior pubic rami and its attached tumor.

TABLE 1 Preoperative patient characteristics

Case	Sexr	Age (years)	Location of tumor	Margin	Operative time(min)	Blood loss (mL)	Size of excised tumor (cm)
1	M	22	Lytic lesion in the right inferior pubis ramus (giant cell tumor)	Marginal	36	40	5.8 × 3.1
2	M	27	Expanding lesion in the right inferior pubis ramus (chondrosarcoma)	Wide	42	80	9.1 × 4.1
3	F	32	Recurrence in right inferior pubis ramus after prior surgery (desmoplastic fibroma)	Marginal	39	70	6.9 × 3.8
4	F	45	Lytic lesion in the left inferior pubis ramus (bone metastasis)	Wide	33	50	7.0 × 2.5

tive. This patient had no obvious systemic symptoms of bone metastasis but her symptoms had restricted her activities of daily living. Anterior-posterior pelvis X-ray films and CT scan revealed osteolytic bony destruction of the left inferior pubic ramus. MRI demonstrated equal T₁ and long T₂ mixed signals from a 2.5 cm × 4.5 cm oval-shaped lesion on the left inferior pubic ramus (Fig. 2a–f).

To avoid prevent progression of her disease, surgery was performed to resect the tumor of the inferior pubic ramus through a femoribus internus–perineal approach. The patient was postoperatively monitored in a routine manner. After removal of the drainage strip, local incision infection developed; this was successfully managed with oral antibiotics and regular changes of dressing. She began gradual weight bearing 5 days postoperatively. Her stitches were removed 2 weeks after surgery. The final pathological diagnosis was bone metastasis from a poorly differentiated squamous cell carcinoma; the patient agreed to receive radiation therapy (Fig. 2g,h). At the final follow-up, pronounced relief of her previous severe pain was documented and she had a limited range of joint motion. There was no evidence of local recurrence and slight pain on walking, but basically she had returned to her previous life style. Her MSTS score was 22.

Discussion

The femoribus internus–perineal approach for resection of tumors in the inferior pubic ramus requires the patient to be in the lithotomy position with the feet raised. The patient's buttocks should be placed as close to the edge of operating table as possible, in order to better expose the perineal skin. During the operation, removing the adductor group of

muscles, obturator externus, bulbospongiosus muscle, and obturator internus subperiosteally from their pelvic attachments reduces the risk of bleeding.

The femoribus internus–perineal approach approach may be indicated for surgical management of chronic osteomyelitis, bone tumor or tuberculosis in the inferior pubic ramus. We recommend this approach for: (i) benign tumors and those malignant tumors that can be effectively controlled with chemotherapy/radiotherapy; and (ii) tumors damaging adjacent bone and invading the neighboring soft tissues (marginal or wide excision as indicated). Distant metastases may occur, but a good prognosis is likely.

At present, the usual approaches to resecting the inferior pubic ramus are the ilioinguinal or modified ilioinguinal approaches¹¹. As a consequence of the longer operative time, these approaches have greater rates of postoperative complications such as infection, greater blood loss, and soft tissue damage and are more difficult and risky. The femoribus internus–perineal approach utilizes the interval between muscles, providing better access to the inferior pubic ramus. It is therefore the ideal approach for reducing blood loss and avoiding nerve injury. Because the operation involves a short operative time and has only a minor influence on general status, it restores normal hip function faster and more effectively than the alternative approaches.

Depending on the extent of tumor invasion, the incision may be extended anteriorly to join the ilioinguinal approach to the pubic body and superior pubic ramus. The incision can also be extended posteriorly along the inferior ramus to the ischial tuberosity, permitting resection of part of the ischium. No matter where the incision is extended, the important vessels and nerves should protected as well as possible.

TABLE 2 Postoperative patient characteristics

Case	Follow-up (months)	Histologic features	Results	MTST score
1	40	Giant cell tumor	No recurrence or pain	28
2	3	Chondrosarcoma	No recurrence, slight deep tenderness	18
3	29	Desmoplastic fibroma	No recurrence or pain	27
4	10	Bone metastasis	Radiotherapy of uterus postoperatively; slight limitation in range of motion of left hip and pain	22

Fig. 2 Illustrative case of a 45 year-old woman: Preoperative (a) anterior-posterior pelvic X-ray film and (b) axial CT scan showing osteolytic bony destruction of the left inferior pubic ramus. (c) Axial MRI also demonstrated equal T_1 and long T_2 (d) mixed signals from the 2.5 cm $\times$ 4.5 cm oval-shaped lesion on the left inferior pubic ramus. (e,f) Anteroposterior radiograph and 3D CT scan 6 months after operation showing excision of the left inferior pubic ramus. (g) Pathologic examination showed oval cancer cells arranged in groups. Marked pleomorphism and nuclear fission were readily apparent, as was fibro-plastic proliferation. The margin was clear of tumor cells. (HE $\times$ 100). (h) Focal necrosis and small abscesses are visible in the tumor tissue (HE $\times$ 400).

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