Type 3 internal hemipelvectomy: a report of two cases

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ABSTRACT
Type 3 internal hemipelvectomy involves resection of the pubis. We report on 2 patients who underwent type 3 internal hemipelvectomy. One patient developed a bladder hernia, tumour recurrence, and a pathological fracture of the proximal femur. These were resolved with external hemipelvectomy 7 months later. Another patient underwent additional fascia lata transplantation to prevent development of hernia. Both patients had a stress fracture in the contralateral posterior ilium mimicking bone metastasis.

Key words: hemipelvectomy; hernia; pubic bone

INTRODUCTION
Internal hemipelvectomy is less destructive than external hemipelvectomy. Nonetheless, it is more technically challenging owing to the complex pelvic anatomy and proximity of vital organs, nerves, and vessels. It is associated with a poor prognosis, and a high rate of recurrence and postoperative complications. Internal hemipelvectomy can be classified according to the resection site into type 1 (the ilium), type 2 (the periacetabular region), and type 3 (the pubis). Type 2 is most studied, with various reconstruction options including endoprosthetic replacement, arthrodesis, and pseudo-arthrodesis. Type 3 accounts for approximately 10% of all types of internal hemipelvectomy. We report on 2 patients who underwent type 3 internal hemipelvectomy.

CASE REPORTS
Patient 1
In October 2011, a 65-year-old woman presented with recurrence of osteosarcoma in the left pubic bone and proximal posterior thigh soft tissue (Fig. 1a). 16 months earlier, the patient had undergone primary marginal resection and first-line chemotherapy elsewhere for osteosarcoma in the proximal hip...
adductors. According to the Union for International Cancer Control classification, the tumour was at stage 4, with multiple metastases to the lung and external pelvic lymph nodes.

The patient refused amputation and underwent 4 courses of second-line chemotherapy and resection of the 2 lesions. The entire left pubis, pubic symphysis, and medial body of the pubis were removed. The left abdominal rectus muscle was detached approximately 5 mm from the pubis. No ligament was noted, and fibrous tissue between the bladder and the left body of the pubis was cut. Reconstruction for the pubic defect was not performed; synthetic mesh was not used for the groin region to minimise the risk of infection.

One month later, the patient developed an incisional bladder hernia (Fig. 1b). The patient was unable to control the direction of urination and had difficulty standing unsupported because of discomfort. Magnetic resonance imaging revealed an abnormal area in the contralateral posterior ilium mimicking bone metastasis (Fig. 1c). The area decreased in size without treatment indicating a stress fracture.

Seven months later, she underwent external hemipelvectomy for a pathological fracture of the proximal femur secondary to tumour recurrence. The problems in urination and standing were resolved, despite a slight residual hernia (Fig. 1d).

The patient was satisfied with her urinary function. She was unable to walk, but could maintain a sitting position for 5 minutes unsupported. She died 13 months later from multiple lung metastases.

Patient 2

In August 2012, a 49-year-old man presented with a mass in the left pubic area. Core needle biopsy confirmed the mass to be a grade 2 chondrosarcoma. Whole body computed tomography and bone scintigraphy detected no evidence of metastasis. The tumour was resected along with the ipsilateral body and both rami of the pubis (Fig. 2a). Only a 5-mm wide attachment of the abdominal muscle and hip adductors to the left pubis was removed, as the chondrosarcoma was localised to the left pubis. There were no obvious ligaments between the bladder and the left pubis, and the ligamentous tissue corresponding to the left pubovesical ligament was cut (Fig. 2b). To avoid development of bladder hernia, the pubic defect was reconstructed with a free, double-folded fascia lata (Fig. 2c).

Two weeks later, the patient began to ambulate without assistance, but later complained of mild pain around the contralateral sacroiliac joint. T2-weighted magnetic resonance imaging revealed a high-intensity signal in the posterior ilium (Fig. 2d). The pain resolved without further treatment. At 21 months, the patient remained free of recurrence and complications (Fig. 2e). He had no limitations in his

Figure 1 Patient 1: (a) magnetic resonance images showing recurrence of osteosarcoma in the left pubic bone and proximal posterior thigh soft tissue (arrows) 16 months after primary marginal resection and chemotherapy. (b) After type 3 internal hemipelvectomy, a bladder hernia is noted. (c) Eight months later, a pathological fracture is noted in the left femur owing to tumour recurrence, and a stress fracture with marrow oedema (arrow) is noted in the right posterior ilium mimicking bone metastasis. (d) A residual hernia is noted after external hemipelvectomy.
daily activities, was satisfied with the surgery, and had a Musculoskeletal Tumour Society (MSTS) score of 30/30 (100%).

DISCUSSION

Incisional hernia secondary to external/internal hemipelvectomy has been reported. Only 2 cases of bladder hernia secondary to type 3 internal hemipelvectomy have been reported. One case was severe, could not be repaired surgically, and necessitated intermittent self-catheterisation. Symptomatic hernia secondary to hemipelvectomy is rare. No bladder hernia was noted in 25 patients with apparent anatomic shift of the pelvic viscera after external hemipelvectomy. Focal bladder prolapse through a small defect is more likely to cause symptoms than a bulky hernia after external hemipelvectomy.

The risk factors for bladder hernia following type 3 internal hemipelvectomy include gender, the extent of the operative field, and skin elasticity. In patient 1, her skin was thin and elastic, and the hip adductors had been removed. During external hemipelvectomy, exposure of the bladder was time-consuming owing to skin adhesion. Fascia lata transplantation or coverage with polypropylene mesh is recommended after type 3 internal hemipelvectomy.

In our patients, full-weight bearing and daily activities were allowed. Thus, both patients developed stress fractures, as pelvic ring disruption changed stress distribution on the posterior ilium. Insufficiency fractures mimic bone metastases on magnetic resonance imaging. After type 3 internal hemipelvectomy, the residual pelvic bones can become unstable and distorted during walking or running, resulting in increased stress on the posterior ilium and fatigue fractures. Attention should therefore be paid to stress fractures in the posterior ilium after type 3 internal hemipelvectomy.

CONCLUSION

Type 3 internal hemipelvectomy can cause bladder hernia, and thus non-bony reconstruction of the defect is recommended. Increased stress on the contralateral side of the pelvis can lead to fatigue fractures mimicking bone metastasis on magnetic resonance imaging.

DISCLOSURE

No conflicts of interest were declared by the authors.
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