Primary Marlex-mesh reconstruction in partial resections of the hemipelvis

Report of 2 cases

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A method for immediate anatomic reconstruction of the pelvis using Marlex (nylon) mesh is described, with good results in 2 cases of chondrosarcoma subjected to partial resections of the hemipelvis.

Partial or complete resections of the hemipelvis are associated with marked weakening of the lower abdominal wall, pelvic floor, and thigh adduction.

In order to prevent the risk of herniation and rectal and uterine prolapse in 2 cases of partial resection of the hemipelvis, we performed immediate reconstruction of the pelvic ring using Marlex (nylon) mesh. The operative technique and follow-up of the patients are presented.

Patients and methods

Operative technique

For resections of the pubic and/or ischial bones, we basically follow the technique described by Milch (1935) and Radley et al. (1954). For wider resections of the innominate bone or for a formal internal hemipelvectomy, we use the technique described by Steel (1978), which is an extension of the above-mentioned procedures.

After removal of the specimen, the urinary bladder invariably herniates laterally to the transected pubic symphysis and into the defect, while the peritoneum protrudes caudally and outwards from under the detached inguinal ligament, along the superior margin of resection. At this stage, we proceed with reconstruction of the defect while reducing the herniated organs (Figure 1).

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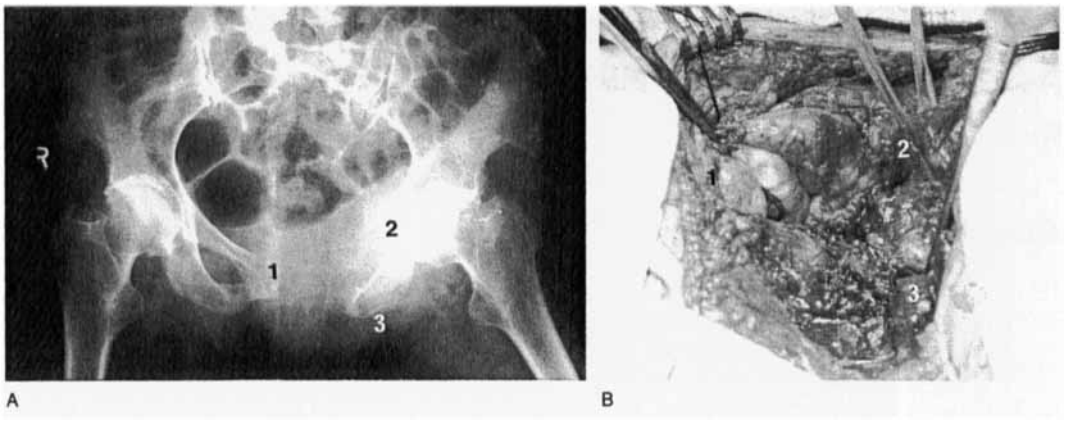
Following resections of the pubic-ischial bone(s), the defect is confined between three bony structures, the exact locations of which are a function of the extent of bone resection: namely, 1) superomedially: the pubic symphysis or the contralateral pubic bone; 2) superolaterally: the point of transection of the superior pubic ramus; and 3) inferiorly: the point of transection through the inferior pubic ramus, ischial ramus, ischial tuberosity, or body of the ischium (Figures 1 and 2).

Holes are drilled in these bony landmarks for passage of sutures, and the defect is bridged with a triangular-shaped piece of Marlex mesh, which should be drawn as taut as possible. Interrupted figure-of-eight sutures of No. 1 monofilament nylon are used. Good sized bits are taken through a double layer of mesh, achieved by folding the edge of the mesh back on itself.

The mesh has three taut and sturdy free edges. The lower anterior abdominal wall is sutured to the superior free edge of the mesh in a manner analogous to a Cooper ligament repair of an inguinal hernia. Working from medial to lateral, the lower edge of the rectus sheath and pyramidalis muscle and then the inguinal ligament are carefully approximated to the mesh until the medial wall of the femoral vein is reached. The inguinal ligament and external oblique aponeurosis are snugly sutured to the adventitia of the femoral vessels and to the sheath surrounding the femoral nerve. Lateral to the nerve, the lower abdominal wall is approximated to the fascia iliaca. Care must be exerted so that the femoral vessels (especially the vein) are not narrowed by the reconstruction, and that they and the femoral nerve are not compressed or kinked as they pass over the free superior edge of the mesh.

The inferior free edge of the mesh serves for reinsertion of the perineal muscles medially as well as



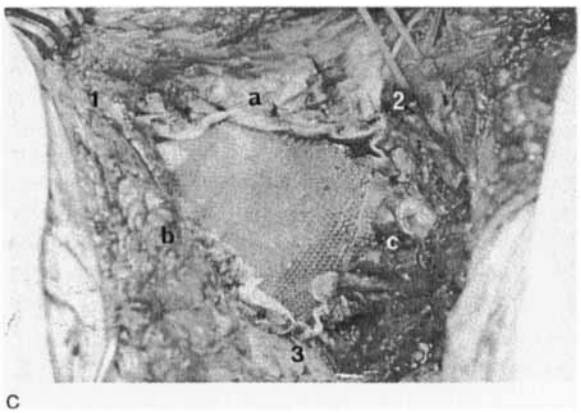


Figure 1. A 74-year-old woman with a low-grade chondrosarcoma of the left pubic bone. The left pubic bone was resected, including symphysis and superior and inferior rami to the ischial tuberosity, and immediate Marlex-mesh reconstruction was performed.

A. Extent of resection. Note the relative positions of points 1, 2, and 3.

B. Following removal of the specimen, the bladder and peritoneum herniate into the defect. Note: sponge-stick partially reduces the bladder, which is herniated laterally to the transected symphysis pubis (1); surgical tape encircles the femoral vessels and the femoral nerve near the point of transection of the superior pubic ramus (2); and the tip of the forceps points to the transection of ischial bone (3).

C. Reconstruction completed. Note the triangular-shaped Marlex mesh stretched taut between points 1, 2, and 3; anterior abdominal wall and inguinal ligament are sutured to the superior edge of mesh (a) analogous to a Cooper ligament repair of an inguinal hernia; inferior edge of mesh (b) serves for reinsertion of thigh adductors and musculature of the perineum; lateral edge of mesh (c) is sutured to underlying tissues to prevent posteriorly directed hernia.

the thigh adductors laterally. If the ischial tuberosity is resected, the sacrotuberous ligament should also be reinserted to the inferior free edge of the mesh.

It is important to suture the lateral free edge of the mesh to underlying muscles and to the capsule of the hip joint in order to prevent a posteriorly directed hernia, analogous to an obturator hernia but for its posterior direction.

The operative field is drained by closed suction drainage. The wound is closed in two layers in the usual manner. Perioperative antibiotic coverage is used.

Physical therapy and mobilization are started on the first postoperative day. On the second postoperative day, weight-bearing exercises are started, aided with a walker initially, and later with a cane. Patients should be walking freely and unaided within several weeks.

Case 1

A 74-year-old woman had a hard and slightly tender mass in her left pubic bone. The mass was osteolytic on radiographs and CT, had high scintigraphic uptake, and biopsy showed a low-grade chondrosarcoma. The patient underwent resection of the left pubic bone, including the symphysis and superior and inferior rami, to the ischial tuberosity, with immediate Marlex-mesh reconstruction (Figure 1). Physical therapy was started on the day following the operation, and she was out of bed and in an armchair.

On the second postoperative day, she began walking with the aid of a walker, and 3 days later she was walking with canes. The wound healed nicely, and the drain was removed after 72 hours. She was discharged on the 10th postoperative day. By that time, she was walking freely and unaided, although

she preferred to keep a cane handy. All the motor functions, including adduction of the left hip joint, were normal. One month postoperatively, she was completely asymptomatic and had resumed her normal activities. The perineum was intact with no laxity or postoperative hernia. Motor function of the left leg was normal, including adduction. Two years later, she remains asymptomatic, and the physical examination remains normal.

Case 2

A 34-year-old woman was admitted for resection of a large left ischiopubic tumor suspected of being a chondrosarcoma. This tumor had been slowly growing for several years, causing dyspareunia, necessitating delivery by cesarian section, and gradually compressing the vagina until sexual intercourse became impossible. Upon rectal examination the mass was felt compressing the left wall of the rectum, whereas vaginal examination was practically impossible due to compression by the mass.

Radiographs and a CT scan of the pelvis showed a large tumor, originating in the left pubic and ischial bones, bulging into the left obturator foramen and compressing the urinary bladder, rectum, and vagina. An intravenous pyelogram demonstrated compression of the bladder (Figure 2).

Removal of the tumor entailed resection of the entire left pubic bone, including superior and inferior rami, the pubic symphysis, partial resection of the

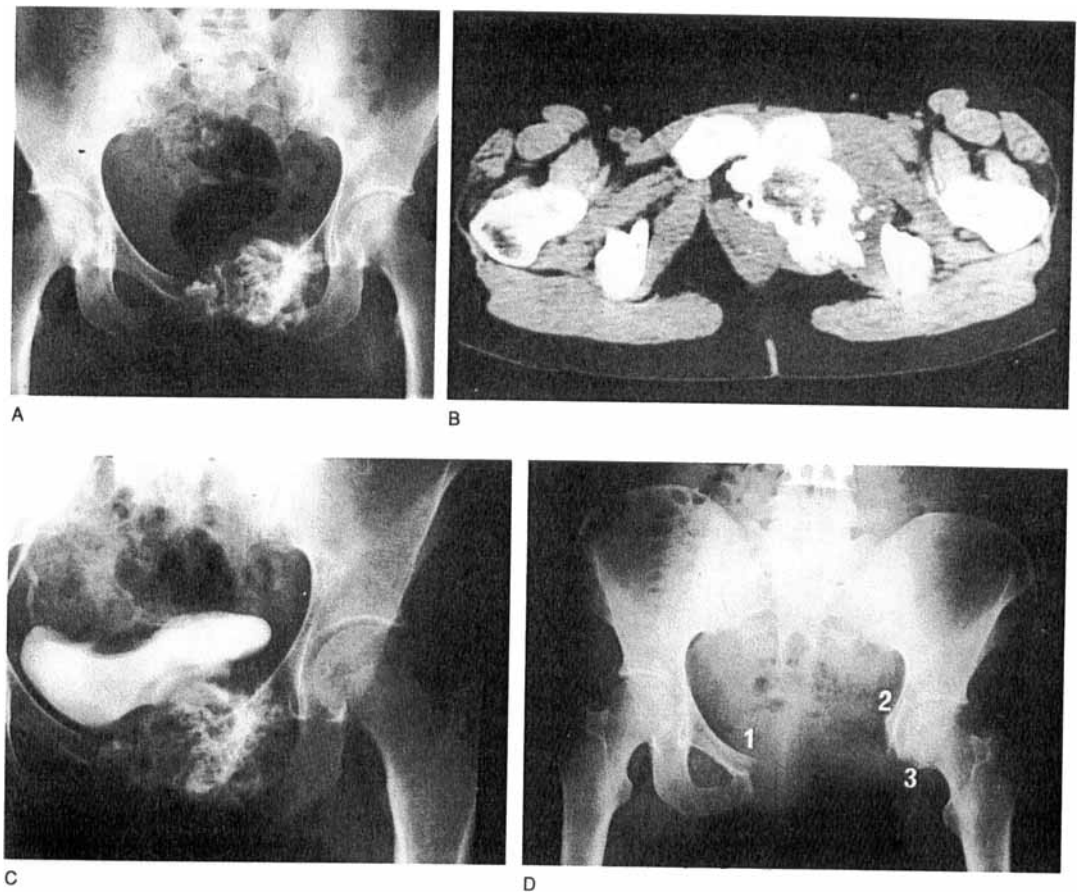


Figure 2. A 34-year-old woman with a low-grade chondrosarcoma of the left pubic and ischial bones. The large tumor extends beyond the midline and compresses the vagina, rectum, and bladder. The entire left pubic bone, the left ischial bone, and part of the body of the right pubic bone were resected, and immediate Marlex-mesh reconstruction was performed.

A. Extent of tumor.

B. CT scan demonstrating extent of tumor. Note extension of mass beyond the midline, causing displacement and compression of midline organs (vagina, urethra, rectum).

C. Intravenous pyelogram demonstrating displacement of the bladder.

D. Extent of resection. Note the relative positions of points 1, 2, and 3, and, accordingly, the elongation of the inferior free edge of the mesh (between points 1 and 3), and the extreme shortening of the lateral free edge (between points 2 and 3).

body of the right pubic bone, resection of the entire left ischial bone, including the ramus and tuberosity. The urethra, bladder, vagina, and rectum were carefully dissected away from the closely adherent tumor mass, and were preserved undamaged. The obturator nerve was identified and preserved. Immediate Marlex-mesh reconstruction was carried out.

Histologic examination of the surgical specimen showed a low-grade chondrosarcoma.

The postoperative course was uneventful except for a minimal wound infection in the perineal part of the incision. She was out of bed and sitting in an armchair on the day following surgery, and walking with the aid of a walker on the second postoperative day. By the time of her discharge on the 16th postoperative day, she was walking freely and unaided. Motor function of the left leg was intact, including adduction. Vaginal examination was normal, as were bladder and rectal function.

Two months postoperatively, she was walking freely and with no difficulty, and had resumed her normal daily activities. Her only complaint was with regard to the awkwardness of having to sit on her right buttock. One month later, she reported that she had resumed normal sexual activity with no difficulty.

Twenty months postoperatively, the patient complained of minimal urinary stress incontinence during attacks of coughing. Examination revealed a mild degree of laxity of the perineum to the left of the vagina, moderate weight gain, and some wheezing over both lungs. Pelvic radiographs and a CT scan showed no evidence of tumor recurrence. She was advised to lose weight, stop smoking, and control her bronchial asthma. Twenty-six months postoperatively, her condition remains unchanged.

Discussion

In their classic descriptions of the technique for resection of the pubic and/or ischial bones, both Milch (1935) and Radley et al. (1954) recommend a layer closure, neither mentioning the problem of postoperative hernia. Steel (1978), on the other hand, emphasizes the possibility of both anterior abdominal wall and perineal hernia formation. He attempts to prevent the abdominal wall hernia by anchoring the muscles in the inguinal area to the sartorius, rectus femoris and pectineus, whereas the perineal muscles are attached to the thigh adductors to augment the stability of the perineum. One of Steel's 5 patients developed a severe rectal prolapse postoperatively. Enneking (1983) considers soft-tissue or bone reconstruction unnecessary. It must be pointed out that he keeps his patients in bed and in traction for 6–8 weeks postoperatively while fibrous scar tissue forms in the area of resection.

The technique we describe here is reconstruction of the pelvic ring and the partition between the pelvis and upper thigh. In addition to strengthening of the lower anterior abdominal wall, inguinal region, and pelvic floor, and prevention of herniation and prolapse of organs in these regions, reinsertion of the thigh adductors and the musculature of the pelvic floor is achieved, resulting in marked improvement, if not full restoration, of their motor functions.

Marlex mesh is a readily available material that has been widely used for reconstruction of defects of the abdominal and chest walls. These are basically soft-tissue replacements. We are unaware of reports of reconstructions in which Marlex mesh was used as a substitute for parts of the bony pelvis.

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