

Approach to the Pelvis: Type I.

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Introduction

Large exposures to the pelvis are required in tumor and trauma surgery. There are a number of classifications for approaches and resections of the pelvis. Sometimes, particularly in fracture treatment, only limited parts of these large exposures are required, depending on the fracture type and location. Acetabular fractures are approached by using a Kocher-Langenbeck, an ilioinguinal, an extended iliofemoral, or modified triradiate approaches. Here, we describe the exposure of the entire pelvis as it is used in tumor surgery and as originally described by Enneking, incorporating all (limited) exposures for fracture treatment of the pelvis.

Approach to the Posterior Pelvis (Enneking Type I Resection)

Indication

1. Tumors of the Ilium and ilio-lumbar junction
2. internal and/or external hemipelvectomy
3. fractures of the ilium

Technique

1. Positioning: The patient is positioned in the “floppy lateral” position and is held with anterior and posterior side supports at the chest wall. This allows the patient to be rolled forward and backward to gain optimal visualization and access to the pelvis, in addition to rolling the operating table. Jack-knifing the table assists in drawing the iliac crest and costal margins apart to create more space for the exposure. The legs as well as the ipsilateral arm, which lies on an arm bench, are well padded. (Fig. 1)
2. Landmarks: One should palpate the entire iliac crest. Posteriorly, the processus spinosi, the sacrum with the PSIS, anteriorly, the ASIS, the symphysis and the greater trochanter are marked out with a marking pen.
3. Incision: The incision is centered along the iliac crest, beginning posteriorly at the posterior superior iliac spine and curves forward along the iliac crest to reach the anterior superior iliac spine. Depending on the exact localization and extent of the tumor, this incision may be extended anteriorly to the inguina (ilio-inguinal) or to the thigh (ilio-femoral approach, please see Type II resections). Posteriorly, if the tumor lies in the ilio-lumbar junction, the incision may be extended over the PSIS to the midline, where it joins perpendicularly the midline incision over the processus spinosi. (Fig.2)
4. In a first step, the abdominal wall musculature is transected off the iliac crest. Large fasciocutaneous flaps are raised and reflected medially and posteriorly. Depending on the length of incision anteriorly, the sartorius and tensor fasciae latae muscles are transected from their tendinous insertions and reflected distally.
5. The exposure of the externa of the posterior pelvis includes the release of the gluteal muscles based on the pedicle of the inferior gluteal vessels, as well as the complete release

of the abdominal wall musculature. The gluteus maximus muscle is released from the iliotibial band and from the gluteal tuberosity of the femur, and reflected posteriorly. The superior gluteal vessels may be sacrificed early to prevent inadvertent division and retraction into the pelvis where control of hemorrhage may be difficult. (Fig.3.)

6. The sciatic notch with the emerging sciatic nerve and gluteal vasculature is identified. The piriformis muscle emerges together with the nerve and may lie wholly in front of the nerve or the nerve may divide within the notch into its femoral and tibial components, which may be split by the course of the piriformis muscle. (Fig.4)
7. Depending on the tumor extent, the gluteus medius muscle is transected through its substance, 2-3 cm distally to the inferior border of the tumor. It is important to save as much muscle belly as possible.
8. The exposure of the interna of the posterior pelvis is achieved by a retroperitoneal access and through the ilioinguinal component of the incision. This approach maintains the bowel and viscera in a single sac that provides good control over these structures. The operating table may be rolled forward to tip the viscera away from the side of surgery. Deep, broad blade retractors are helpful for maintaining firm but gentle retraction of the abdominal contents.
9. The plane between the iliacus and the psoas muscle is carefully developed where the femoral nerve is identified. The femoral nerve lies to the lateral and deep side of the psoas muscle, whereas the obturator nerve lies to its medial and deep side. The iliac vessels pass from the midline laterally over the psoas muscle to form the external iliac artery and vein. The internal iliac system passes backwards towards the sciatic notch medial to the lower part of the psoas muscle. The ureter crosses these vessels. These structures are identified and tagged. Division of the psoas muscle may facilitate greater exposure of the iliac vessels as they enter the lesser pelvis. The iliac muscle is transected through its substance or left with the specimen depending on the tumor extent (Fig.5).
10. When the exposure is complete, the osteotomy can be performed. The goal is to resect an iliac tumor with the iliacus muscle covering the inner aspect of the pelvis with the gluteus minimus and/or medius covering the outer aspect of the pelvis, which allows containment of the tumor.
11. Prior to the osteotomy, the exposure is optimized. A malleable retractor is inserted through the greater sciatic notch, along the inferior border of the inner table, and out just underneath the anterior superior iliac spine to protect the pelvic viscera. Particular attention is focused on the protection of the superior gluteal vessels as they exit the superior aspect of the sciatic notch, and the lumbo-sacral plexus of the sciatic nerve as they pass over the distal and lateral anterior aspect of the sacral ala. (Fig.6)
12. The osteotomy passes in line with the sacro-iliac joint either medial or lateral to it. After mobilization and retraction of the iliac vessels and the L4 and L5 lumbar nerve roots, the joint is opened from within the pelvis. Distally, the ilium is transected above the hip capsule, leaving the origin of the rectus femoris muscle and the roof of the acetabulum intact. Care is taken not to enter the hip joint. (Fig.7)

13. The ilio-transverse ligament, a strong structure passing laterally from the transverse process of the 5th lumbar vertebra to the iliac crest, is divided to allow mobilization of the specimen. The ilio-lumbar vessels, which lie inferior to this structure, are ligated to prevent bleeding

Pearls and Pitfalls

- Involvement of the sciatic notch by tumor: Preoperative MRI gives critical information as to the expected challenges to dissecting out the sciatic nerve and securing the internal iliac vessels.
- Medial extent of the tumor mass: Large, medially projecting tumors make dissection and securing of the internal iliac vessels as well as visualizing the lumbosacral plexus as it enters the sciatic notch difficult.

Figures

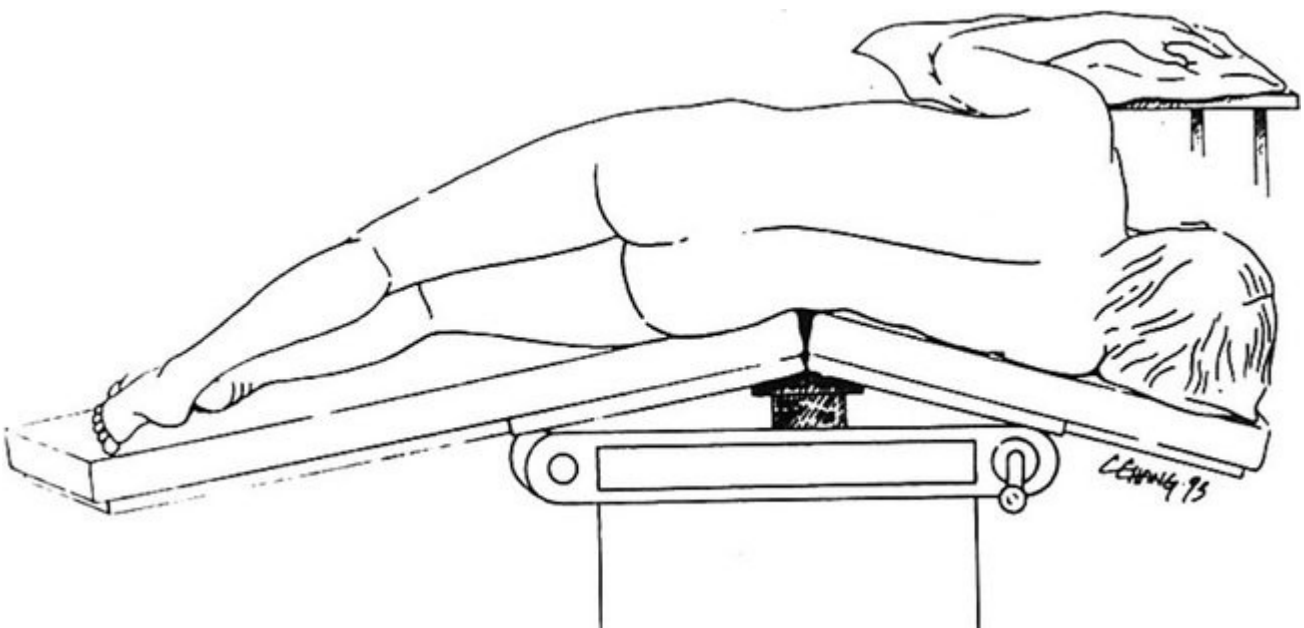
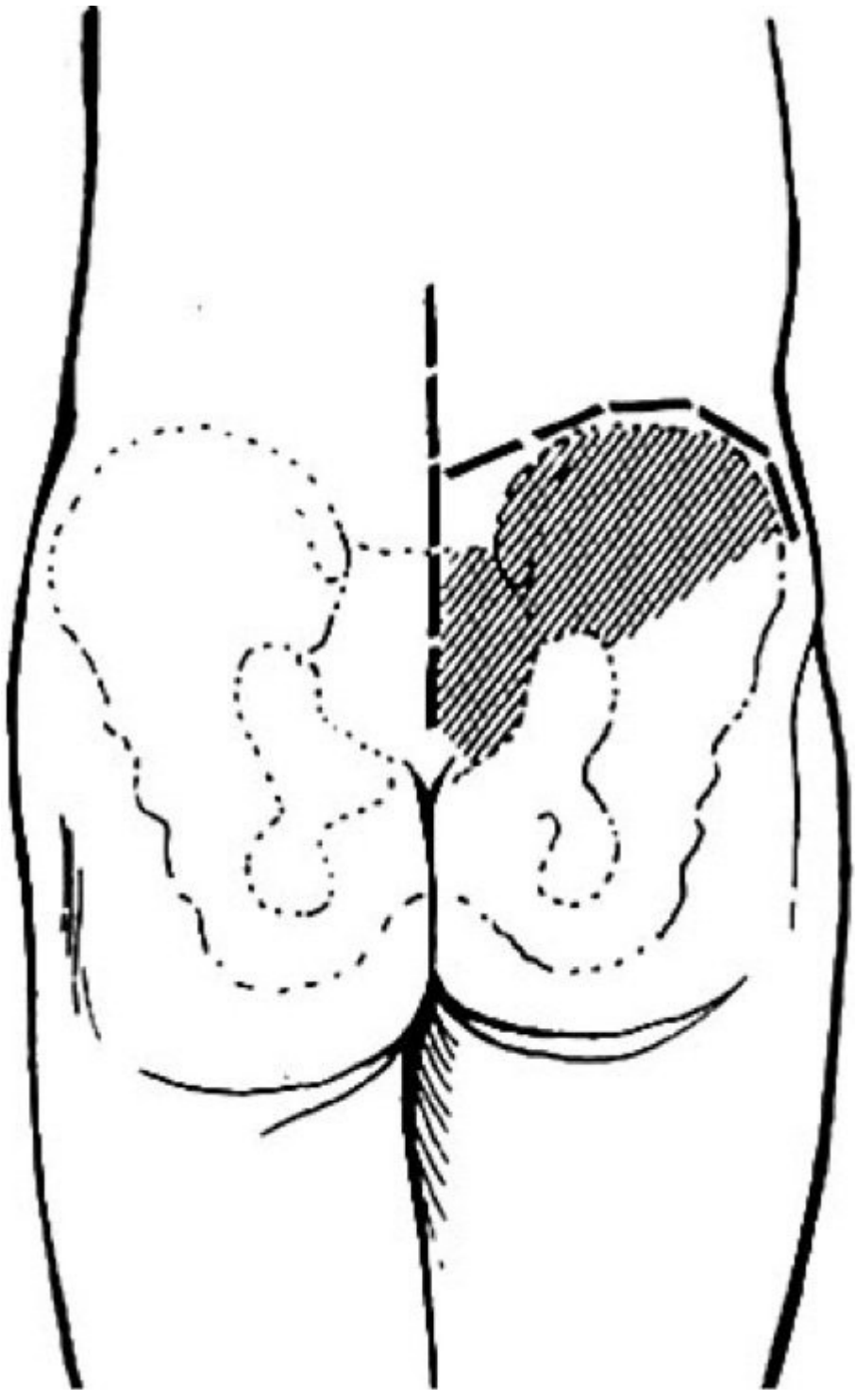


Figure 1: The floppy lateral position allows the patient to be rolled forward and backward, and to “jack-knife” the table in order to enlarge intrapelvic exposure.



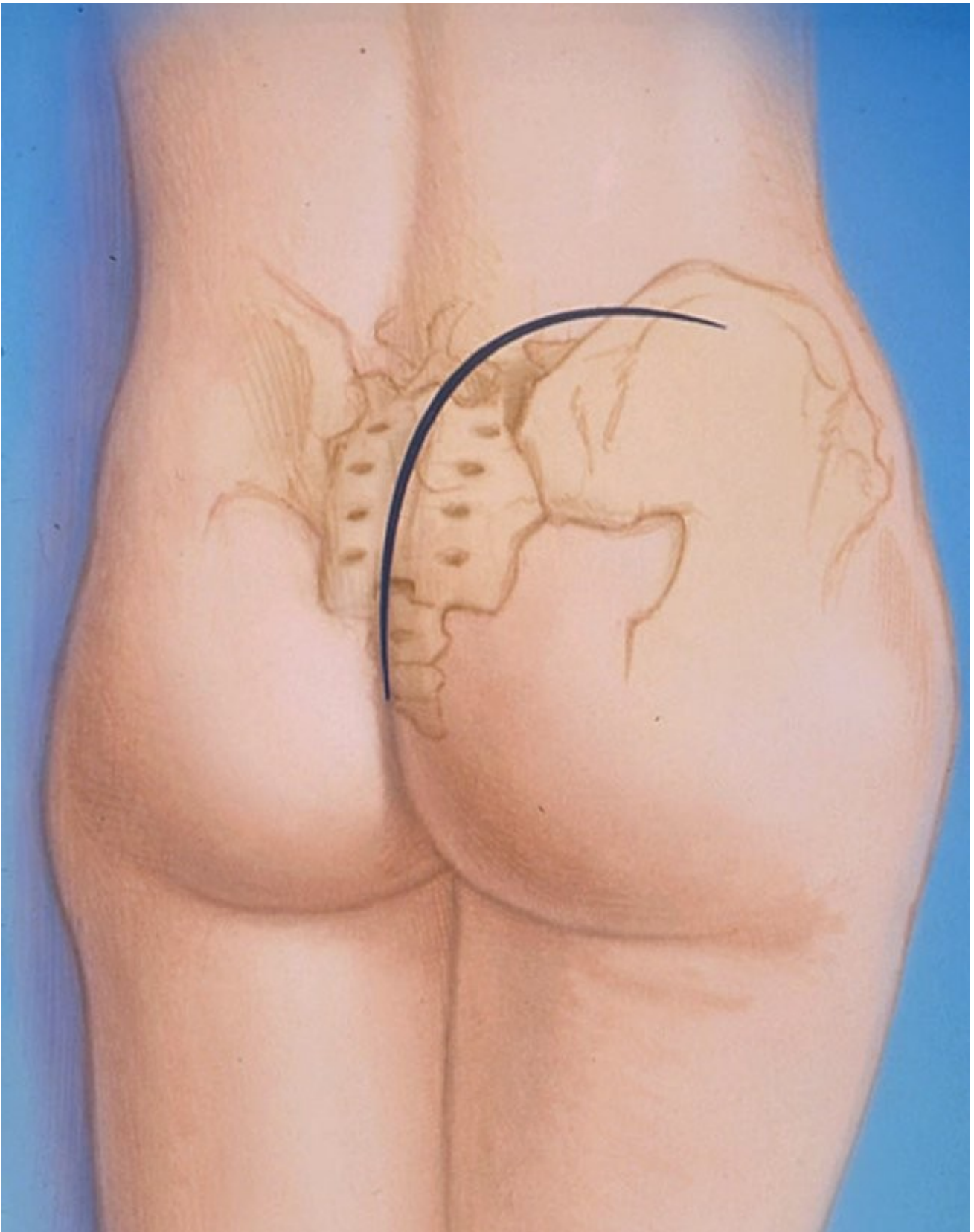
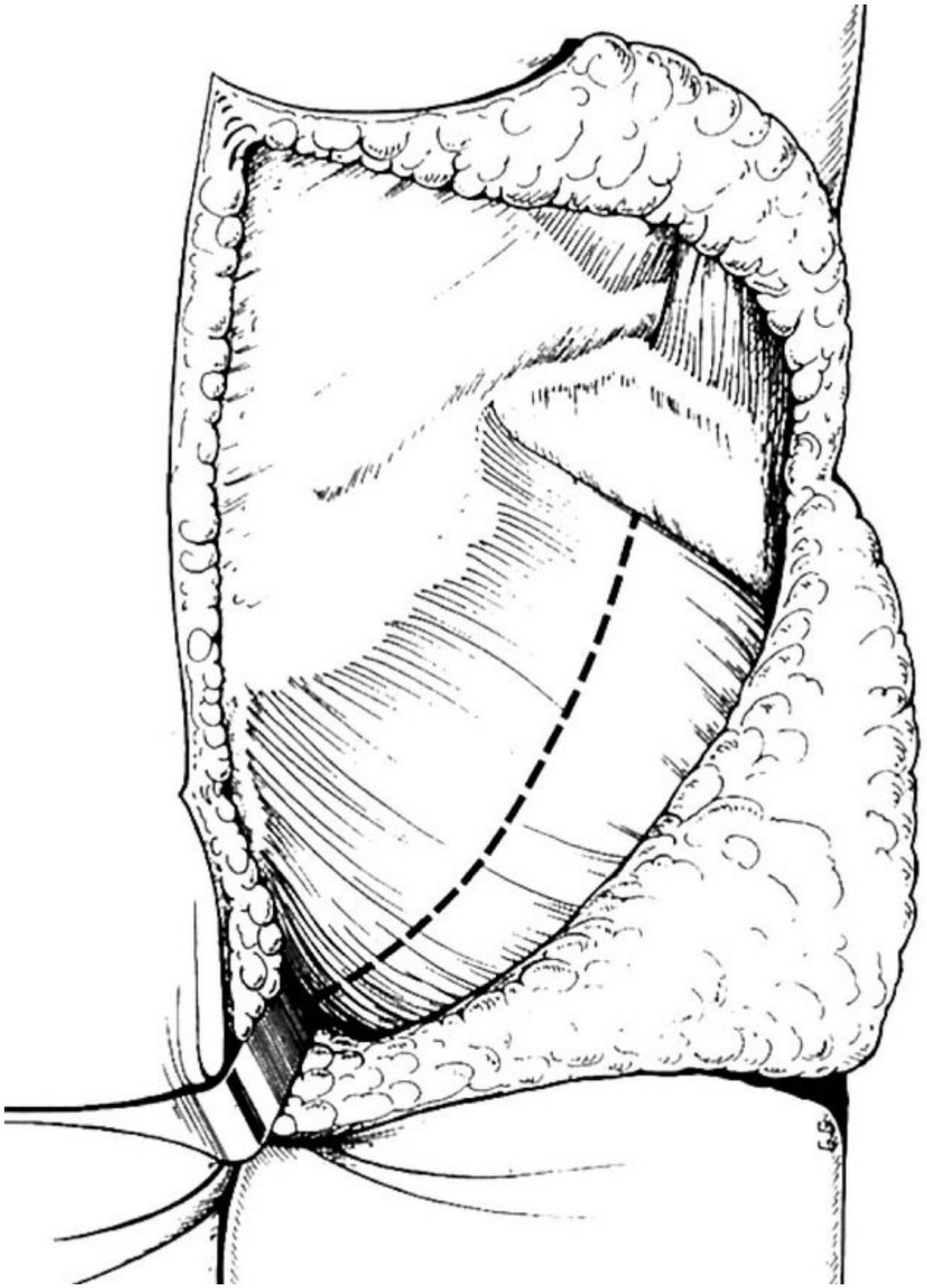


Figure 2: The posterior incision can either be curved centered over the PSIS or, depending on the exact location of the tumor, to perpendicularly join a midline incision, which can be extended proximally.



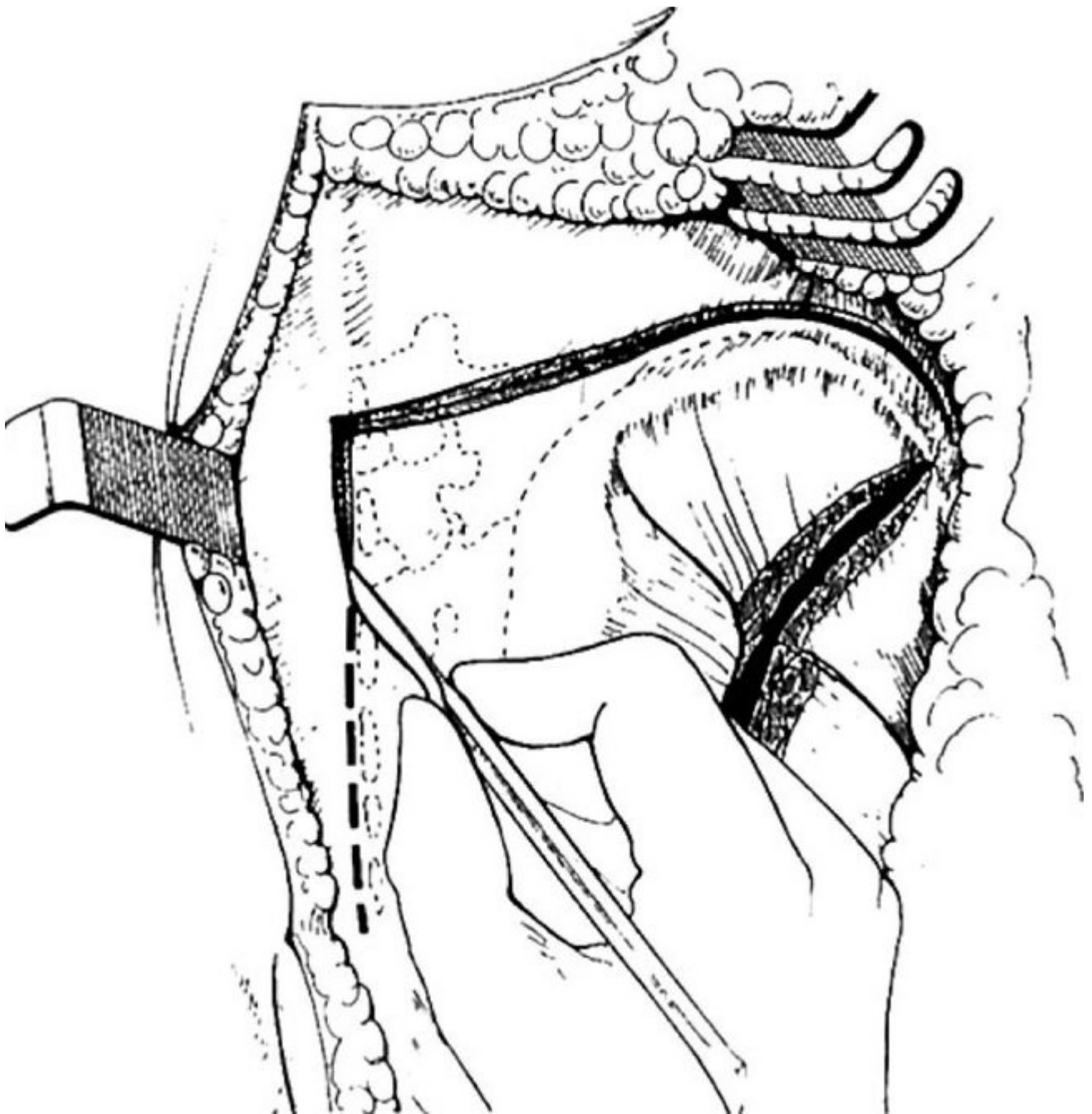


Figure 3: The abdominal wall and gluteal musculature as well as the lumbar fascia and paravertebral fascia are released along the iliac crest.

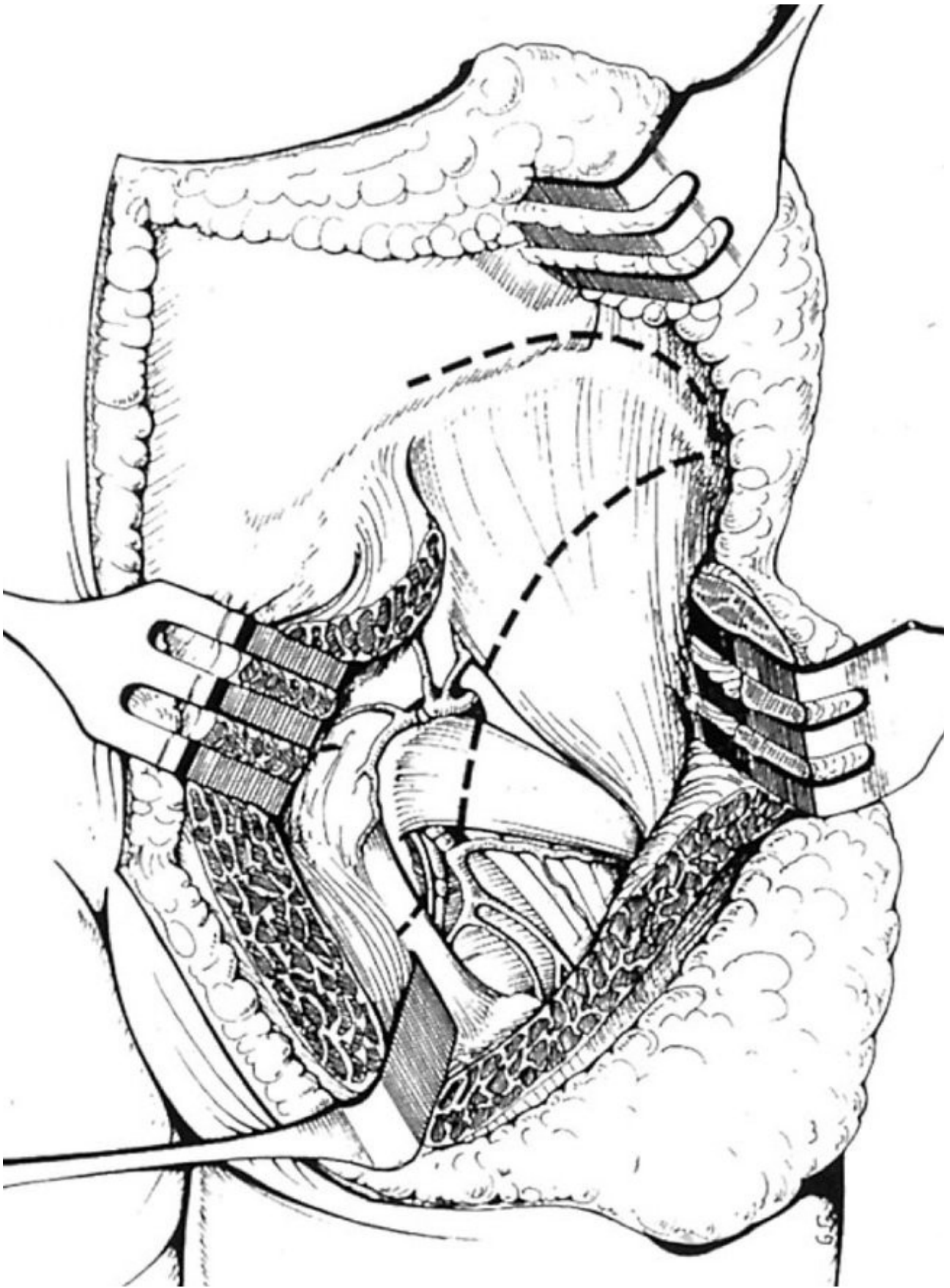


Figure 4: The superior gluteal vassels are identified and tied. The gluteus medius and piriformis muscles as well as the sacro-tuberous ligament are severed.

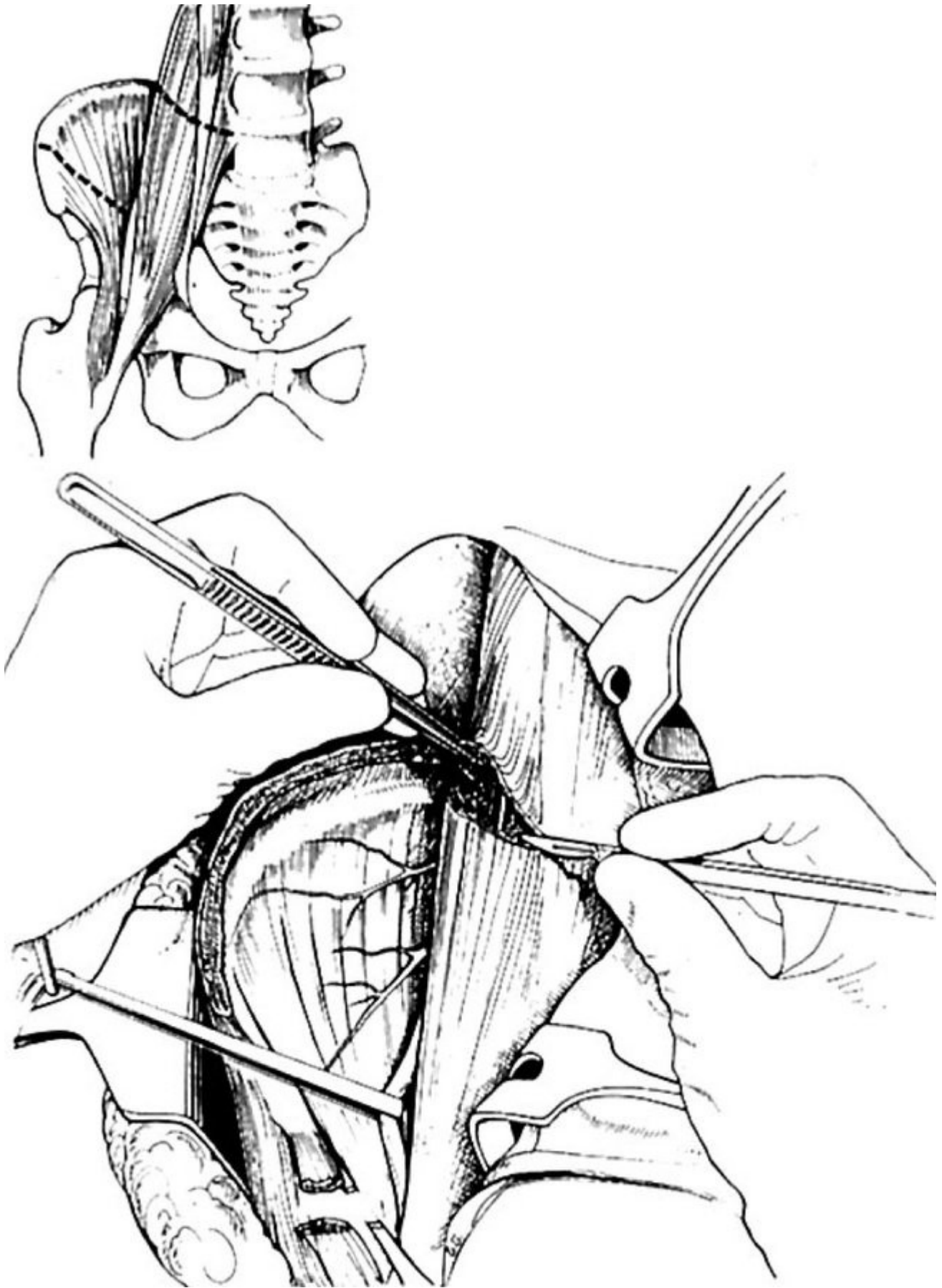


Figure 5: Division of the psoas muscle and iliacus muscles facilitates greater exposure, while the femoral nerve, lumbosacral trunk and ureter are preserved.

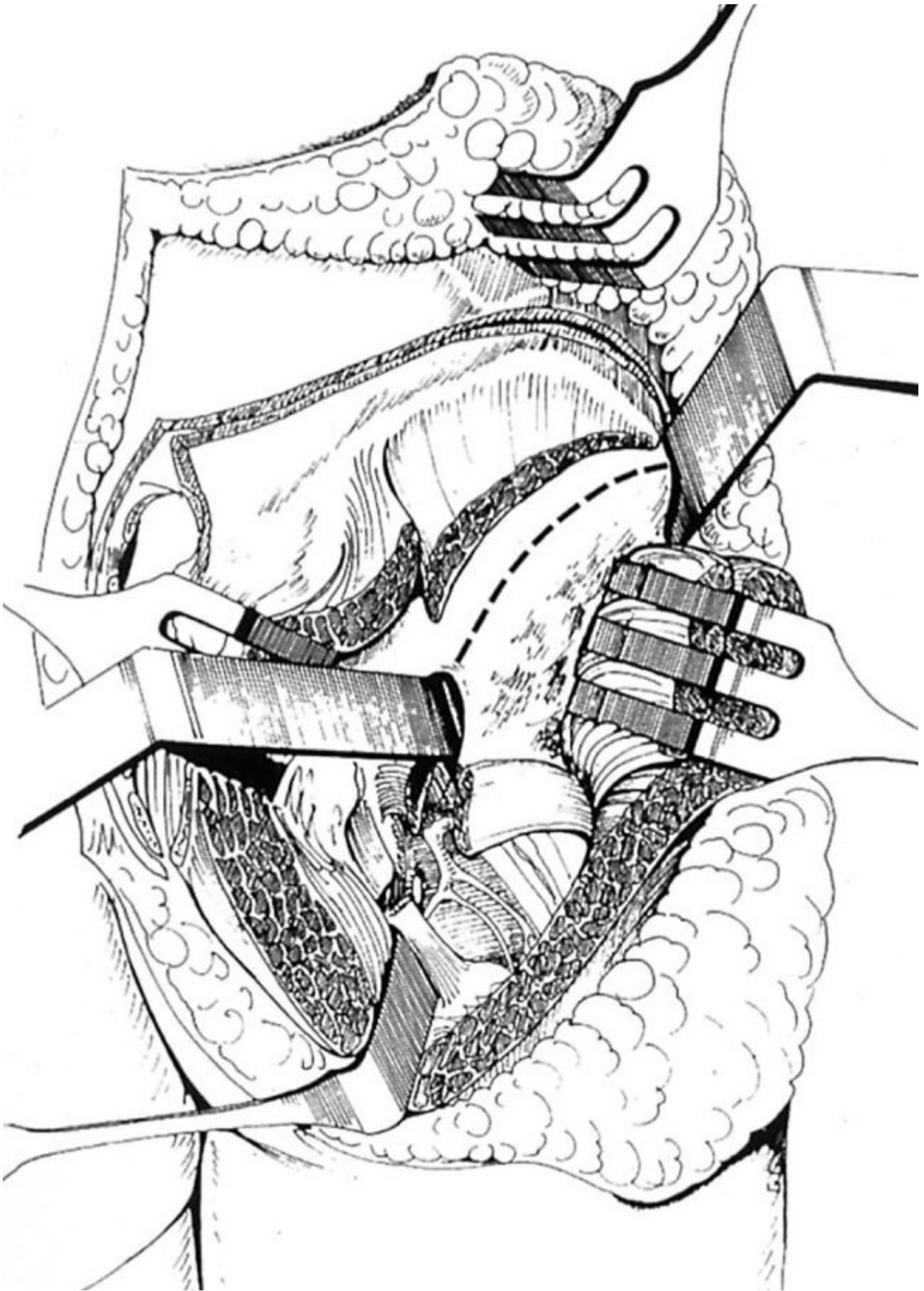


Figure 6: Prior to the osteotomy, the sciatic notch is exposed and the gluteal vessels protected.



Figure 7: The posterior osteotomy lies either medial or lateral to the SI-joint.