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Appendix

Surgical Technique

Anesthesia, Patient Positioning, and Other General Considerations

Following administration of regional and general anesthesia, a Foley catheter is placed and the patient is positioned in the lateral decubitus position with all pressure points padded. A post is utilized posteriorly at the lumbosacral junction and the patient's torso is stabilized with silk tape extending from the lumbosacral post to the inferior margin of the rib cage. The operative leg is prepped and draped into the field to enable unencumbered manipulation of the hip during the procedure. The operative field should extend from the gluteal cleft posteriorly to the umbilicus anteriorly to permit adequate access for the two-incision approach. Cell saver is utilized throughout the procedure and the anesthesiologist maintains optimal mean arterial blood pressure of 60 – 65 mmHg. Preoperative antibiotics and 1000 mg of tranexamic acid are administered 30 minutes prior to incision, with the tranexamic acid re-dosed after 3 hours to reduce perioperative bleeding.

Posterior Approach and Bony Cuts

The operative leg is placed on a mayo stand with the hip extended and knee flexed to relax the sciatic nerve. A 4 to 6 cm oblique incision is made in line with the gluteus maximus fibers, positioned equidistant from the greater trochanter and ischial tuberosity and centered on the proximal aspect of the greater trochanter. Subcutaneous dissection is carried down to the

gluteus maximus fascia which is incised in line with the muscle fibers and tagged for retraction and manipulation. The surgeon's index fingers are then utilized to bluntly dissect the gluteus maximus fibers in line with the fascial incision to expose the perineural fat overlying the sciatic nerve. Care is taken to preserve a common plane as the posterior approach is deepened. A self-retaining Bankart retractor is then inserted to retract the gluteus maximus muscle fibers. The sciatic nerve is mobilized from the greater sciatic notch to the level of the hamstrings and reflected posteriorly, bringing into view the short external rotators. A central interval is created in line with the short external rotator fibers using long Metzenbaum scissors. Angled lane retractors are then placed through the interval and directed proximally into the greater sciatic notch and distally into the infracotyloid fossa, exposing the ischium just beneath the hip joint (Figure 1A). The ischial bony cut is then initiated with an oscillating saw (Precision, Stryker), preserving 10-15 mm of posterior column (Figure 1). After both near and far cortices are cut in the distal aspect of the osteotomy, a curved osteotome is used to extend the bone cut 2-3 cm proximally at an approximate 120-degree angle (Figure 1B), again addressing both near and far cortices. At the proximal third of this upward-directed osteotomy, only the near cortex is cut. The sciatic nerve is directly visualized and protected throughout this portion of the procedure and fluoroscopy is not required. When the osteotomy has been completed, the interval in the short external rotators is re-approximated and the gluteus maximus fascia is closed. Subcutaneous and skin closure is performed per routine and a sterile dressing applied. The patient is then repositioned supine by having the circulating nurse remove the lumbosacral post and silk tape under the drapes, and utilizing the draw sheet to turn the patient while the surgeon monitors the pelvis and lower extremities. The original draping is preserved and there is no need to re-prep

and drape. All pressure points are again padded under the drapes and attention is directed to the anterior pelvis.

Anterior Approach and Bony Cuts

A 4-6 cm oblique incision is made one fingerbreadth below and in line with the iliac crest, centered on the anterior superior iliac spine (ASIS). Subcutaneous dissection is carried down to the fascial layer and the skin is mobilized to the inner border of the iliac crest. The interval between the sartorius and tensor fascia lata (TFL) is identified just distal to the ASIS by palpation and passive hip flexion/extension. A triangle is placed behind the knee to gently flex the hip while the TFL/sartorius interval is developed. The dissection is extended subperiosteally, proximally along the iliac crest to elevate the external oblique aponeurosis. The ilioinguinal ligament/sartorius insertion is elevated from the ASIS and tagged for identification and later repair. Care is taken to maintain subperiosteal dissection at the level of the iliac crest and ASIS to preserve the lateral femoral cutaneous nerve (LFCN). Dissection is carried into the inner pelvis elevating the iliacus muscle and inferiorly into the sulcus between the ASIS and anterior inferior iliac spine (AIIS). The hip is then flexed to 70 degrees to relax the iliopsoas and partial detachment of proximal rectus fiber from the AIIS is performed, to facilitate access to the pubic root. An angled crescentic osteotome is advanced subperiosteally along the superior cortex of the pubic root and under the hip flexor, in preparation for the pubic osteotomy. Fluoroscopic views are obtained to position the osteotome approximately 5 mm medial to the medial teardrop, angled laterally to complete the inferior aspect of the pubic cut just medial to, or at, the medial border of the teardrop. A specifically designed sciatic notch retractor is then placed in the inner

pelvis and the iliac step cuts are made with a reciprocating saw in accordance with the desired degree of lateral correction (Figure 2A).[1] A modification is made to the C-cut, which is directed inferiorly, using an angled crescentic osteotome. The posterior aspect of the iliac cut (C-cut) is then connected to the proximal aspect of the ischial cut under fluoroscopic visualization (Figure 2B) to complete the osteotomy and mobilize the central acetabular fragment (CAF). Importantly, during this step only the inner pelvic cortex needs to be cut when connecting the C-cut to the ischial cut, because the outer cortex was cut through the posterior approach. Given that the sciatic nerve lies in close proximity to the distal outer cortex, and this area was already cut 3 cm proximally through the posterior approach, the risk of nerve damage is low. The corrective maneuver is then performed using a joystick type external fixator with two 5.0 mm Schanz pins[1], and the CAF is provisionally stabilized with pins. A digital flat-plate x-ray is obtained with orientation to match the preoperative weight bearing and standardized AP pelvis radiograph to allow for direct comparison of the repositioned CAF. The hip is checked for range of motion (ROM) to ensure that overcorrection (and resultant impingement) has not occurred by comparing it to the preoperative examination under anesthesia. When the correction is deemed optimal, three to four cannulated screws are inserted to stabilize the CAF (4.0 – 5.5mm cannulated, fully threaded metal screws, Smith & Nephew). The exposed A-cut and proud AIIS (if present) are removed to avoid the “double bump” deformity and the bone is placed into the C-cut gap as bone graft. The hip is again assessed for functional range of motion and further AIIS reduction is completed as needed to eliminate sub-spine impingement. The rectus femoris is then reattached using all-suture anchors. The sartorius and ilioinguinal ligament are repaired through bone

tunnels to the ASIS and the fascia is closed. Skin is closed per routine and a sterile dressing is applied.

References

1. Mei-Dan O, Jewell D, Garabekyan T, et al. The Birmingham Interlocking Pelvic Osteotomy for acetabular dysplasia: 13- to 21-year survival outcomes. *Bone Joint J*. 2017 Jun;99-B(6):724-31.