

SUBSPECIALTY PROCEDURES

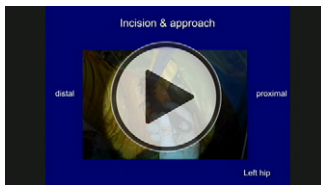
SPHERICAL PERIACETABULAR OSTEOTOMY

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Published outcomes of this procedure can be found at: *J Bone Joint Surg Am.* 2021 Sep 15; 103(18):1724-33

Investigation performed at Iizuka Hospital, Iizuka, Fukuoka, Japan

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Abstract

Background: Various techniques for periacetabular osteotomy have been reported to prevent the progression of osteoarthritis in dysplastic hips¹⁻⁵. Bernese periacetabular osteotomy, which involves the use of an anterior approach, is widely performed throughout the world because it offers preservation of the blood supply to the bone fragment and lateral pelvic muscles. However, Bernese periacetabular osteotomy has potential complications, such as nonunion at the osteotomy site, postoperative fracture, nonunion of the pubis and ischium, and damage to the main trunk of the obturator artery. Spherical periacetabular osteotomy (SPO) has been developed to resolve some of disadvantages of Bernese periacetabular osteotomy⁶. Although SPO involves some technical difficulty, the procedure is safe when performed with use of appropriate preoperative 3-dimensional planning and surgical technique.

Description: Preoperative 3-dimensional planning is utilized to decide the radius of the curved osteotome, locations of the reference points for the osteotomy line, and depth of the bone groove at the teardrop area. The pelvic positioning is arranged fluoroscopically to match the neutral position based on preoperative planning. A 7-cm incision is made along the medial margin of the iliac crest. An anterior iliac crest osteotomy of 4.5 cm (length) × 1 cm (medial wedge-shaped) is performed. The operative field is maintained with aluminum retractors. The osteotomy line is completed by connecting the preoperatively planned reference points on the inner cortex of the ilium. The bone groove is made along the osteotomy line with use of a high-speed burr. A blunt osteotome is inserted into the bone groove at the teardrop area until it reaches the preoperatively planned depth. The blunt osteotome makes a pathway for the curved osteotome without breaking the quadrilateral surface (QLS) or perforating the hip joint. The special curved osteotome is inserted manually until it reaches the bottom of the groove, and the posterior cortex is cut. After the top of the teardrop is divided fluoroscopically, the anterior ischial cortex is osteotomized with a sharpened spiked Cobb elevator at the infracotyloid groove. An angled curved osteotome is used for the osteotomy of the superior area of the teardrop area. The bone fragment is rotated with a spreader and an angled

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retractor, and fixed with 2 absorbable screws. Beta-tricalcium phosphate blocks are inserted into the bone gap. The osteotomized wedge-shaped iliac bone is repositioned and fixed.

Alternatives: Alternatives include the Bernese periacetabular osteotomy, rotational acetabular osteotomy, and triple innominate osteotomy.

Rationale: Bernese periacetabular osteotomy utilizes an anterior approach, cuts into the QLS, and preserves the posterior column. In contrast, SPO preserves the QLS and does not cut the pubis. These features of SPO have some advantages. The large osteotomized surface is advantageous for osseous fusion, and preserving the QLS and pubis protects the trunk of the obturator artery. Furthermore, the preservation of the connection between the ilium, ischium, and pubis in SPO maintains a more stable pelvic ring than in Bernese periacetabular osteotomy. The osteotomy line is arranged to prevent leg shortening caused by thin medial bone stock of the bone fragment. Although splitting the teardrop area in SPO is somewhat technically difficult, particularly in cases with a thin teardrop, it can be safely done with use of preoperative 3-dimensional planning and appropriate surgical technique.

In addition, the use of our medial wedge-shaped osteotomy at the iliac crest has 2 advantages: protection of the lateral femoral cutaneous nerve and preservation of the attachment of the tensor fascia latae muscle.

Expected Outcomes: The advantages of SPO are a stable pelvic ring postoperatively, reduced risk of nonunion at the osteotomy site, no risk to the trunk of the obturator artery, preservation of the blood supply to the bone fragment, a small incision, and early muscle recovery.

Important Tips:

- Preoperative 3-dimensional planning of the osteotomy design is essential.
- The special curved osteotomes are designed so that osteotomy of the posterior cortex is completed when the handles are perpendicular to the pelvis.
- The special curved osteotomes are made with a radius of either 50 or 60 mm, which are the most suitable sizes for the Japanese population. Larger-diameter osteotomes may be required for different races.
- As the rotated bone fragment is relatively small, it is difficult to obtain rigid fixation of the osteotomy site. Hence, the fragment can move slightly in the early phase after surgery. Careful rehabilitation is needed.

Acronyms and Abbreviations:

- AIIS = anterior inferior iliac spine
- ASIS = anterior superior iliac spine
- LFCN = lateral femoral cutaneous nerve
- G.T. = greater trochanter
- K-wire = Kirschner wire
- Beta (β)-TCP = beta-tricalcium phosphate

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