Periacetabular osteotomy: a systematic literature review
Clohisy JC, Schutz AL, St John L, Schoenecker PL, Wright RW

CRD summary
This review assessed periacetabular osteotomy (PAO) on clinical and radiographic outcomes, and complications. The authors appeared to conclude that PAO successfully achieved radiographically defined deformity correction and there were clinical benefits in younger patients without preoperative osteoarthritis, but complication rates were high. The uncertain quality of included studies and potential biases in the search made the reliability of the conclusions unclear.

Authors' objectives
To evaluate the effects of periacetabular osteotomy in terms of clinical and radiographic outcomes and complications.

Searching
PubMed, CINAHL, EMBASE and The Cochrane Library were searched from 1950 to 2008 for articles published in English. Search terms were reported. Bibliographies of the included studies were searched for additional studies. Clinical Orthopaedics and Related Research, Journal of Bone and Joint Surgery (British and American volumes), Acta Orthopaedica, Journal of Arthroplasty and International Orthopaedics journals were handsearched for articles published between November 2007 and February 2008.

Study selection
Eligible studies assessed Bernese periacetabular osteotomy (PAO) with at least two years follow-up and had to report on clinical and radiographic outcomes. Excluded studies were case reports and studies that investigated femoro-acetabular impingement associated with acetabular retro version or dysplasia associated with specific syndromes (such as neuromuscular dysplasia, Downs' Syndrome and polio myelitis).

Most of the included studies were retrospective designs with a high proportion of female patients with a mean age range from 18 to 34 years. Where reported, between 12% and 100% of patients had undergone previous surgery. Methods of reporting clinical outcomes and complications were varied; outcomes that related to radiography and range of motion (where reported) were more consistent.

Two reviewers selected studies for inclusion.

Assessment of study quality
The authors did not report that they carried out a formal validity assessment.

Data extraction
Data were extracted on mean changes in radiographic outcomes related to: deformity correction; pain relief; improvements in hip function (over half of studies used the Harris hip score); range of motion; percentage conversion to total hip arthroplasty; and percentage complication rates (major, moderate and minor).

Data were extracted by three reviewers. Disagreements were resolved by consensus.

Methods of synthesis
Data were synthesised narratively. Differences between studies were presented in tables.

Results of the review
Thirteen studies were included in the review (566 patients, 626 hips). Mean follow-up ranged from 2.9 to 12 years.

Radiographic results showed that mean change in acetabular inclination ranged from 4.5 degrees to 25.9 degrees. Mean changes in anterior angles ranged from 16 degrees to 51 degrees and lateral centre-edge from 20 degrees to 44.6 degrees. Mean change in medial translation of the hip centre ranged from 5mm to 10mm. These results indicated that
PAO was successful in achieving deformity correction. Clinical outcomes showed improvements in pain relief and hip function; the latter indicated by improvements ranging from 14.5 points to 33 points in the Harris hip score (eight studies).

Range of motion was reported in three studies. Reductions were noted for: flexion (range 12 degrees to 18 degrees); abduction (six degrees); adduction (three degrees to six degrees); external rotation (six degrees to 21 degrees); and internal rotation (five degrees to 21 degrees). Conversion to total hip arthroplasty was reported in 0% to 17% of patients. Most of the clinical failures were associated with patients who had moderate to severe preoperative osteoarthritis. Most studies did not attempt to correlate radiographic and clinical outcomes.

Major complications were reported in 6% to 37% of cases (12 studies). The most frequent were symptomatic heterotopic ossification, wound haematomas, nerve palsies, intra articular osteotomies, loss of fixation and malreductions. Moderate complications were largely connected with symptomatic hardware needing removal (10 studies).

Authors' conclusions
The authors appeared to conclude that PAO was successful in achieving radiographically-defined deformity correction and clinical benefits were more pronounced in younger patients with minimal preoperative osteoarthritis, but complication rates are high.

CRD commentary
The review question was clear. Inclusion and exclusion criteria were reported, although broadly for study design and outcomes. A range of data sources were searched, but the restriction to published English-language articles meant that publication and language biases could not be ruled out. Attempts were made to minimise errors and biases in the process of study selection and data extraction. The absence of any formal quality assessment meant that the reliability of included studies could not be ascertained. The chosen method of synthesis appeared to be appropriate in the presence of clinical heterogeneity. The authors' apparent conclusion reflected the results presented. The uncertain quality of included studies and potential for biases in the search made the reliability of the conclusions unclear.

Implications of the review for practice and research
The authors did not state any implications for practice.

Research: The authors stated that prospective longitudinal multicentre cohort studies that focused on PAO and used up-to-date validated patient outcome measures were needed. Studies should identify selection criteria for surgery, risk factors for clinical failure, optimal deformity correction parameters, complication characteristics and the role of adjunctive surgical procedures. Comparisons of PAO with other osteotomy procedures and total hip arthroplasty were warranted.

Funding
National Center for Research Resources Award UL1RR024992; Curing Hip Disease Fund; Zimmer, Inc.

Bibliographic details
Clohisy JC, Schutz AL, St John L, Schoenecker PL, Wright RW. Periacetabular osteotomy: a systematic literature review. Clinical Orthopaedics and Related Research 2009; 467(8): 2041-2052

PubMedID
19381741

DOI
10.1007/s11999-009-0842-6

Original Paper URL
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2706361/
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