Surgical Technique and 30-Year Results of the Periacetabular Osteotomy (PAO)

Simon D. Steppacher

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Surgical Treatment of Hip Dysplasia before PAO

Shelf

Salter, Varus Osteotomy
Osteotomies of the pelvis

- Shelf arthroplasty
- Salter
- Pemberton
- Triple
- Chiari
Osteotomies of the pelvis

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- Shelf arthroplasty*
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*Salvage procedures
Surgical Treatment of Hip Dysplasia before PAO

Shelf

Pain 8 years later
Periacetabular Osteotomy (PAO)

- First performed in March 1984
- Inventor Prof. R. Ganz
  — Former Chairman Orthopaedic Department Inselspital
- Surgical advantages
- Long-lasting experience of >30 years
Periacetabular Osteotomy (PAO)
Advantages of the PAO

> Large **correction potential**
  — No soft-tissue restraints (sacrospinous ligaments)

> **Posterior column** remains intact
  — Intact continuity of pelvic ring
  — Early partial weightbearing

> **True shape** remains unchanged
  — Normal childbirth

Flückiger et al, Orthopäde, 2000
Surgical Technique

- Patient positioning
  - Supine
  - Radiolucent table
  - Freely draped leg
Surgical Technique

- Modified Smith-Petersen approach:
  - Ilioinguinal skin incision
    *(Bikini incision)*
> Modified Smith-Petersen approach:
  — Ilioinguinal skin incision (Bikini incision)
  — Lateral cutaneous femoral nerve crossing
Surgical Technique

- Approaching the joint:
  - Detachment of Ingual ligament and sartorius muscle
Surgical Technique

> Approaching the joint:
  — Detachment of inguinal ligament and sartorius muscle
  — Detachment of abdominal muscles and iliacus muscle (first ilioinguinal window)
Surgical Technique

Approaching the joint:
- Detachment of inguinal ligament and sartorius muscle
- Detachment of abdominal muscles and iliacus muscle (first ilioinguinal window)
- Origin of **recuts muscle** preserved
Surgical Technique

> Performing osteotomies:
  — **Ischial osteotomy**
    - Spare ischial nerve
    - Optional use of fluoroscopy
    - Incomplete osteotomy
Surgical Technique

> Performing osteotomies:
  — Ischial osteotomy
  — **Pubic osteotomy**
    - Protect neurovascular bundle
    - Medial to eminentia iliopsectinea
Surgical Technique

Performing osteotomies:
- Ischial osteotomy
- Pubic osteotomy
- Supra- and retroacetabular osteotomies
Surgical Technique

> Mobilizing the acetabular fragment
Surgical Technique

- Intraoperative pelvic radiograph to verify correction
Surgical Technique

- Fixation in optimized orientation of the fragment with three 3.5 cortical screws
30-Year Results of PAO

Endpoints:
- Conversion to THA
- Progression of OA
- Insufficient clinical result

Steppacher et al, CORR, 2008
Lerch et al, CORR, 2017

10-year: 88% (80%–95%)
20-year: 61% (49%–72%)
30-year: 29% (17%–42%)
# Predictive factors for failure

<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
<th>Hazard Ratio</th>
<th>p-value</th>
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<td>Age at operation &gt; 40 years</td>
<td>4.32</td>
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## Results: Predictive factors for failure

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30-Year Results of PAO

Survival Rate (%) vs. Followup (years)

- Age < 20 Years
- Age < 30 Years
- Age > 40 Years
- Age > 45 Years
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30-Year Results of PAO

Survival Rate (%)

Followup (years)

OA = 0
OA = 1
OA > 2
Impingement following PAO
30-Year Results of PAO

Optimal orientation of acetabulum and offset

Suboptimal orientation and offset

Albers et al, CORR, 2013
Treatment Options in Acetabular Retroversion

Anteverting PAO

Surgical Hip Dislocation
PAO for Acetabular Retroversion

Followup (years)

Survival Rate (%)

Anteverting PAO

Surgical hip dislocation with acetabular trimming

$p = 0.0002$

Zurmühle et al, CORR, 2017
Size of the Acetabulum

Dysplasia  Retroversion  Deep Hip  Protrusio

lateral  posterior

medial  anterior

Steppacher et al, Osteoarthritis Cartilage, 2014
Conclusion

> The periacetabular osteotomy (PAO)
  — Gold standard
  — >30 years of experience

> Key factors for a good long term result are
  — Correct reorientation of the acetabular fragment
  — Treatment of impingement if present
  — Joint with no or only little degeneration
Bernese Hip Symposium
February 1 – 3, 2018

Host
K. A. Siebenrock
and distinguished international faculty

www.hip-symposium-bern.ch