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**Title:** Optimal Acetabular Reorientation and Offset Correction Improve the Long Term Results after Periacetabular Osteotomy

**Abstract:** The Bernese Periacetabular Osteotomy (PAO) has become the established method for treating developmental dysplasia of the hip. In the 1990s, the surgical technique was modified to avoid postoperative cam impingement due to uncorrected head neck offset or pincer impingement due to acetabular retroversion after reorientation. The goal of the study was to compare the survivorship of two series of PAOs with and without the modifications of the surgical technique and to calculate predictive factors for a poor outcome.

A retrospective, comparative study of two consecutive series of PAOs with a minimum follow-up of 10 years was carried out. Series A included 75 PAOs performed between 1984 and 1987 and represent the first cases of PAO. Series B included 90 hips that underwent PAO between 1997 and 2000. In this series, emphasis was put on an optimal acetabular version next to the correction of the lateral coverage. Additionally, a concomitant arthrotomy was performed in every hip to check impingement-free range of motion after reorientation and in 50 hips (56%) an additional offset correction was performed. Survivorship analyses according to Kaplan and Meier were carried out and the endpoint was defined as conversion to a total hip arthroplasty, progression of osteoarthritis, or a Merle d'Aubigné score  $\leq 14$ . Predictive factors for poor outcome were calculated using the Cox-regression analysis.

The cumulative 10-year survivorship of Series A was significantly decreased (77%; 95%-confidence interval [CI] 72-82%) compared to Series B (86%; 95%-CI 82-89%,  $p=0.005$ ). Hips with an aspherical head showed a significantly increased survivorship if a concomitant offset correction was performed intraoperatively (90% [95%-CI 86-94%] versus 77% [95%-CI 71-82%],  $p=0.003$ ). Preoperative factors predicting poor outcome included a high age at surgery, a Merle d'Aubigné score  $\leq 14$ , a positive impingement test, a positive Trendelenburg sign, limp, an increased grade of osteoarthritis according to Tönnis, and (sub-)luxation of the femoral head (Severin  $> 3$ ). In addition, predictive factors related to the three dimensional orientation of the acetabular fragment were identified. These included total, anterior, and posterior acetabular over-coverage or under-coverage, acetabular retroversion or excessive anteversion, a lateral center edge angle  $< 22^\circ$ , an acetabular index  $> 14^\circ$ , and no offset correction in aspherical femoral heads.

A good long term result after PAO mainly depends on optimal three-dimensional orientation of the acetabulum and impingement-free range of motion with correction of an aspherical head neck junction if necessary.