Acetabular Labrum Blood Flow during Periacetabular Osteotomy: An Intraoperative In vivo Study using Laser Doppler Flowmetry

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Introduction: The acetabular labrum plays an important role in the stability and protection of the articular cartilage of the hip. In patients with hip dysplasia, acetabular rim overloading may precede and possibly lead to labral hypertrophy and tear. The vascular supply to the labrum is important for the repair of the torn labrum. Ganz et al. reported that the acetabular labrum was supplied by radial branches of a periacetabular vascular ring, and the blood supply to the acetabular labrum likely remains intact in the majority of the hips with labral tears, based on the results of a fresh cadaver study [1]. Additionally, Emmanuel et al. reported that the labral tears appeared to be healed histologically in biopsy specimens that were retrieved from 6 patients during total hip arthroplasty after clinical failure of the arthroscopic labral repair [2]. However, blood flow measurement in vivo of the acetabular labrum has not been described in the literature. The purpose of this study was to measure in vivo the blood flow of the acetabular labrum of patients with acetabular dysplasia using laser Doppler flowmetry (LDF).

Methods: Between March and July 2014, a periacetabular osteotomy combined with arthroscopy was performed on 7 patients with dysplastic hip. The surgical indication for the periacetabular osteotomy was dysplastic hip with a lateral center-edge angle < 20° in patients with hip pain that interfered with daily activities. There were 1 male and 6 females, with a mean age at the time of surgery of 35.1 (15-53) years. The stage of osteoarthritis was graded radiologically according to the Tonnis grade classification: 5 hips were grade 1 and 2 hips, grade 2. Blood flow of acetabular labral lesions in the 7 patients were measured during arthroscopy using LDF (ALF21N, ADVANCE Co., Tokyo, Japan) (Fig. 1). The acetabular labral lesions were categorized using Beck’s classification [3]. The location of labral lesions was divide into three regions: anterosuperior (AS), superior (SU), and posterosuperior (PS) [4].

Results: Mean systolic blood pressure at the time of measurement was 84.6 (78-89) mmHg. Blood flow of acetabular labral lesions was measured in all hips. The mean of the blood flow rate was 2.27±0.52 ml/min/100g. The labral lesions were located in the AS area in all hips. Detachment and full-thickness labral lesions were found in 6 hips and 1 hip, respectively.

Discussion: Limbird et al. reported that the use of LDF during arthroscopy allowed the evaluation of blood flow within meniscal tears in sheep [5]. Hashiuchi et al. reported superficial blood flow in the superior labrum of the shoulder with rotator cuff tear was measured during arthroscopy using LDF. Further, the blood flow in type 1 SLAP lesions (1.32 ml/min/100g) was lower than in the normal labrum of the shoulder (1.75 ml/min/100g) [6]. Our study measured the blood flow of the acetabular labrum of patients in vivo with acetabular dysplasia using LDF during the arthroscopic procedure. We found that
blood flow of the acetabular labrum lesions was present in patients with dysplastic hips. Additionally, we found that the blood flow of the acetabular labrum lesions with acetabular dysplasia was more than the blood flow in type 1 SLAP lesions [6]. The results of our study support the findings of a prior study: the blood supply to the acetabular labrum remains intact in the majority of hips with labral tears [1]. This finding may have implications for surgical repair of labral tears.

**Significance:** We found that blood flow of the acetabular labrum lesions was present in patients with dysplastic hips. This finding may have implications for surgical repair of labral tears.