# Evaluation of Joint Cartilage and Subchondral Bone using Arthroscopic Ultrasound Imaging

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## Introduction

Evaluation of articular cartilage and subchondral bone is essential in diagnostics of joint diseases and injuries. The inter-observer reliability of the arthroscopic grading of cartilage lesions has been reported to be poor (1). Furthermore, the arthroscopic assessment of chondral injuries and stability of osteochondritis dissecans (OCD) is challenging (2). For more objective evaluation of cartilage ultrasound arthroscopy (UA) has been introduced (3).

## Objectives

To investigate in knee arthroscopy the feasibility and clinical value of high frequency ultrasound, potentially enabling simultaneous visualization of the cartilage surface and subchondral bone integrity.

## Methods

Six patients with cartilage related knee disorders were included. Radiographic and MRI studies were performed. Ultrasound imaging was conducted with a 9 MHz ultrasound catheter inserted into the joint while ultrasound images and arthroscope view were synchronously recorded.

Three patients were referred to arthroscopy due to an OCD lesion, two patients due to knee pain after a repaired knee injury (ACL, medial meniscus), and one patient had an arthroscopic examination due to persistent unsolved knee pain. Ultrasound reflection coefficient, integrated reflection coefficient, apparent integrated backscattering and ultrasound roughness index were determined from the cartilage and subchondral bone in normal and pathologic sites of the knee. Cartilage lesions were assessed using the ICRS classifica-

tion (4). Peroperative ultrasound imaging was used to determine specific surgery for each cartilage defect.

## Results

UA enabled detection and measurement of the dimensions of cartilage and OCD lesions and evaluation of cartilage quality, changes in subchondral bone, and meniscal pathology. Even with breeched cartilage, ultrasound allowed simultaneous visualization of deeper structures, such as the subchondral bone. Thus, fluid between the bone-cartilage interface was easily detected indicating an unstable OCD lesion that needed surgical fixation.

## Conclusion

UA provides diagnostically valuable information on articular cartilage and subchondral bone. The quality of articular cartilage after trauma or reparative surgery can be assessed (surface roughness, morphology, total thickness, collagen organization). The location and extent of lesions, and even stability of OCD can be evaluated. Ultrasonic visualization of retrograde drilling in OCD treatment might also be possible.

### References

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