INTRODUCTION: Degeneration of articular cartilage, osteophytes, joint effusion and synovitis are the characteristics for osteoarthritis (OA). Traditionally, the stage of knee OA is clinically evaluated using conventional radiography with semi-quantitative grading scales, e.g. Kellgren-Lawrence (K-L) grading [1]. More recently, there has been an increased interest for the application of ultrasonography (US) to OA diagnostics [2,3]. US is cheap, widely-available and non-invasive technique, which does not involve ionizing radiation. US has also moderate performance in OA diagnostics when compared to MRI [2].

Arthroscopy is often regarded as a gold standard for clinical evaluation of articular cartilage since it offers a direct access to articular surfaces inside the joint. The disadvantage of arthroscopy is that it is an invasive procedure. Therefore, any non-invasive diagnostic technique capable to predict arthroscopic findings for OA would have a significant clinical value. Both US and conventional radiography are cost- and time-effective and non-invasive options to assess knee OA. In the present study, we compared the ability of non-invasive US and conventional radiography to predict arthroscopic findings for knee OA.

METHODS: Altogether 37 non-rheumatoid patients undergoing a diagnostic arthroscopy because of pain of the knee were enrolled in the study. There were 13 women and 24 men, and the mean age was 53 years (range 38-73 years). US examination of the knee was conducted for each patient on the same day before the arthroscopy. Semi-quantitative scoring system was introduced for the US examination (Table 1). The grading system included evaluation of joint effusion, synovitis, presence of femoral and tibial osteophytes (all these evaluated knee straight or in 30 degrees flexion, patient supine), and degeneration of femoral condylary cartilage (examined knee in full flexion). The range of the US score varied from 0 to 17.

Table 1. Ultrasound scoring system used in the study. Mild synovitis: slight thickening of the synovium, power Doppler signal + or -. Moderate synovitis: clear thickening of the synovium, power Doppler signal + or -. Advanced synovitis: villous formation, power Doppler signal + or -. Mild degeneration of the cartilage: the interface between the cartilage and soft tissue is not sharp and/or the cartilage is echogenic. Moderate degeneration: the previous items and the thickness of the cartilage is clearly reduced but less than 100 %. Advanced degeneration: 100 % defect in the cartilage.

MFC = medial femoral condyle, LFC = lateral femoral condyle, MTP = medial tibial plateau, LTP = lateral tibial plateau, FSULC = femoral sulcus

RESULTS: Scatter plots and Spearman’s correlation coefficients between K-L grading, US scoring and arthroscopic scoring are presented in Figure 1. It can be observed that the US score seems to better predict the Arthroscopic score than the K-L grade does. Especially, the K-L grade 0, i.e. normal knee radiograph, includes much variation in the Arthroscopic score. Furthermore, it can be seen that when the K-L grade is zero, the US score varies between 0 and 12. The multiple linear regression model indicated that the US score is a significant predictor for the Arthroscopy score (Table 2). However, the contribution of the K-L grade seems not to be significant (Table 2).

DISCUSSION: For the first time, the ability of non-invasive US and conventional radiography were compared to predict arthroscopic findings for OA. The results suggest that non-invasive ultrasonography predicts significantly better the outcome from diagnostic arthroscopy than conventional radiography. This is mainly caused by the better sensitivity of US scoring since several other aspects related to OA, such as joint effusion, synovitis and osteophytes, can be evaluated together with a cartilage status.

There are some limitations related to non-invasive ultrasonography: it is possibly to scan only part of the femoral condyle cartilages because of the shadow of the patella, and US has no access to the tibial plateau cartilages. Thus, the sonographer needs to be aware of this issue and, if needed, comprehend the examination with other diagnostic techniques.

As a conclusion, the superiority of US imaging to estimate the arthroscopic findings for OA is a significant finding since conventional radiography, in addition to clinical evaluation, is the most widely used technique for estimating the OA status of the knee. Furthermore, the sensitivity of US imaging of the cartilage may be possible to enhance even more with quantitative analysis of the cartilage [5].