

Reliability and Validity of the Arthroscopic International Cartilage Repair Society Classification System: Correlation With Histological Assessment of Depth

Tim Dwyer, M.B.B.S., Ph.D., F.R.A.C.S., F.R.C.S.C., C. Ryan Martin, M.D., F.R.A.C.S.,
 Rita Kendra, M.D., F.R.C.P.C., Corey Sermer, M.Sc.,
 Jaskarndip Chahal, M.D., M.Sc., F.R.C.S.C., M.B.A.,
 Darrell Ogilvie-Harris, M.D., M.Sc., F.R.C.S.C., Daniel Whelan, M.D., M.Sc., F.R.C.S.C.,
 Lucas Murnaghan, M.D., M.Ed., F.R.C.S.C., Aaron Nauth, M.D., M.Sc., F.R.C.S.C., and
 John Theodoropoulos, M.D., M.Sc., F.R.C.S.C.

Purpose: To determine the interobserver reliability of the International Cartilage Repair Society (ICRS) grading system of chondral lesions in cadavers, to determine the intraobserver reliability of the ICRS grading system comparing arthroscopy and video assessment, and to compare the arthroscopic ICRS grading system with histological grading of lesion depth. **Methods:** Eighteen lesions in 5 cadaveric knee specimens were arthroscopically graded by 7 fellowship-trained arthroscopic surgeons using the ICRS classification system. The arthroscopic video of each lesion was sent to the surgeons 6 weeks later for repeat grading and determination of intraobserver reliability. Lesions were biopsied, and the depth of the cartilage lesion was assessed. Reliability was calculated using intraclass correlations. **Results:** The interobserver reliability was 0.67 (95% confidence interval, 0.5-0.89) for the arthroscopic grading, and the intraobserver reliability with the video grading was 0.8 (95% confidence interval, 0.67-0.9). A high correlation was seen between the arthroscopic grading of depth and the histological grading of depth (0.91); on average, surgeons graded lesions using arthroscopy a mean of 0.37 (range, 0-0.86) deeper than the histological grade. **Conclusions:** The arthroscopic ICRS classification system has good interobserver and intraobserver reliability. A high correlation with histological assessment of depth provides evidence of validity for this classification system. **Clinical Relevance:** As cartilage lesions are treated on the basis of the arthroscopic ICRS classification, it is important to ascertain the reliability and validity of this method.

Accuracy in determining the size, location, and depth of chondral lesions in the knee is critical, as each of these factors is important in determining both the type and efficacy of any chosen treatment.^{1,2} The

most cartilage lesions are graded at arthroscopy, with several classification systems available; of these, the Outerbridge Classification³ and the International Cartilage Repair Society (ICRS) grading system⁴ are the most commonly used.^{4,5}

The ICRS classification system is used to characterize cartilage injury on the basis of lesion area and depth.⁴ Two previous studies have evaluated the reliability of the ICRS classification system during arthroscopy, with contrasting results. In 2010, Spahn et al.⁶ reported the interobserver reliability of 4 experienced arthroscopy surgeons independently grading lesions in the medial compartment of the knee during live arthroscopy—in this study the interobserver agreement was poor (0.17). In 2011, Niemeyer et al.¹ compared arthroscopic ICRS grading of cartilage lesions with grading at arthrotomy, identifying an 80.9% consensus—in this study all lesions were ICRS grade 3 or 4.

From the Department of Surgery, Division of Orthopedics, University of Toronto Orthopaedic Sports Medicine (T.D., C.R.M., J.C., D.O-H., D.W., L.M., A.N., J.T.); Women's College Hospital (T.D., J.C., D.O-H., D.W., L.M., J.T.); and Mt Sinai Hospital (T.D., R.K., C.S., J.T.), Toronto, Ontario, Canada.

The authors report that they have no conflicts of interest in the authorship and publication of this article.

Received June 30, 2016; accepted December 5, 2016.

Address correspondence to Tim Dwyer, M.B.B.S., Ph.D., F.R.A.C.S., F.R.C.S.C., Women's College Hospital, 76 Grenville St., Toronto, Ontario M5S 1B2, Canada. E-mail: tim.dwyer@wchospital.ca

*© 2016 by the Arthroscopy Association of North America
 0749-8063/16614/\$36.00*

<http://dx.doi.org/10.1016/j.arthro.2016.12.012>

Table 1. Arthroscopic Grading of the Articular Lesions Based on International Cartilage Repair Society Score⁴

Grade	Description	Grade Subgroup
0	Normal intact cartilage	
1	Chondral softening and blistering, superficial lesions, fissures and cracks, soft indentation	Grade 1A—superficial lesions or softening Grade 1B—superficial fissures and lacerations
2	Fraying, lesions, and fissures extending down to <50% of cartilage depth	
3	Partial loss of cartilage thickness, cartilage lesions extending down >50% of cartilage depth as well as down to the calcified layer	Grade 3A—defect more than 50% but not down to the calcified layer Grade 3B—down to the calcified layer Grade 3C—down to but not through the subchondral bone plate Grade 3D—defect more than 50% with blisters
4	Full-thickness cartilage loss with exposure of the subchondral bone	Grade 4A—defect included the superficial subchondral bone plate Grade 4B—defect down to deep subchondral bone

There are a variety of histological grading systems developed for use in grading osteoarthritis⁷⁻⁹ and cartilage repair.¹⁰ These systems are used to determine the severity of chondral lesions, or to determine the quality of repair tissue in patients, especially in regard to animal and human trials of cartilage repair procedures.¹⁰ Although many of the parameters used in these measures include descriptions of cell morphology and matrix staining, the ICRS 2 histology scoring system¹⁰ includes grading of the depth of the cartilage lesion.

The purpose of this study was 3-fold: (i) to determine the interobserver reliability of the ICRS grading system of chondral lesions in cadavers, (ii) to determine the intraobserver reliability of the ICRS grading system comparing arthroscopy and video assessment, and (iii) to compare the arthroscopic ICRS grading system with histological grading of lesion depth. We hypothesized that the ICRS grading system would have good inter- and intraobserver reliability, as well as a good correlation with histological grading of lesion depth.

Methods

Ten whole, fresh-frozen, cadaveric legs were obtained from the anatomy department of the University of Toronto. Inclusion criteria were any age and sex of cadavers that had localized cartilage lesions. Exclusion criteria were any cadaveric knees with widespread cartilage changes, or those with no cartilage defects. A single surgeon (T.D.) performed arthroscopy of 10 cadaveric knees, and selected cartilage lesions that were estimated to be evenly distributed between all 4 ICRS grades—a minimum of 4 lesions in each grade were selected. No lesions were created by surgeons for the purpose of this study. The same surgeon also recorded an arthroscopic video for each lesion, using a probe to provide information regarding the depth of each lesion.

After this, each cartilage lesion was graded arthroscopically by 7 fellowship-trained arthroscopic surgeons (T.D., J.C., D.O.-H., D.W., L.M., A.N., J.T.) using standard anterolateral and anteromedial portals. Grading was performed using the ICRS grading system; this system was reviewed in detail with each surgeon, with

a description of the ICRS grading system provided at each arthroscopic station (Table 1).^{4,11} Surgeons were also asked to consider the subgroups of each grade during the arthroscopic grading. The arthroscopic video of each lesion was sent to each surgeon 6 weeks later for repeat grading—all surgeons were blinded from their original grading of each lesion.

After arthroscopic grading, each of the cartilage lesions identified was biopsied at the deepest aspect of each chondral lesion using arthroscopic mosaicplasty instruments (Smith & Nephew, Andover, MA) by a single surgeon. Lesions in the tibial plateau were accessed using hyperflexion of the knee, using a spinal needle to identify the best orientation of an accessory arthroscopic portal. Full-thickness osteochondral cylinders including subchondral bone with a diameter of 4.5 mm were taken, and fixed in 10% formalin for 24 hours before being decalcified and paraffin embedded. After this, the embedded samples were cut into 5 μ m, and placed onto saline coated glass slides, with standard H&E and Toluidine blue protocols used for sample staining. The depth of each cartilage lesion, in correlation with the arthroscopic ICRS classification system, was performed by a pathologist experienced at grading cartilage lesions (R.K.).

Statistical Analysis

The sample size was calculated using an estimated interobserver reliability of 0.6, taken from a study using the Outerbridge classification.¹² Using an alpha of 0.5 and a power of 80%, the sample size was calculated to be 18. A minimum of 4 cartilage lesions in each of the 4 ICRS grades were selected for study. Interobserver reliability for surgeons' arthroscopic measurement of cartilage lesions was calculated using the interclass correlation coefficients (ICC), whereas the intraobserver reliability was calculated by comparing each surgeon's arthroscopic measurement with his or her grading of each lesion via a video review. The correlation between the arthroscopic grading of each lesion and the histological grade of lesion depth was also calculated using ICC. ICC was calculated using a 2-way random effects

Download English Version:

<https://daneshyari.com/en/article/5706271>

Download Persian Version:

<https://daneshyari.com/article/5706271>

[Daneshyari.com](https://daneshyari.com)