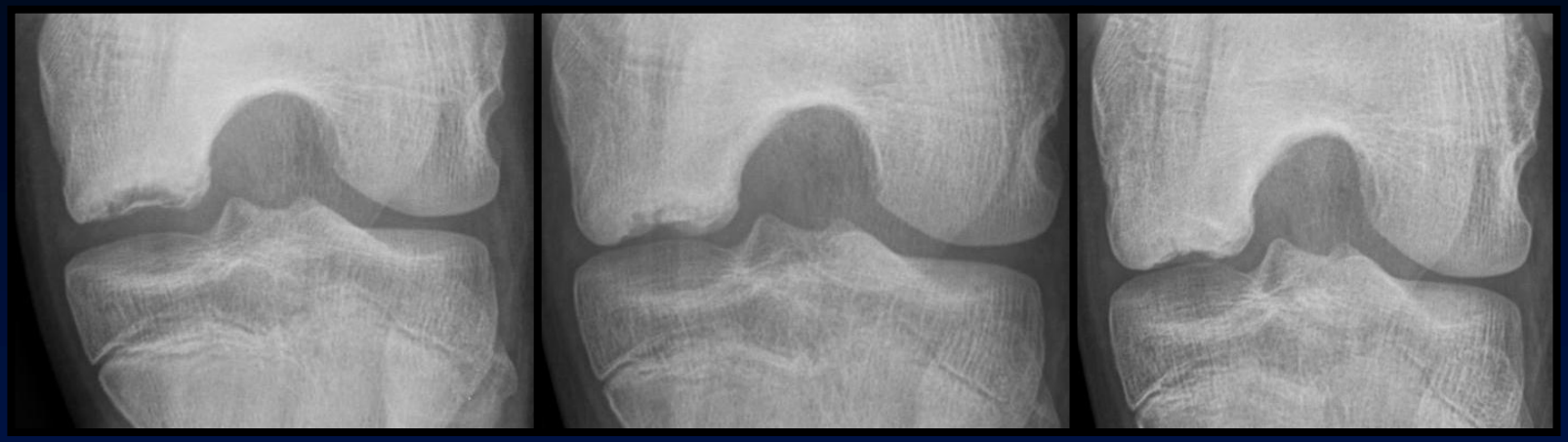
A Novel Healing Classification for Osteochondritis Dissecans of the Knee



David E. Ramski, MD [1]; Theodore J Ganley, MD [2]; Alex L. Gornitzky, BS [2]; James L. Carey MD, MPH [3]

[1] = Department of Orthopaedics, St. Luke's University Health Network;
[2] = Division of Orthopaedics, Children's Hospital of Philadelphia;
[3] = Department of Orthopaedics, University of Pennsylvania

Please address correspondence to: James.Carey@uphs.upenn.edu

Background

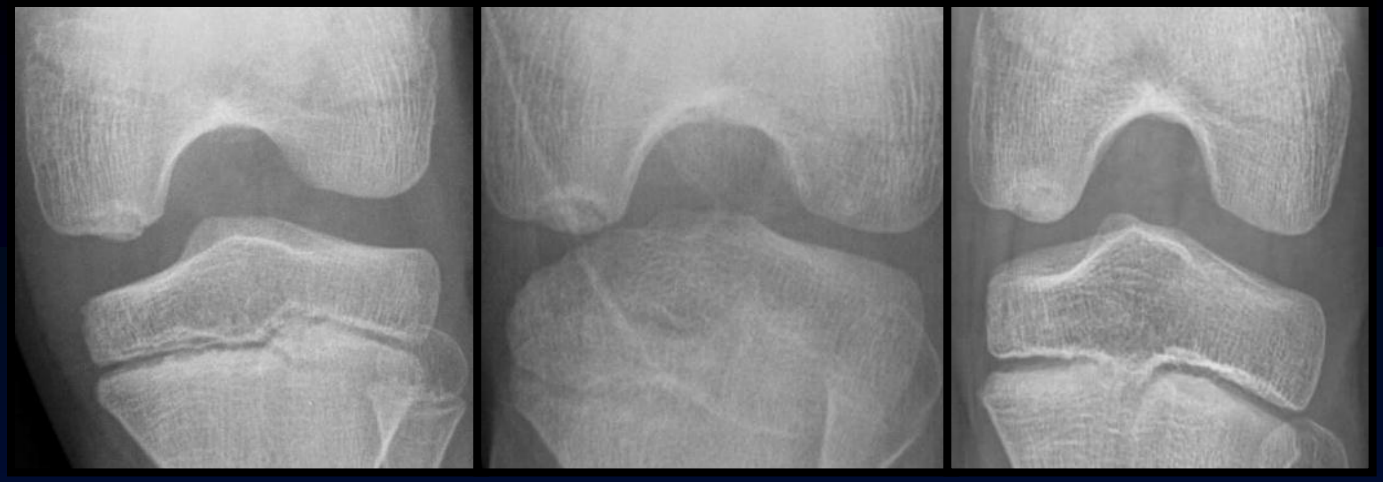
- Osteochondritis dissecans (OCD) is a localized process in which a focus of subchondral bone and adjacent articular cartilage (progeny fragment) separates from the surrounding bone (parent).
- Juvenile OCD of the knee has increased healing potential when compared to adult type
- Stability and prognosis *roughly* correlated with size of the lesion and the degree of perilesional sclerosis on plain film
- Although conventional radiographs provide valuable information including lesion size and location and an assessment of skeletal maturity, they have a number of limitations, including: underestimation of fragment size, separated lesion may be covered by cartilage, consistency in lesion status and view limitations
- To our knowledge, patterns of healing have not been formally delineated on standard knee radiographs.

Methods

Goal: Evaluate practicality of classification system; examine associations between healing pattern and age, gender, lesion location, treatment type, and physeal patency

- Screening and Data Collection: 489 patients screened from 2006 – 2010 from single surgeon (TJG)
  - Inclusion: age < 18, OCD lesion of knee, at least three consecutive knee radiographs
  - Data collected: age, gender, lesion location, op. vs. non-op. treatment

  → Radiographic series compiled for 41 patients
- Ratings: Two fellowship trained orthopaedic sports medicine specialists (TJG, JLC) classified the images according to lesion location, healing type and physeal patency
  - Radiographs were blinded and presented in sequential order with only time from initial presentation provided
  - Two independent readings were conducted three weeks apart
- Statistical Analysis: Percent agreement between raters, intraclass correlation coefficient (ICC) and Randoph's free-marginal muti-rater kappa



Boundary Healing: Resolution of the boundary between progeny fragment and parent bone from distinct to indistinct

Radiodensity Healing: Increasing radiodensity of the progeny fragment (from radiolucent to the same radiodensity as the parent bone

Combined Healing: Pattern shows features of both boundary resolution and increasing radiodensity

Results

- We identified 41 consecutive evaluable knee OCD lesions (35 males, 6 females). Mean patient age was 12.8 years (SD 2.1; range 7.8-17.1). Mean follow-up was 75 weeks (range 14 – 276) with an average interval between radiographs of 22 weeks. There were 35 males and 6 females. (reflects standard demographics)

→ The most common patient type was a 13- to 17-year old male with open physes receiving operative treatment for a medial femoral condyle lesion.

- The ICC for the inter- and intra-observer reliability of the proposed healing classification were 0.67

Table 1: Results for combined ratings of healing classification and physeal patency

	Inter-observer ICC	CI	Quality	Intra-observer ICC	CI	Quality
Healing Pattern	0.67	0.55-0.79	Good	0.67	0.55-0.79	Good
Physis	0.87	0.81-0.92	Very good	0.82	0.75-0.89	Very good

  - The ICC was categorized according to the Altman (1991) standard for reliability coefficient magnitude, whereby 0.6 – 0.8 = 'Good' and 0.8 – 1.0 = 'Very Good'.

- The inter-surgeon agreement across all healing ratings was 78%.

Table 2: Inter-observer % agreement, free-marginal kappa by presence/absence of healing type

	Boundary % Agreement	Component κ	Radiodensity % Agreement	Component κ
First Rating	0.78	0.56	0.98	0.95
Second Rating	0.80	0.61	0.93	0.85

- Boundary and radiodensity healing was observed in all ages, genders, lesion locations, treatment types and physeal patency states. The rating of "not applicable" was not used.

Conclusion

- The proposed radiographic classification system has substantial intra- and inter-observer reliability.
- Healing patterns were not significantly associated with age, gender, lesion location, treatment type, or physeal status.
- The described three-category model is a novel, simple, accurate and user-friendly method for evaluation of OCD lesion healing.

References

Wall EJ, Vourazeris J, Myer GD, Emery KH, Divine JG, Nick TG, Hewett TE. The healing potential of stable juvenile osteochondritis dissecans knee lesions. J Bone Joint Surg Am. 2008 Dec;90(12):2655-64. PubMed PMID: 19047711; PubMed Central PMCID: PMC2663329.

McGill JJ, Demos TC, Lomasney LM. Osteochondritis dissecans: imaging modalities. Orthopedics. 1995 Dec;18(12):1180-85. PubMed PMID: 8749299.

Ramirez A, Abril JC, Chaparro M. Juvenile osteochondritis dissecans of the knee: perifocal sclerotic rim as a prognostic factor of healing. J Pediatr Orthop. 2010 Mar;30(2):180-5. PubMed PMID: 20179567.

Moktassi A, Popkin CA, White LM, Murnaghan ML. Imaging of osteochondritis dissecans. Orthop Clin North Am. 2012 Apr;43(2):201-11, v-vi. Epub 2012 Feb 21. PubMed PMID: 22480469.

Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977 Mar;33(1):159-74. PubMed PMID: 843571.

Bland JM, Altman DG. A note on the use of the intraclass correlation coefficient in the evaluation of agreement between two methods of measurement. Comput Biol Med. 1990;20(5):337-40. PubMed PMID: 2257734.