Iatrogenic Cartilage Injury During Arthroscopic Procedures: A Common Occurrence that Results in Superficial Cartilage Cell Death

Jocelyn T Compton¹, Michael Slattery¹, Mitchell Coleman¹, Robert Westerman¹

¹University of Iowa Hospitals and Clinics, Department of Orthopedic Surgery and Rehabilitation
Conflict of Interest

• The authors have nothing to disclose
Background

• Arthroscopy is a generally safe procedure with minor complications related to the technique itself:
  – Iatrogenic chondrolabral damage occurs 7.9% of the time in hip arthroscopy
  – Cartilage is known to be sensitive to minor changes in local environment
  – Irrigant solutions may increase cartilage sensitivity to mechanical trauma.
Background

• Focal articular cartilage damage is the most common iatrogenic lesion.
  – The rate of iatrogenic cartilage damage due to instrumentation has not been investigated
  – The cellular effect of iatrogenic cartilage damage has not been investigated.
Specific Aims

Specific Aim 1. Frequency of iatrogenic articular injury in hip and knee arthroscopic procedures was quantified from academic training videos (i.e. from cases with exemplary surgical technique).

Specific Aim 2. Cell death due to arthroscopic tool mechanical trauma was assessed in a bovine articular cartilage osteochondral explant model.
Iatrogenic Superficial Cartilage Injury is Frequent

Prevalence of iatrogenic Injury in 130 technique videos. Overall, the prevalence of injuries was high, with minor injuries being the most common; rates of minor, intermediate, and major injuries were statistically significant. Inter-observer reliability of the rating scale was 0.73.
The width of the zone of injury significantly increases with increasing force in both the load-bearing portion of femoral bovine explants and the non-load bearing regions. Two-way ANOVA demonstrates significantly significant magnitude effect between different forces (p<0.0001); articular and extra-articular 1.5N and 2.5N forces were not different (* and ^), however 9.8N was statistically different from 1.5N and 2.5 N in the articular and extra-articular groups (p<0.001).
Conclusions

- Iatrogenic cartilage injuries during arthroscopy are common. The high prevalence of injury observed in academic technique videos suggests this study is likely an underestimate of iatrogenic injury, as these videos represent “gold standard” technique.

- Shear stress has been previously shown to alter cartilage metabolism, producing rearrangement of focal adhesions of chondrocytes and changes in collagen production and matrix integrity.

- Minor mechanical injury (1.5 N force) results in profound chondrocyte cell death at the surface of articular cartilage.

- Clinical significance of these injuries is unknown, but they may represent a significant source of pain, inflammation, or altered healing after arthroscopy that accounts for clinical differences amongst patient-reported outcomes.
Selected References


