Complete Capsular Closure Restores Native Hip Kinematics Following Interportal and T-capsulotomy

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Disclosures

• Ryan M. Degen, MD:
  – I have no financial conflicts to disclose on my behalf or on behalf of my co-authors
• In recent years, hip arthroscopy utilization has significantly increased \(^1,^2\)

• Surgical techniques continue to evolve to optimize patient outcome
  – Capsular management has become an area of focus

• Extent of capsulotomy utilized ranges from capsulectomy to an interportal capsulotomy to a T-capsulotomy \(^3,^4\)
• Prior biomechanical studies have reported increased rotational laxity with larger capsulotomies
  – Repair has subsequently restored normal joint rotation$^{5-8}$

• However, there is a paucity of information on the effect of capsulotomies on joint translation
  – Particularly relevant as increased translation is thought to be linked to ‘microinstability’
• To investigate the biomechanical effect of capsulotomy and capsular repair techniques on hip joint kinematics, including both translation and rotation, in varying combinations of sagittal and coronal plane joint positions
Methods

- Eight hips (78.3±6.0 years of age; 4 left, 6 male) were prepared.
- The femur was potted and attached to a load cell, while the pelvis was secured to a custom-designed fixture allowing static alteration of the flexion/extension arc.
- Optotrak markers were rigidly attached to the femur and pelvis to track motion of the femoral head with respect to the acetabulum.
- Seven conditions were tested:
  - i) intact;
  - ii) after portal placement (anterolateral and mid-anterior);
  - iii) interportal capsulotomy (IPC) [35 mm in length];
  - iv) IPC repair;
  - v) T-capsulotomy [IPC+15 mm longitudinal incision];
  - vi) partial T-repair (repair of longitudinal incision with IPC left open);
  - vii) full T-repair.
Methods

• Testing occurred in 15° of extension (-15°), 0°, 30°, 60° and 90° of flexion
• Each sagittal plane position was then repeated in neutral, abduction and adduction resulting in 15 testing positions.
• 3N-m internal rotation (IR) and external rotation (ER) moments were manually applied to the femur via the load cell at each position.
• Rotational range of motion and joint translation were recorded
Results

• **Rotation**
  – Neutral coronal plane:
    • In extension (-15°): T-capsulotomy significantly increased IR/ER rotational ROM compared with intact state at (55.96±6.11° vs. 44.92±7.35°, p<0.001)
    • At 0°: IPC significantly increased rotation compared with the portal state at (60.09±6.82° vs. 51.68±10.35°, p=0.004)

• **Translation:**
  – There were no statistically significant increases in mediolateral (ML) joint translation following IPC or T-capsulotomy
  – There were no statistically significant increases in anteroposterior (AP) translation following IPC or T-capsulotomy

• **Complete capsular repair restored near native joint kinematics, with no significant differences in rotation or translation between any complete capsular repair groups and the intact state, regardless of joint position**
Conclusion

• Universally across all conditions, complete capsular repair following interportal or T-capsulotomy restored rotational ROM and joint translation to values observed in the native joint.

• Where feasible, complete capsular closure should be performed, especially following T-capsulotomy.

• Further clinical evaluation is required to determine if adverse kinematics of an unrepaired capsule are associated with reduced patient reported outcomes.
References


