

Effect of Capsulotomy on Hip Biomechanics :

Should the Capsule Be Repaired After Hip Arthroscopy?

Suenghwan Jo^{*}, Alexander Hooke^{**}, Kai-Nan An^{**}
Rafael Sierra^{***}, Robert Trousdale^{***}

^{*}Chosun University Hospital, Gwangju

^{**}Mayo Clinic, Biomechanics Laboratory, Rochester

^{***}Mayo Clinic, Department of Orthopaedics, Rochester

Disclosure

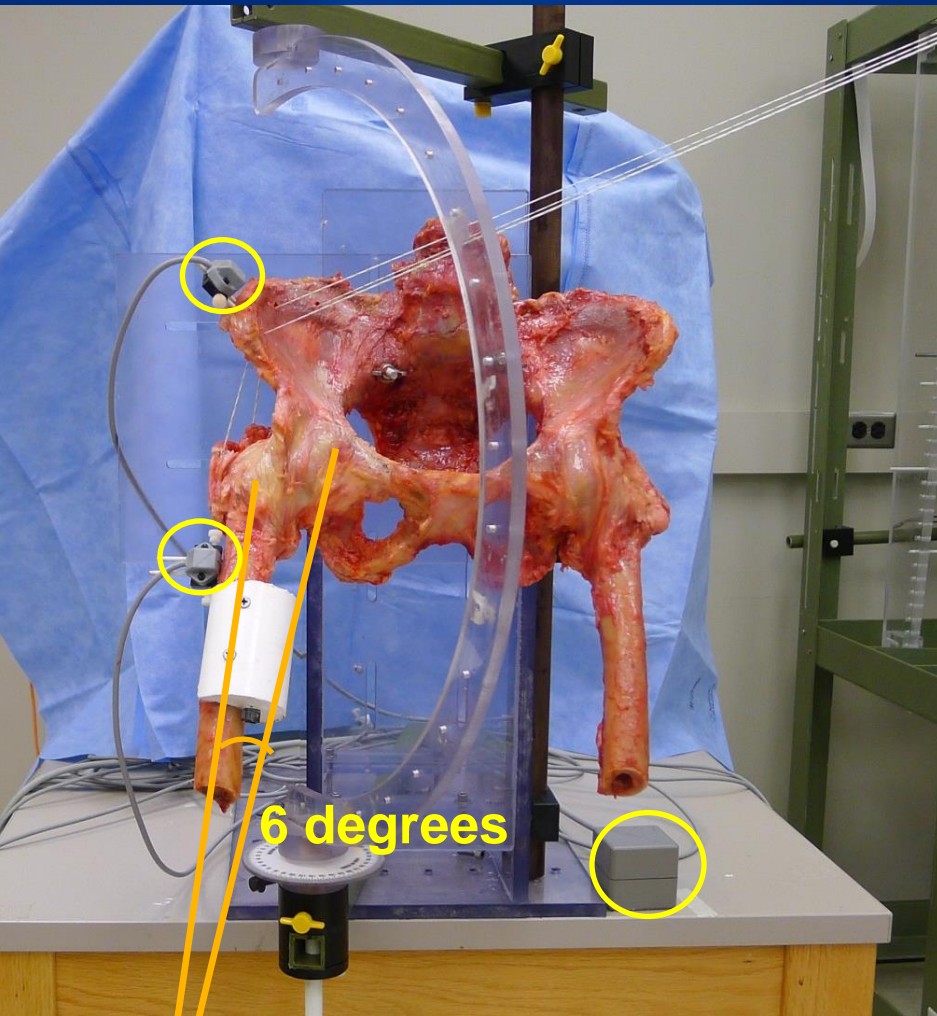
- Non conflict with current study
- SJ : none
- AH : none
- KA: none
- RS : Biomet
- RT : Depuy

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Objective

- Validate the effect of various capsulotomy on the stability of hip joint with special interest in disruption of iliofemoral ligament (IFL) and zona orbicularis (ZO)

Materials and Methods



8 Pelvis

- Mean age 56.2 years (48-69 yrs)

Test set up

- 6 degree of freedom motion tracking sensor (Liberty, Polhemus)
- Maintain femoral head to acetabulum contact
- Torque applying adaptor
- Guiding construct
- ISB guideline used to define anatomical coordination system
- Center of rotation defined as functional approach
- **Axial rotation applied manually with torque ranch with load cell**

Test conditions

Test I

- A) Intact capsule
- B) Interportal capsulotomy
- C) T-shape capsulotomy



Test II

- D) Reproduced interportal capsulotomy
- E) Extended interportal capsulotomy (inf IFL resection)
- F) Extended T capsulotomy (inf IFL + ZO resection)



Measurements

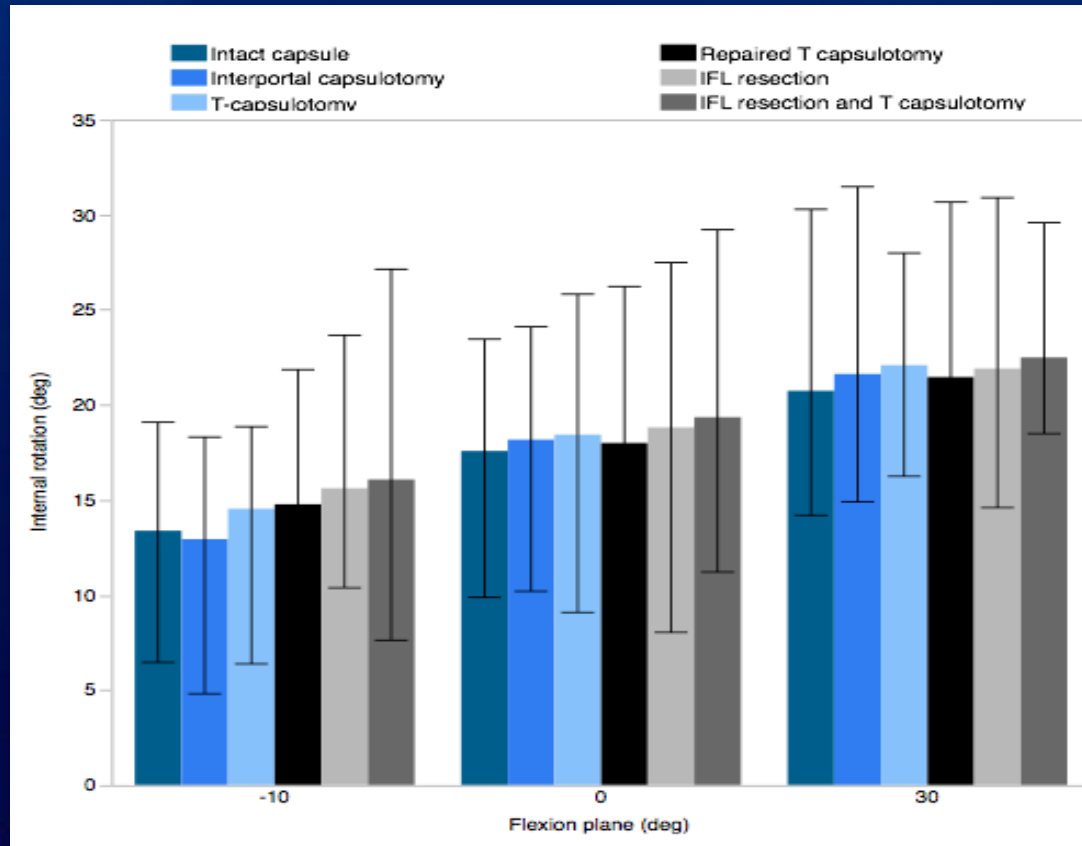
- IR and ER measured at 10° extension, neutral, 30° flexion
- Additional ER measured at 60°, 90°, and 110° of flexion
- Femoral head's center of rotation coordinate monitored simultaneously when the hip was maximally rotated internally to externally at 10° extension, 0° flexion and 30° flexion

Statistics

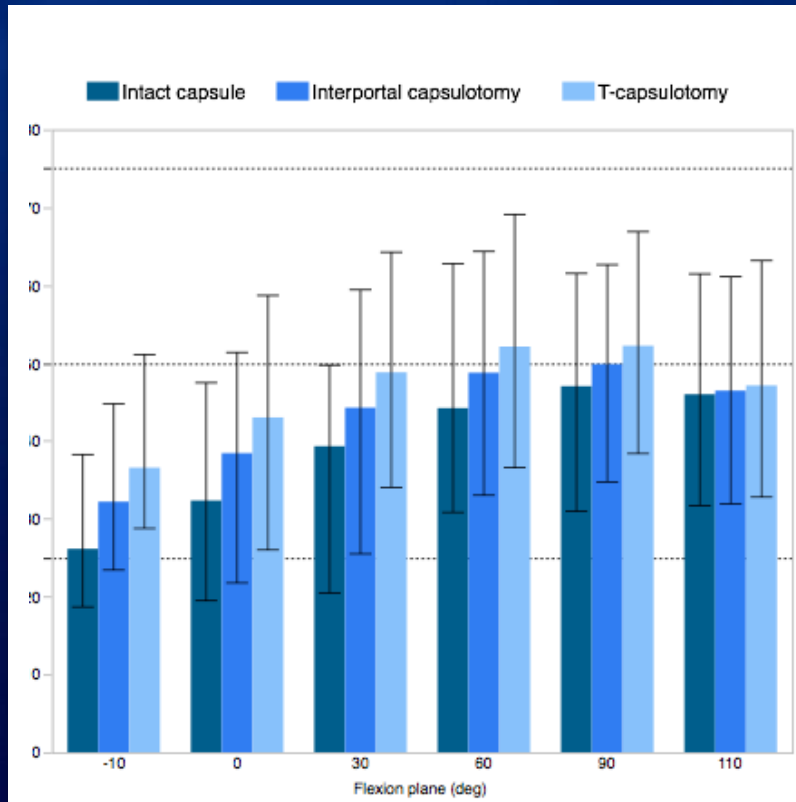
- JMP software (SAS institute, Cary, NC)
- Repeated MANOVA performed independently for each hip flexion plane for the capsule of interest
- For significantly different conditions : a pair-wise repeated measures analysis was performed with a Bonferroni correction of α value

Results I – Internal rotation

- No significance found among different capsulotomy conditions

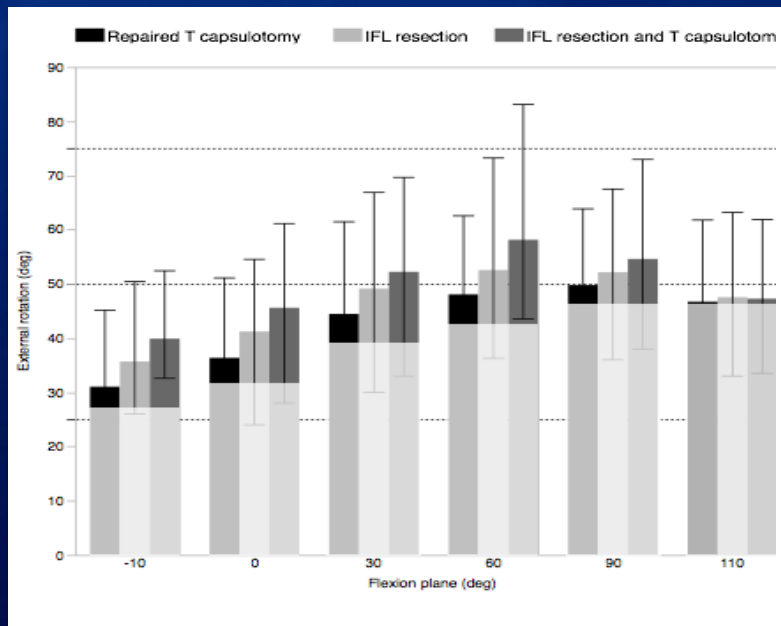


Results II – External rotation in conventional capsulotomy conditions



- Interportal capsulotomy
 - Significant increase up to 60° flexion compared to intact capsule
 - Pronounced in 10° of extension : $6.1^{\circ} \pm 3.4^{\circ}$
- T shape capsulotomy
 - Significant increase up to 110° flexion compared to intact capsule
 - Pronounced in 10° of extension : $10.4^{\circ} \pm 6.4^{\circ}$

Results III – External rotation after IFL and ZO resection



*Dim area represents result of intact capsule

- Significant increase in ER up to 110° flexion after entire IFL resection
 - Pronounced in 0° of flexion : $5.9^\circ \pm 4.3^\circ$
- Significant increase in ER up to 60° flexion after both IFL and ZO resection
 - Pronounced in 60° of flexion : $6.0^\circ \pm 6.3^\circ$

Result – Translation (change in hip center of rotation at maximal internal rotation to maximal external rotation)

Unit in mm

	10 extension	0 flexion	30 flexion
Intact capsule	0.8 ± 0.2	0.8 ± 0.2	1.0 ± 0.5
Interportal capsulotomy	1.2 ± 0.4	1.0 ± 0.1	1.5 ± 0.9
T capsulotomy	1.9 ± 0.3	2.1 ± 0.5	2.3 ± 0.8
Reproduced Interportal capsulotomy	1.2 ± 0.6	1.3 ± 0.4	1.2 ± 0.5
Extended interportal capsulotomy <i>(IFL resection)</i>	1.6 ± 0.9	1.9 ± 0.8	2.0 ± 1.1
Extended T capsulotomy <i>(IFL and ZO resection)</i>	2.9 ± 0.9	2.6 ± 1.0	2.7 ± 0.9

- No significant difference between intact and interportal capsulotomy condition
- Significant increase with T capsulotomy as compared to intact condition
- No significant difference after IFL resection
- Significant translation after ZO resection at 10° extension and at 10° flexion

Conclusions

- Conventional capsulotomy resulted in increase of external rotation and resecting entire IFL result in further external rotation
- T shape capsulotomy can lead to significant translation
- ZO contribute significantly to prevent excessive external rotation and translation
- **Clinical recommendation** : Repair of the capsule would be beneficial especially when a T-capsulotomy is performed or when the routine interportal capsulotomy is extended to resect the entire inferior IFL or ZO

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