

# A Simple Hip-Spine Classification for Total Hip Replacement –Validation and Large Multi-Center Series

## INTRODUCTION

- Historically, patients undergoing a primary total hip arthroplasty (THA) following a lumbar spine fusion have an increased risk of dislocation, instability and revision rate compared to patients without a lumbar fusion
- This hip-spine relationship is important for patients with degenerative diseases of the spine, who have altered body kinematics with varying spinopelvic alignment<sup>1-4</sup>

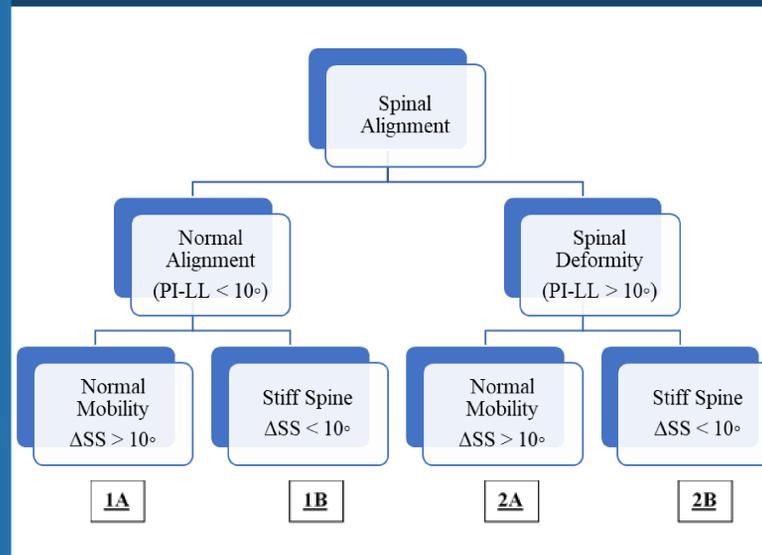
## PURPOSE

The purpose of our study was to determine if utilization of the Hip-Spine Classification results in a decreased rate of postoperative dislocation in patients with spine fusion.

## METHODS

- We prospectively reviewed 3,777 consecutive patients undergoing a THA by three surgeons from January 2014 – December 2019 at a single institution
- Patients were categorized using The Hip-Spine Classification: 1 – normal spinal alignment, 2 – flatback deformity; A – normal spinal mobility, B – stiff spine
- Flatback deformity was defined by pelvic incidence minus lumbar lordosis >10-degrees, and spinal stiffness was defined by <10-degree change in sacral slope from standing to seated
- Each category defines patient-specific cup positioning
- Survivorship free of dislocation was recorded and spinopelvic measurements were compared for reliability using intraclass correlation coefficient (ICC)

**FIGURE 1: Hip-Spine Classification according to spinal alignment and spinal mobility**



**FIGURE 2: Four Categories of the Hip-Spine Classification in Total Hip Arthroplasty**

Group	Classification	Pathology	Number of Patients
1A	Normal spinal alignment (PI-LL < 10°) and normal spinal mobility (ΔSS > 10°)	Normal anatomy and mobility	987 (47%)
1B	Normal spinal alignment and stiff spine (ΔSS < 10°)	“Stuck standing” - stiff spine	232 (11%)
2A	Flatback deformity (PI-LL ≥ 10°) and normal mobility	Anterior pelvic tilt: typically resolves postoperatively Posterior pelvic tilt: spinal deformity increasing cup anteversion	715 (34%)
2B	Flatback deformity and stiff spine	“Stuck sitting” - spinal deformity and stiff spine increasing cup anteversion	147 (7%)

## RESULTS

- 2,081 patients met inclusion criteria. There were 987 1A, 232 1B, 715 2A, and 147 2B patients
- 70 patients had lumbar spinal fusions, and the majority had L4-5 (16) or L4-S1 (12) fusions
- 51 (73%) patients had 1-2 levels fused and 19 (27%) patients had 3+ levels fused
- Dual mobility was used in 166 patients, which included 100% of the 2B and 3+ level fusion patients
- Survivorship free of dislocation to 5 years was 99.2%, with a 0.8% dislocation rate. The ICC was 0.83 (95% CI, 0.89-0.91)

## CONCLUSIONS

This is the largest series in the literature evaluating the hip-spine relationship and guiding appropriate treatment. The Hip-Spine Classification provides the framework for arthroplasty surgeons to use during preoperative evaluation of their patients, which may help guide the use of dual mobility articulations in patients with spinopelvic pathology and reduce the risk of postoperative dislocation in these high-risk patients.

## REFERENCES

- Lazennec JY, Brusson A, Rousseau MA. Lumbar-pelvic-femoral balance on sitting and standing lateral radiographs. *Orthopaedics & Traumatology: Surgery & Research*. 2013;99(1, Supplement):S87-S103.
- Tang WM, Chiu KY, Kwan MFY, Ng TP. Sagittal pelvic malrotation and positioning of the acetabular component in total hip arthroplasty: Three-dimensional computer model analysis. *J Orthop Res*. 2007;25(6):766-771.
- Lum ZC, Coury JG, Cohen JL, Dorr LD. The Current Knowledge on Spinopelvic Mobility. *The Journal of Arthroplasty*. 2018;33(1):291-296. doi:10.1016/j.arth.2017.08.013
- Legaye J. Influence of the sagittal balance of the spine on the anterior pelvic plane and on the acetabular orientation. *Int Orthop*. 2009;33(6):1695-1700.