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Should Routine Radiographic Screening for Spino-pelvic Relationship Be Performed in Patients Undergoing Primary Total Hip Arthroplasty?



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Should routine radiographic screening for spino-pelvic relationships be performed in patients undergoing primary total hip arthroplasty?

Response/Recommendation: There is no need for routine radiographic screening for the spino-pelvic relationship, and this should be reserved for patients who have spinal disease and risk factors for instability.

Level of Evidence: Low.

Expert Vote: Agree 82.0%, Disagree 15.2%, and Abstain 2.8%

Rationale

The spino-pelvic relationship plays a critical role in the biomechanics and functional outcomes of patients undergoing primary total hip arthroplasty (THA). Accurate preoperative assessment of this dynamic relationship is crucial to optimize implant positioning and reduce complications such as dislocation, impingement, aseptic loosening, and revision surgery. While some surgeons advocate for routine radiographic screening of the spino-pelvic relationship in all patient candidates for THA, others argue that it should be reserved for select cases only. The existing literature was reviewed to identify factors associated with impaired spino-pelvic mobility.

There are multiple studies that reported impaired spino-pelvic motion in patients who have surgical or nonsurgical spinal fusion

[1–3]. The impaired spino-pelvic mobility in these patients could cause hip instability after THA [3]. Therefore, spino-pelvic assessment in this subset of patients is recommended.

Older age is associated with impaired spino-pelvic mobility [4–7]. Innmann et al. proposed a cutoff point of 65 years of age suggesting the performance of a radiological screening for spino-pelvic mobility [6].

Patients who have spinal deformity, including scoliosis, flat back, and hyperlordosis, are at increased risk of spino-pelvic mobility impairment [8–10]. Patients who have clinical spinal deformity are recommended to undergo further assessments. A study by Innmann et al. stated that patients who have lumbar lordosis lower than 45 degrees are at higher risk of spino-pelvic mobility impairment [6]. Further cutoff points for flat back and scoliosis are yet to be determined in the literature. Vigdorchik et al. reported that patients who have severe sagittal spinal deformity (lumbar lordosis minus pelvic incidence mismatch of greater than 20 degrees) are at increased risk of spino-pelvic mobility impairment [11].

Moreover, patients who have lumbar degenerative disk disorders are reported to have impaired spino-pelvic mobility [12–15].

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However, the cost-effectiveness of lumbar degenerative disk disorder evaluation in patients undergoing THA has not been studied in literature.

Patients who have limited hip range of motion are reported to have impaired spino-pelvic mobility [16,17]. A study by Innmann et al. reported a cutoff point of 88 degrees for hip flexion for screening of spino-pelvic assessment [16].

Contralateral hip degenerative joint disease has been reported to have effects on spino-pelvic mobility [8,17,18]. Moreover, contralateral THA may have an effect on spino-pelvic mobility [18]. Therefore, spino-pelvic mobility evaluation in bilateral hip osteoarthritis might be necessary.

Multiple studies have reported that increased pelvic tilt on standing X-rays is associated with impaired spino-pelvic mobility [11,16,19]. Multiple cutoff points of 10, 13, and 19 degrees have been reported in the literature [11,16,19]. Patients who have increased pelvic tilt should undergo a thoughtful spino-pelvic evaluation; however, the exact cutoff point is yet to be determined. Pelvic tilt on lateral radiographs is correlated with pubic symphysis to sacro-coccygeal junction distance on supine antero-posterior (AP) radiographs [20]. Carender et al. reported that patients who have overlap of the sacro-coccygeal junction/pubic symphysis in AP radiographs have 10 times greater risk of impaired spino-pelvic mobility [21]. Rainer et al. reported that patients who have an overlap of the sacro-coccygeal junction/pubic symphysis in AP radiographs have nine times greater risk of dislocation [20].

Sacral slope on standing radiographs is correlated with spino-pelvic mobility [7,8,16]. Innmann et al. reported that patients who have sacral slopes greater than 42 degrees have spino-pelvic hypermobility [16]. Therefore, patients who have impaired standing sacral slopes should undergo further spino-pelvic evaluation.

In summary, the above-mentioned factors can be categorized into two groups.

1. Factors assessable through physical examination and radiographic studies routinely performed for primary THA:
 - a. Spinal fusion (both surgical and nonsurgical) [1–3,21].
 - b. Older age \geq 65 years old [4–7].
 - c. Clinically evident spinal column deformity (flat back, hyper-lordosis, and scoliosis) [8–10].
 - d. Limited range of motion of the hip (flexion $<$ 88°) [16,17].
 - e. Contralateral hip degenerative joint disease or contralateral THA [8,17,18].
 - f. Lumbar degenerative disc disease [12–15].
 - g. Overlap of the sacro-coccygeal junction/pubic symphysis in AP radiograph [20,21].
2. Factors that could be assessed on standing lateral lumbo-sacral radiographs:
 - a. Pelvic tilt $>$ 19°, 13°, 10° [11,16,19].
 - b. Sacral slope $>$ 42° [7,8,16].
 - c. Pelvic incidence-lumbar lordosis PI-LL mismatch $>$ 20° [11].
 - d. Lumbar lordosis $<$ 45° [6].

No clear screening method for spino-pelvic mobility is defined in the literature. The outlined factors above represent a collation of available studies, as none of the articles evaluate all the predictors in combination or their efficacy in determining outcomes. Additionally, the cost-effectiveness of using an additional standing lateral pelvic X-ray for screening purposes has yet to be determined.

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