Should spinopelvic relationship be taken into account when performing routine primary THA?

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Response/Recommendation: Current literature suggests that spinopelvic mobility evaluation is not routinely required for all patients undergoing primary THA. However, several factors have been identified that could serve as screening criteria to determine which patients might benefit from further spinopelvic assessment. At present, there is no consensus on how the screening should be performed, considering that the evaluation of proposed factors usually requires further radiographs in addition to routine THA workup, including sitting and standing lateral spinopelvic X-rays. The cost-efficacy of those radiographs is yet to be determined. We recommend the development and validation of a standardized screening protocol for spinopelvic evaluation in patients undergoing THA.

Level of evidence: low

Rationale: Few articles on this topic have been published and most of these papers were published by a limited number of institutions. Most of these articles were published in recent years. Four articles tried to find factors for screening of spinopelvic mobility [1-4], while others proposed the analysis of parameters that are associated with impaired spinopelvic mobility.

There are multiples studies that reported on impaired spinopelvic motion in patients with surgical or non-surgical spinal fusion[5-7]. The impaired spinopelvic mobility in these patients could cause

hip instability after THA [7]. Therefore, spinopelvic assessment in this subset of patients is recommended.

Older age is associated with impaired spinopelvic mobility [3, 9-11]. A study by Innmann et al. proposed a cutoff point of 65 years old as the optimal cut-off point for screening of spinopelvic mobility [3].

Patients with spinal deformity including scoliosis, flatback, and hyperlordosis are at a higher risk of spinopelvic mobility impairment [12-14]. Patients with clinical spinal deformity are recommended to undergo further assessments. A study by Innmann et al. stated that patients with lumbar lordosis lower than 45 degrees are at higher risk of spinopelvic mobility impairment [3]. Further cut-off points for flatback and scoliosis is yet to be determined in the literature. A study by Vigdorchi that patients with severe sagittal spinal deformity (LL-PI mismatch of greater than 20 degrees) are at higher risk of spinopelvic mobility impairment [4].

Also, patients with lumbar degenerative disk disorders (DDD) are reported to have impaired spinopelvic mobility [17-20]. However, cost-effectiveness of lumbar DDD evaluation in patients undergoing THA has not been studied in the literature.

Patients with limited hip range of motion are reported to have impaired spinopelvic mobility [1, 15]. A study by Innmann et al. reported a cut-off point of 88 degrees for hip flexion for screening of spinopelvic assessment [1].

Contra-lateral hip degenerative joint disease has been reported to have effects on spinopelvic mobility [12, 15, 16]. Also, contra-lateral THA is also reported to have an effect on spinopelvic mobility [16]. Therefore, spinopelvic mobility evaluation in bilateral hip osteoarthritis might be necessary.

Multiple studies have reported that increased standing pelvic tilt is associated with impaired spinopelvic mobility [1, 2, 4]. Multiple cut-off points of 10, 13, and 19 degrees has been reported on the literature [1, 2, 4]. Patients with increased pelvic tilt should undergo spinopelvic evaluation; however, the exact cut-off point is yet to be determined. Pelvic tilt on lateral radiographs is correlated with pubic symphysis to sacrococcygeal junction distance on supine AP radiographs [21]. A study by Carender et al. reported that patients with overlap of the sacrococcygeal junction/pubic symphysis in AP radiographs has 10 times greater risk of impaired spinopelvic mobility [8]. A study by Rainer et al. reported that patients with overlap of the sacrococcygeal junction/pubic symphysis in AP radiographs has 9 times greater risk of dislocation [21].

Standing sacral slope is reported to be correlated with spinopelvic mobility [1, 11, 12]. A study by Innmann et al. reported that patients with sacral slope of greater than 42 degrees have spinopelvic hypermobility [1]. Therefore, patients with impaired standing sacral slopes should undergo further spinopelvic evaluation.

In summary, the

above-mentioned factors can be categorized into two groups:

1. Factors assessable through routine physical examination and radiographic studies done routinely for primary THA:
    a. Spinal fusion (both surgical and non-surgical) [5-8]
    b. Older Age ≥65years old [3, 9-11]
    c. Clinically evident Spinal Column Deformity (flat back, hyper-lordosis, Scoliosis) [12-14]
    d. Limited range of motion of the hip(flexion<88) [1, 15]

e. Contralateral hip degenerative joint disease or Contralateral THA [12, 15, 16]

f. Lumbar Degenerative disc disease [17-20]

g. Overlap of the sacrococcygeal junction/pubic symphysis in AP radiograph [8, 21]

2. Factors that could be assessed on standing lateral lumbosacral radiographs:

a. Pelvic tilt >19°, 13°, 10° [1, 2, 4]

b. Sacral slope >42° [1, 11, 12]

c. Pelvic incidence-lumbar lordosis PI-LL mismatch >20°[4]

d. Lumbar lordosis <45° [3]

It is important to note that there are a limited number of studies addressing the development of a screening method for spinopelvic mobility. None of the available articles have evaluated all the above-mentioned factors to determine the efficacy of them in predicting of spinopelvic mobility problems. Additionally, the cost-effectiveness of using an additional standing lateral spinopelvic X-ray for screening purpose has yet to be determined.

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