



Predisposes arthroplasty challenge in abnormal spinopelvic motion

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Total hip arthroplasty (THA) late dislocation is a main challenge. It is still an area of a research gap. Defining the late dislocation period is also a point of controversy, Charnely et al define the period as more than five years, other authors define it as 1 to 2 years after primary THA. A dynamic coordinated continuous motion of the spine, pelvis, and hip creates the spinopelvic balance; during standing, the pelvis is tilted anteriorly, lumbar spine is lordotic, and hip is in extension, sagittal balance is reached by locating the trunk on the pelvis and the acetabulum over the femoral head. Changing to sitting, the hip joint does not flex to 90° but the following spinopelvic motions occur to accommodate and provides the biologic acetabular opening; The pelvis is tilted posteriorly by 20° , lumbar spine loses some lordosis, and the acetabulum tilted posteriorly. Aging and spine diseases alter this normal spinopelvic balance. Different classifications are described for the abnormal spinopelvic motion.

For simplicity, three different pattern of spinopelvic unbalance are described. (1) fixed posterior pelvic tilt during standing with diminished spinopelvic motion which seen in lumbar spine degenerative diseases, it requires femoral hyperextension to stand, so it predisposes to a posterior impingement and a THA anterior dislocation. (2) fixed anterior pelvic tilt during sitting with spinopelvic stiffness, which seen after lumbar spine fusion, this require femoral flexion in sitting, so it predisposes to anterior impingement and a posterior hip dislocation. The third pattern has a decreased spinopelvic motion

$<10^\circ$ between standing and sitting. Spinopelvic imbalance alters the functional position of the acetabulum which determined by the spinopelvic coordinated movement, adding a major risk factor for dislocation.

From a cohort of 9784 patients undergone a total hip arthroplasty following the established guidelines for a safe total hip procedure, 206 patients dislocated with 58% were correctly following the Lewinnek safe zone criteria for positioning the acetabulum component. Esposito et al in another 7040 patients cohort having total hip arthroplasty, 147 hips dislocation reported, representing a 2.1%. After analyzing the matched data between dislocators and non dislocators, no difference was founded between the acetabulum components positions between the two groups. They concluded that we have to reconsider our concept of the factors affecting hip stability. Phan D et al categorize the spinopelvic motion regarding lumbar spine pathology into four types; flexible and balanced, rigid and balanced, flexible and unbalanced, rigid and unbalanced. The last three abnormal motions leading to different types of hip impingement and consequent hip dislocation. The same study suggested different acetabular cup position for each type to improve the THA stability and reduce the dislocation rate. The recent research focusing on total hip arthroplasty dislocation risk factors concluded that we should reconsider our established parameters for what we think is a safe total hip procedure.

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