Indirect determination of pelvic tilt from anterior posterior x-ray in patients undergoing Total Hip Arthroplasty and variations induced by surgery.

Cesare Faldini[1], Giuseppe Geraci[1], Federico Pilla[1], Piergiorgio Cataldi, Francesco Schilardi, Enrico Masi, Francesco Traina[1], Alberto Corrado Di Martino[2]
[1]Istituto Ortopedico Rizzoli, [2]University of Bologna

INTRODUCTION:

Spinopelvic biomechanics plays a crucial role in the setting of THA, considering the potential influence of pelvic version and kinematics on clinical outcomes and incidence of complications of hip implants. Its relationship is mainly evident in patients with unbalanced spine, whose pelvic tilt is pathologically increased; however, most hip patients do not possess lateral spine X-Rays allowing its determination. Recently, the sacro-femoral-pubic angle (SFPA) has been considered a reliable estimate of pelvic tilt, allowing to acknowledge pelvic orientation in patients candidate to THA on coronal X-Rays. The objective of this study is to evaluate the pelvic orientation before and after THA by considering the SFPA, and to assess outcomes and complications in relation to different types of pelvic orientation.

METHODS:

This retrospective study analyzed pre and postoperative radiographs of a cohort of 182 patients who underwent THA, diagnosed with unilateral primary OsteoArthritis (OA) (study group, 104 patients) or femoral neck fracture (control group, 78 patients), operated on between January 1, 2020, and December 31, 2023 in a single center. For each patient, the SFPA (Figure 1) was calculated before THA and at the latest available follow-up. The SFPA measurements were converted to Pelvic Tilt angle according to the formula PT= SFP–75°. The distribution of the measured angles was evaluated for each group, and cut-off values (± 1 SD) were defined to classify the pelvis as having normal, anteverted, or retroverted orientation, comparing any differences observed following THA surgery. Demographics and clinical data (Harris Hip Score and complications) were also collected, analysed and compared.

RESULTS:

The results suggest that, following THA, among patients who had a pathological pelvic orientation before the surgery, 31% of the anteverted and 40% of the retroverted in the study group, and 46% of the anteverted and 30% of the retroverted in the control group, achieved a position of normal pelvic version ($p<0.05$). There was also a greater tendency towards retroversion in the control group compared to the study group. No predictive factors for a change in pelvic orientation towards anteversion or retroversion were identified. Clinical outcomes and complications did not show significant differences in relation to pelvic orientation in either patient group ($p<0.05$).

DISCUSSION AND CONCLUSION:

THA surgery has the potential to improve pelvic orientation and, consequently, the overall spine balance of the patient. It confirms to be an effective intervention for the treatment of primary hip OA and femoral neck fracture, ensuring excellent clinical outcomes and low complication rates, even in patients with pathological pelvic orientation. The influence of normalization of pelvic version on the overall spinal alignment and development of disease, is yet to be fully investigated

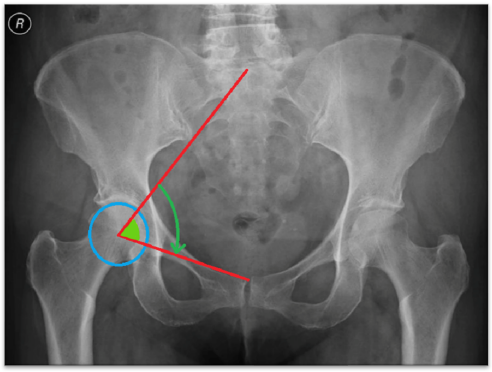

Figure 1. Measurement of the SFP angle (in green): A circumference (in blue) is drawn to circumscribe the femoral head and to identify the centre of rotation. The angle is described between the segment passing through the midpoint of the superior articular surface of the sacrum and the centre of rotation of the femoral head, and the segment drawn between this point and the superior margin of the pubic symphysis.