

Pelvic Tilt Cannot Be Accurately Predicted Using Anteroposterior Radiographs

Zlatan Cizmic MD¹, Jonathan Gabor BS¹, Nima Eftekhary MD¹, Hayeem L. Rudy MD¹, Michael O'Sullivan MD², Ran Schwarzkopf MD, MSc¹, Aaron J Buckland MD¹, Jonathan M. Vigdorichik MD³

¹Department of Orthopedic Surgery, NYU Langone Health, New York, NY,

²North Sydney Orthopaedic and Sports Medicine Centre, Wollstonecraft, AUS

³Adult Reconstruction and Joint Replacement, Hospital for Special Surgery, New York, NY



INTRODUCTION

- The phenomenon of increased anteversion and inclination as the pelvis rotates posteriorly in the transition from standing to sitting is referred to as “the biological opening of the acetabulum.”[1]
- Two-dimensional, antero-posterior (AP) pelvic radiographs are considered by many hip surgeons to be the standard imaging modality for assessment of the hip in THA [2,3-5]
- The use of lateral radiographs of the lumbar spine and pelvis to study postural change and spinopelvic mobility is a relatively new concept [6,7,8]
- The standard use of AP pelvic radiographs has led to some attempts to correlate spinopelvic parameters such a pelvic tilt to measurable ratios visible on AP radiograph [9-12]
- The degree to which spinopelvic mobility can be accurately assessed on AP pelvic radiographs in THA patients

OBJECTIVES

- Determine the ability of surgeons, with varying levels of familiarity with spinopelvic concepts, to accurately measure Anterior Pelvic Plane tilt (APPt) based on AP pelvic radiographs alone
- Quantify the level of familiarity hip surgeons have with spinopelvic concepts
- Quantify how frequently these concepts are applied in THA planning

METHODS

- An online survey, consisting of 65 standing AP pelvis radiographs, was completed by 135 fellowship-trained adult reconstruction surgeons (Figure 1)
- Participants were queried regarding:
 - Number of THAs performed annually
 - Predominantly used surgical approach
 - Familiarity with the subject of spinopelvic mobility as it relates to component placement in THA
 - Whether they routinely used concepts related to spinopelvic mobility in planning for THA
- Participants were asked to score each radiograph as:
 - Anterior pelvic tilt > 10 degrees
 - Posterior pelvic tilt > 10 degrees
 - Neutral
- Responses were then compared to measurements of pelvic tilt made on lateral standing pelvic radiographs
- Categorical and continuous variables were compared using chi-squared, unpaired, two-tailed student's T tests, and ANOVA

RESULTS

- Average correct predictive value of pelvic tilt between all surgeons was 53.2% (Table 1)
- No correlation between correct pelvic tilt percentage and surgeon volume ($p=0.72$), predominant surgical approach ($p=0.1$), familiarity with spinopelvic mobility ($p=0.57$), or routine usage of spinopelvic mobility in THA planning ($p=0.54$)

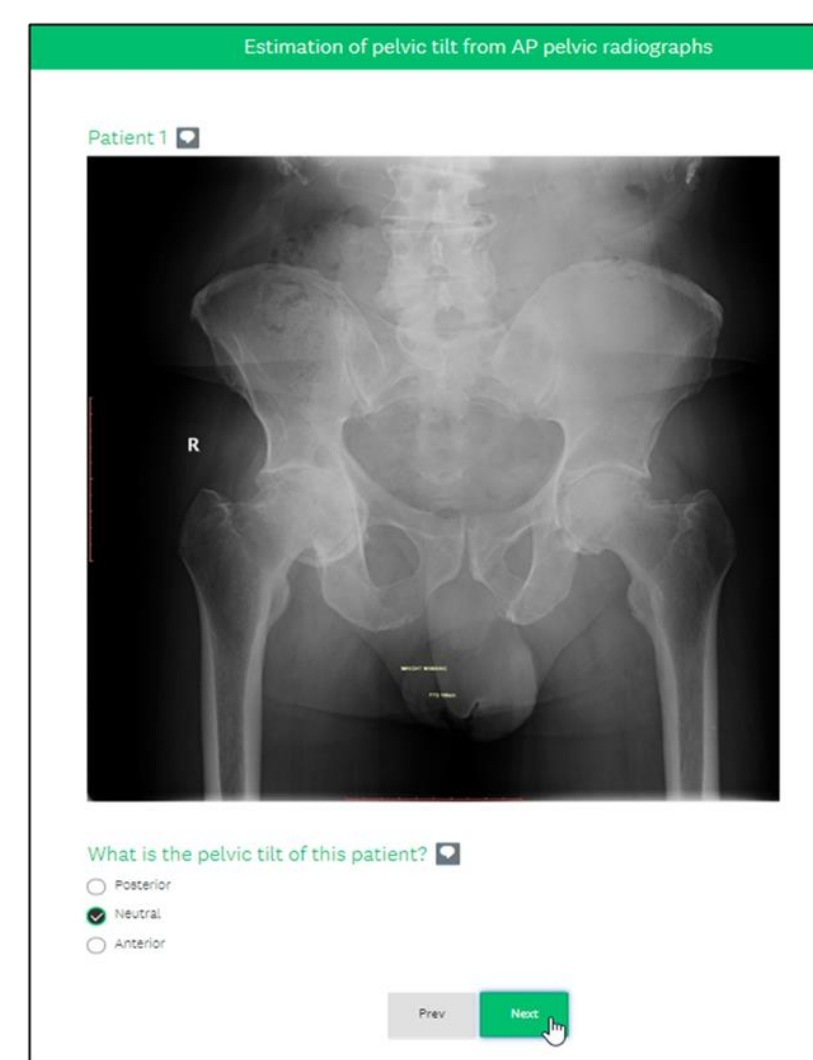


Figure 1: Sample of AP radiograph used to query surgeon ability to predict pelvic tilt

TABLE 1: Comparison of quiz score by surgeon practice, familiarity, and demographics

	N (%)*	Score (SD)	p-value**
Country			0.44
AUS	34 (25.2)	52.7 (9.1)	
USA	101 (74.8)	54.9 (5.4)	
Surgeon Volume			0.72
1-40	8 (5.9)	54.6 (4.7)	
41-100	42 (31.1)	51.0 (11.3)	
101-200	48 (35.6)	54.1 (6.0)	
201+	37 (27.4)	53.4 (10.2)	
Predominant Surgical Approach			0.10
Non-posterior	22 (15.9)	58.2 (3.8)	
Posterior	113 (84.1)	52.6 (8.7)	
Familiarity with spinopelvic mobility			0.57
Not so familiar	29 (21)	56.6 (5.1)	
Somewhat familiar	42 (31)	52.3 (6.4)	
Very familiar	39 (29)	52.3 (10.4)	
Extremely familiar	25 (19)	52.3 (10.1)	
Routine use of spinopelvic mobility in planning			0.54
No	66 (49)	52.4 (10.7)	
Yes	69 (51)	54.9 (6.0)	

* Not all variables sum to 46 due to missing data ** p-values calculated using T-tests and ANOVA

CONCLUSIONS

- Fellowship-trained adult reconstructive surgeons can correctly predict APPt using an AP radiograph about 50% of the time.
- Our results suggest an under appreciation of these concepts and the need for further elucidation of the topic
- We do not recommend that only a single AP radiograph be used in the preoperative workup of a patient undergoing THA, particularly in patients with possible spinal stiffness or deformity
- As the understanding of the hip-spine-pelvis relationship continues to grow, hip surgeons must continue to familiarize themselves with and incorporate functional pelvic concepts into their practice