



Predicting Internal Fixation Failure of Nondisplaced Femoral Neck Fractures using Posterior Tilt Angle

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INTRODUCTION

Femoral neck fractures are expected to increase in prevalence with an aging population. These fractures carry risk of avascular necrosis as the fracture alone can disrupt blood supply. The Garden Classification utilizes displacement to guide treatment decisions. Garden I and II fractures suggest preserved blood supply, allowing internal fixation rather than arthroplasty.

Recent literature indicates the rate of revision surgery following internal fixation of Garden I and II fractures is approximately 20%. Posterior Tilt Angle (PTA) is a radiographic measurement that may be predictive of internal fixation outcomes of these fractures. PTA is measured on a lateral radiograph of the hip, consisting of the angle between the mid-column line and the radius column line. This systematic review aims to determine association of preoperative PTA and risk internal fixation failure of nondisplaced femoral neck fractures.

METHODS

- Systematic review was conducted following PRISMA guidelines
- Quality appraisal conducted using the MINORS criteria
- All data was manually extracted and summarized
- Outcomes of interest included development of malunion, nonunion, avascular necrosis, loss of fixation, and reoperation requirement

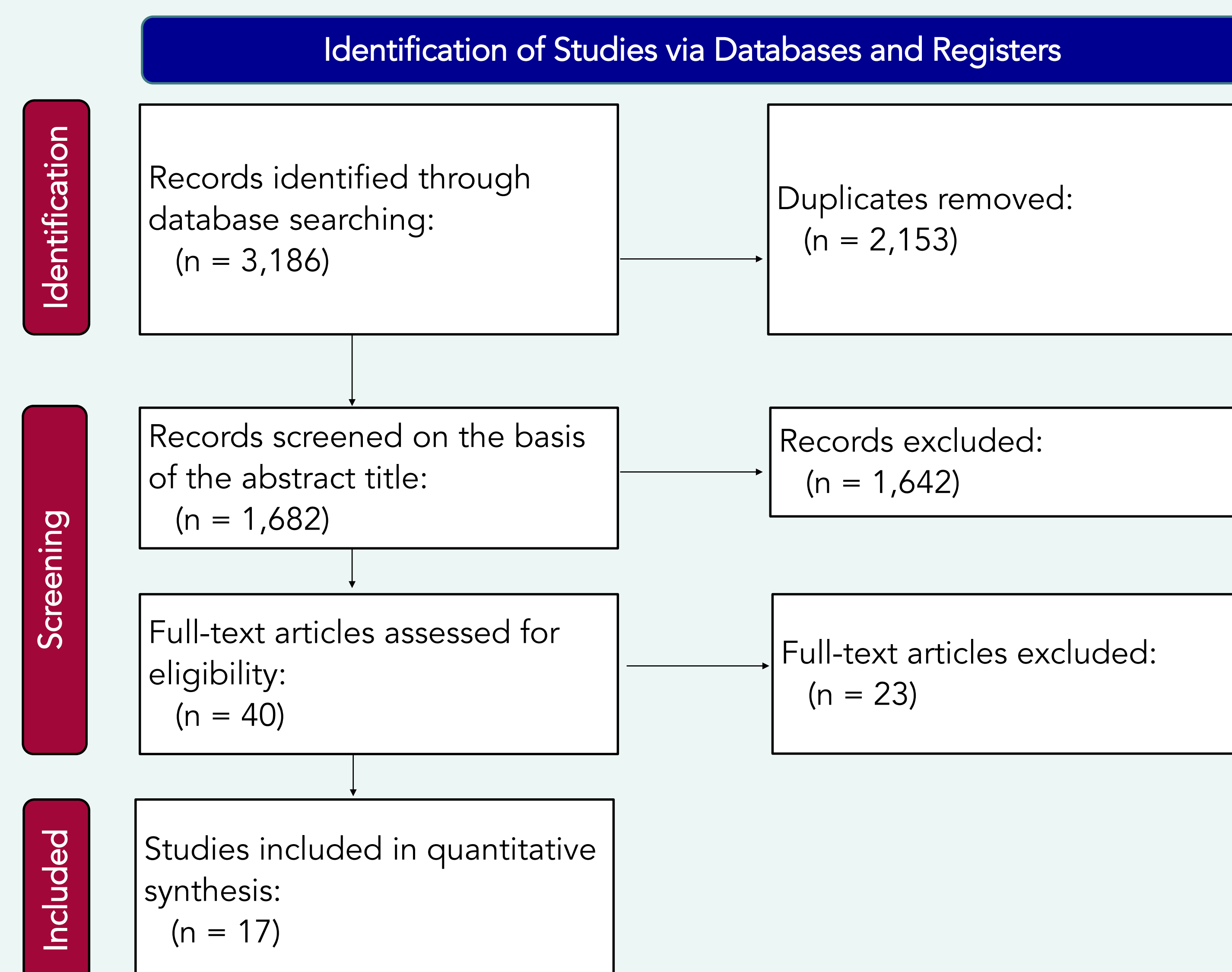


Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart. Full text review of 40 studies was conducted. 17 studies ultimately included.

RESULTS

- Treatment failure was observed in 14% of cases
- PTA ≥ 20 degrees had a failure rate of 24%, compared to 12% for < 20 degrees ($p < 0.001$) (Figure 2)
- Among studies reporting continuous PTA values, failures were found to have 8.2 degrees larger PTA ($p = 0.003$) (Figure 3)

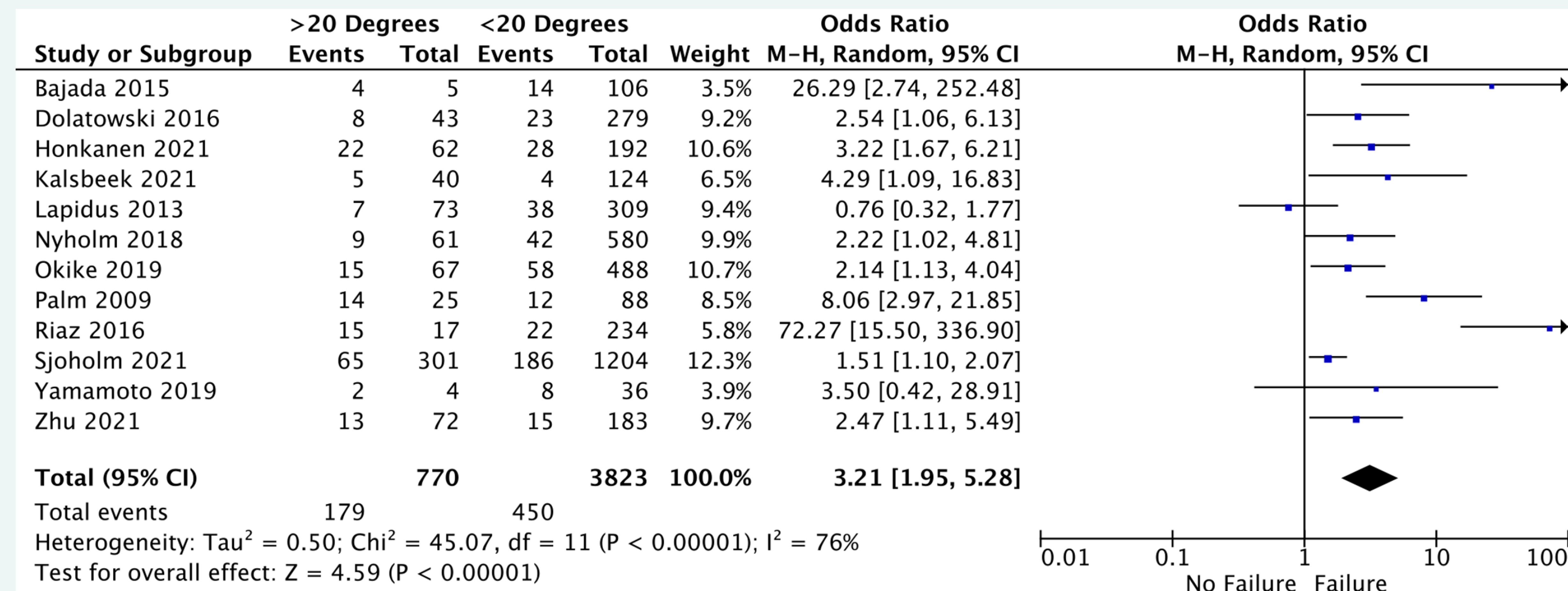


Figure 2: Larger rate of treatment failure with PTA > 20 degrees. Forest plot containing cases reporting failure using a PTA cutoff of 20 degrees.

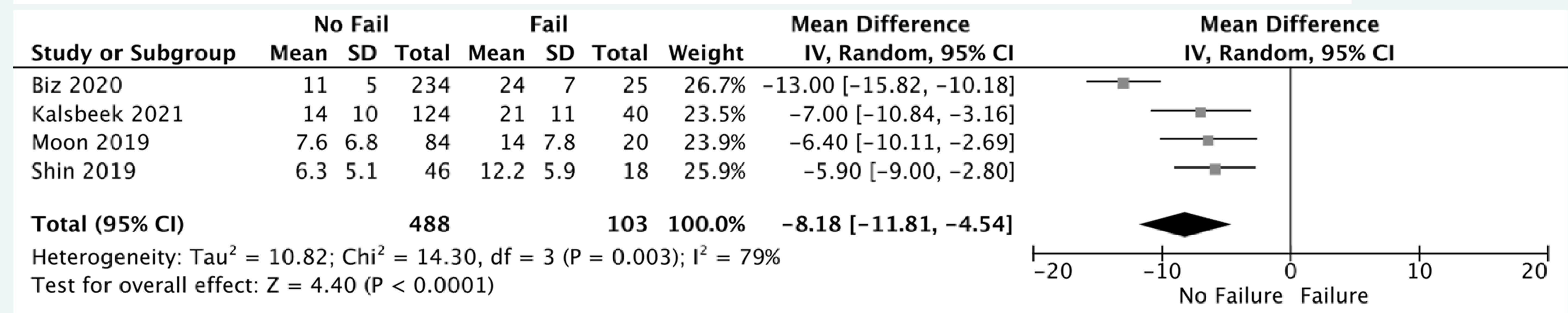


Figure 3: Mean PTA is higher in cohorts with treatment failure. Forest plot containing cases reporting continuous values for PTA with and without treatment failure.

CONCLUSIONS

- PTA is a useful measurement in predicting internal fixation failure of Garden I and II femoral neck fractures
- There is significantly higher rate of failure when PTA is greater than 20 degrees
- Additional studies treating PTA as a continuous variable are required to determine the true critical value

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