# Evaluation of intraoperative panoramic fluoroscopy for leg length discrepancy and cup positioning

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## INTRODUCTION

- Although C-arm guided navigation in total hip arthroplasty (THA) is routinely used, parallax distorts the AP pelvis image.
- There is little evidence on the efficacy of panoramic fluoroscopy (PF) in correcting parallax to improve intraoperative visualization of acetabular cup positioning and leg length discrepancy (LLD), especially during direct anterior approach (DAA) THA.

**Aim: To assess the accuracy of PF for LLD and cup position by comparing real-time intraoperative PF with C-arm measurements, and validating both PF and C-arm values with postoperative radiographic measurements.**

## METHODS

- 101 primary DAA THAs that utilized intraoperative PF (Radlink, El Segundo, California) were retrospectively analyzed.
- Intraoperative LLD and inclination were obtained on calibrated pelvis C-arm images.
- Postoperative inclination and anteversion were measured using EBRA-CUP (Einzel-Bild-Röntgen-Analyse, University of Innsbruck, Austria) software on 4-6 week postoperative AP pelvis images.
- Data were assessed using Wilcoxon signed-rank tests and Spearman correlation coefficients with R Statistical Software (version 1.1.463).

**Panoramic Fluoroscopy Intraoperative Imaging**

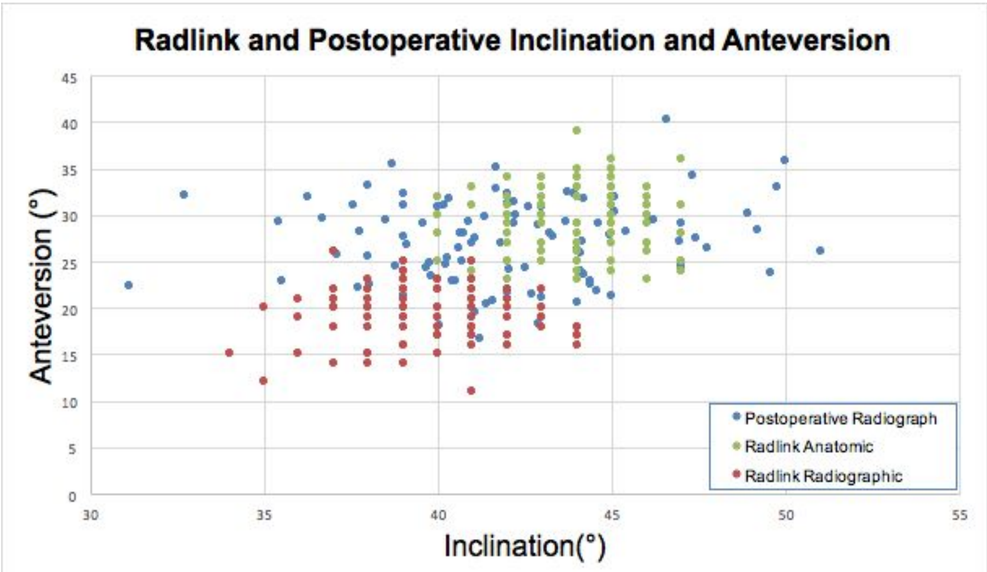


**Table 1: Median (IQR) of LLD, Radiographic Inclination, and Radiographic Anteversion**

| | C-arm Fluoroscopy | Panoramic Fluoroscopy | Postoperative Radiography |
|---|---|---|---|
| **LLD (mm)** | 3.25 (2.0 to 7.0) | 1.45 (0.3 to 2.4) | 1.5 (1.0 to 2.5) |
| **% of hips ± 2mm** | 45.8% | 88.4% | 85.1% |
| **Inclination (°)** | 36.0 (33.0 to 39.0) | 40.0 (38.0 to 41.0) | 43.0 (40.2 to 47.2) |
| **% of hips ± 5°** | 83.1% | 99.0% | 70.7% |
| **% of hips ± 10°** | 100.0% | 100.0% | 94.9% |
| **Anteversion (°)** | Not applicable | 20.0 (18.0 to 22.0) | 28.9 (25.3 to 31.9) |
| **% of hips ± 5°** | | 93.9% | 70.7% |
| **% of hips ± 10°** | | 100.0% | 96.0% |

**Table 2: Median (IQR) Difference between Postoperative and PF or between Postoperative and C-arm Values**

| | Δ Radlink vs Postoperative Measurements | Δ Postoperative vs C-arm Measurements | p-value |
|---|---|---|---|
| **LLD Median Difference (mm) n = 83** | 0.3 (-0.2 to 1.1) | 1.5 (0.0 to 3.5) | <0.0001 |
| **Inclination Median Difference (°) n = 100** | 0.3 (-3.3 to 3.3) | 7.7 (4.3 to 9.9) | <0.0001 |

## RESULTS

### Leg Length Discrepancy

- The median and interquartile range (IQR) of C-arm LLD was significantly higher than both PF LLD and postoperative LLD ($p<0.001$).
- The median (IQR) difference between postoperative and PF LLD was 0.3mm (-0.2 to 1.1), which was significantly lower than the difference between postoperative and C-arm LLD at 1.5mm (3.1 to 3.5; $p<0.0001$).

### Inclination and Anteversion

- Median (IQR) postoperative inclination was 43° (40.2° to 47.2°), which was not significantly different from PF inclination (44°, 42° to 45°; $p=0.9012$) but higher than C-arm inclination (36°, 33° to 38°; $p<0.0001$).
- PF anteversion (29°, 25.5° to 32.0°) was not significantly different from postoperative anteversion (29.1°, 25.4° to 31.9°; $p<0.0001$).

## CONCLUSIONS

- PF rather than C-arm fluoroscopy accurately assesses LLD intraoperatively, when compared to post-operative radiographs.
- Low inclination measurements obtained on C-arm images suggest that parallax horizontally stretches the outer edges of C-arm pelvis images.
- These findings suggest that panoramic fluoroscopy may correct parallax to improve intraoperative visualization of LLD and acetabular positioning in DAA THA.