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Setting the inclination for acetabular reaming in total hip replacement: Should we return to Charnley's original method? A theoretical X-ray study

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Abstract

Being one of the most successful surgeries in the history of medicine, the indication for total hip arthroplasty have widened and are increasingly being offered to younger and fitter patients. This has also lead to high expectations for longevity and outcomes. Acetabular cup position has a significant impact on the results of hip Arthroplasty. We suggest that guiding of acetabular reamers using Charnley's method offers the potential for placing the cup at the optimum 45 degree angle. Further work is currently underway using Pelvic CT scans with 3D reconstruction to correlate acetabulum anteversion angle.

Keywords: X-ray study, inclination of acetabular reaming in hip arthroplasty, Charnley's principle and method

Introduction

The Original Charnley method for acetabular preparation involved placing a drill hole immediately above the fovea which controlled the inclination and anteversion of an expanding grooved reamer.

Current problems with metal on metal prostheses has highlighted the importance of correct inclination and anteversion to reduce wear and component loosening. We wonder whether Charnley's original method of reaming has the potential to produce repeatable implantation at the natural inclination of 45 degrees.

In this study we measured the theoretical acetabular reamer angle with a pilot placed immediately above the fovea on AP pelvis plain radiographs to compare with Charnley's original 45 degree reamer.

Methods

A local search on the electronic X-ray database of all AP Pelvis films taken in August 2017 was performed. AP pelvis X-rays with prosthesis in situ, fractures and patients under aged 18 were excluded.

Fifty randomly selected X-rays fitting the criteria for selection in the study were imported into Ortho view Ltd. And anonymously analysed.

Measurements were taken as follows: a horizontal line was drawn across the inferior pubic rami and the acetabulum was filled with a concentric circle following the curve of the acetabulum.

A point immediately superior to the fovea representing the drill hole was identified and a line was drawn from this point through the centre of this acetabular circle, representing the plane of THR reamer.

The angle of this line was measured against the horizontal line to give the inclination angle of the reamer.

Results

Fifty patients were included in study.

The average inclination angle of the theoretical reamer was 44.98 degrees.

The majority of x-rays were found to have angle of 45 degrees (n=36)

The next most common finding was 46 degrees (n=8).

The range of angles found was 42-46 degrees.

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Conclusions

Based on our finding in this pilot study. We suggest that guiding of acetabular reamers using Charnley's method offers the potential for placing the cup at the optimum 45 degree angle. Further work is currently underway using Pelvic CT scans with 3D reconstruction to correlate acetabulum anteversion angle.

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