



Ten years results of total hip arthroplasty using CT-based navigation system

Nobuo Nakamura¹ and Nobuhiko Sugano²

¹ Kyowakai Hospital

² Osaka University, Suita, Osaka, JAPAN.

nnakamu@abox2.so-net.ne.jp, n-sugano@umin.net

Abstract

The purpose of the study is to investigate minimum ten years clinical results of primary and revision THA using CT-based navigation. Forty-nine primary THAs and 2 revision THAs were performed on 42 patients and followed for at least 10 years. The mean age at surgery was 58 years and the mean follow up was 130 months. During surgery, navigation was used for acetabular reaming and cup implantation in all cases. We evaluated Japanese Orthopaedic Association (JOA) clinical outcome scores, revision surgery and complications. In one primary THA case, navigation procedure was aborted because of registration failure. This case experienced femoral periprosthetic fracture at 4.5 years and dislocation at 8.5 years postoperatively. In another primary THA case, revision THA was performed because of aseptic loosening of cup at 4.5 years postoperatively. Except these two cases, there were no complications such as fracture, dislocation, infection, nerve palsy, deep vein thrombosis or loosening. Preoperatively, mean JOA clinical score was 44 points. Ten years postoperatively, it was improved to 96 points. When the aborted case is eliminated, there were no dislocations at ten years. The survivorship rate at ten years was 98% when revision surgery for any reason was considered as the end point. In conclusion, ten years clinical results of THA using CT-based navigation system were acceptable.

1 Introduction

Accurate positioning of the acetabular cup in total hip arthroplasty (THA) has been reported to prevent dislocation, limb length discrepancy, and accelerated wear, and this ultimately improves longevity¹. The use of surgical navigation systems in performing primary THA^{2,3} and revision THA⁴ has been proven to be accurate in positioning of the acetabular component. On the other hand, little is known about its mid to long term clinical result^{5,6}. The purpose of the study is to investigate minimum ten years clinical results of primary and revision THA using CT-based navigation system.

2 Methods

From November 2004, 49 primary THAs and 2 revision THAs were performed using CT-based navigation system (Stryker, Freiburg, Germany) on 42 patients and followed for at least 10 years. The mean age at surgery was 58 years and the mean follow up was 130 months. For preoperative planning, CT images were taken and transferred into the planning module. Reference points on the pelvis were taken in order to determine the pelvic plane, and segmentation of pelvis and acetabular component was performed. We are adopting functional pelvic plane⁷. According to the combined anteversion theory⁸, cup anteversion was based on the stem anteversion while maintaining the radiographic inclination of the cup aimed at 40°⁷. For example, when stem anteversion was 30±5°, we aimed cup inclination and anteversion at 40° and 15°, respectively.

During surgery, posterolateral approach with patients on the lateral decubitus position was used. Navigation was used for acetabular reaming and cup implantation in all cases. Postoperatively, no restrictions on ADL were imposed on patients. We evaluated Japanese Orthopaedic Association (JOA) clinical outcome scores, revision surgery and complications.

3 Results

In one primary THA case, navigation procedure was aborted because of registration failure. This case experienced femoral periprosthetic fracture at 4.5 years and dislocation at 8.5 years postoperatively. Revision surgeries were performed respectively. In another primary THA case, revision THA was performed because of aseptic loosening of cup at 4.5 years postoperatively. Except these two cases, there were no complications such as fracture, dislocation, infection, nerve palsy, deep vein thrombosis or loosening. Preoperatively, mean JOA clinical score was 44 points. Ten years postoperatively, it was improved to 96 points. At the latest follow up, six patients could not squat, but none of which was attributed to the operated hip joint.

4 Discussion

CT-based navigation system has been reported to both place the cup accurately and to minimize the variance in cup orientation. We have reported that the absolute error of cup positioning was less than 2 mm in spatial position, and the angle error was less than 2° for the angle of inclination and anteversion using this system in primary THA³ and even in revision THA, these accuracies were not significantly different⁴. Sugano et al. had compared survivorship, dislocation rate, and incidence of radiographic failures such as loosening and bearing breakage after THA with and without navigation at a minimum 10-year follow up⁶. They reported that navigation reduced the rates of dislocation and impingement-related mechanical complications leading to revision. However, the navigation system they used was not commercially available. To our knowledge, there had been no other reports about long-term follow up results of THA using commercially available navigation system.

In this study, when the aborted case is eliminated, there were no dislocations at ten years despite that no restrictions on ADL had been imposed on patients. The survivorship rate at ten years was 98% when revision surgery for any reason was considered as the end point. The limitation of study is that this was a retrospective study and we have no control group to compare the influence of navigation. In conclusion, ten years clinical results of THA using CT-based navigation system were acceptable.

5 References

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