

# ORTHOPAEDICS

## SHORT REPORT

### Intra-operative implantation errors during Austin Moore Hemiarthroplasty

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#### Abstract

Austin Moore hemiarthroplasty is an established treatment in elderly patients with neck of femur fractures. Being commonly performed, it is also associated with several technical errors of implantation which results in complications and failure requiring revision surgery. This retrospective pre- and post-operative radiographic study to determine the frequency of technical errors was conducted at the Indus Hospital, Karachi, and comprised data of 50 patients who underwent Austin Moore hemiarthroplasty between January and November 2016. Of the total, 29(58%) patients had no error of implantation. Overhanging of prosthesis was observed in 21(42%) patients, followed by inadequate length of the neck remnant in 18(36%). Moreover, 8(16%) patients sustained intra-operative periprosthetic fractures managed with cerclage wire. Also, 33(66%) patients had a Dorr type-A femur morphologic pattern. Hemiarthroplasty was found to be a technically demanding procedure associated with avoidable intra-operative implantation errors by proper preoperative planning, careful patient selection, proper training of surgeons, hence avoiding failure.

**Keywords:** Austin Moore, Hemiarthroplasty.

#### Introduction

Femoral neck fracture is one of the commonest orthopaedic manifestations in elderly population. Despite high mortality associated with hip fracture, these fractures are expected to double in the next 20 years and triple by 2050.<sup>1</sup> Austin Moore hemiarthroplasty is still commonly employed in developing or under-developed countries, especially in low demanding population. Some studies show durability of the prosthesis of even more than 20 years.<sup>2</sup> Pre-operative technical errors may result in prosthetic failure. Kwok and Cruess reviewed 599 patients with Austin Moore and Thompson hemiarthroplasty implantations and found that improper head size as the cause of prosthesis failure.<sup>3</sup> Sharif and Parker<sup>4</sup> showed strong relationship between inadequate neck length with aseptic loosening required revision surgery. In a study by Yaupoor,

metaphyseal fit (< 70%) resulted in failure.<sup>5</sup> Despite being commonly performed operation, insufficient literature is available regarding the implantation technical errors. The current study was planned to identify the technical errors experienced by residents and surgeons during implantation of the uncemented Austin Moore with a view to improving technique and minimising failure.

#### Methods and Results

This retrospective study was conducted at the Indus Hospital, Karachi, and comprised radiographs of patients



**Figure:** Arrow showing overhang of the Austin Moore prosthesis.

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**Table:** Showing frequency and percentage of patients with intra-operative errors.

Errors during Austin Moore implantation	No. of patients	% of patients
Implant overhang	21	42%
Length of remnant femoral neck	18	36%
Metaphyseal fit <70%	07	14%
Inappropriate femoral head size	Non	non
Periprosthetic fracture	08	16%
Implant seating over the calcar	09	18%
More than 1 errors	12	24%

who had undergone uncemented Austin Moore from January 2015 to November 2015. Electronic data of operation notes and pre- and immediate post-operative radiographs were assessed. Elderly patients with fracture neck of femur fracture treated with Austin Moore endoprosthesis were included. Patients with incomplete data were excluded. Data was recorded on a standardised data sheet. All procedures were carried out by a senior resident (fourth postgraduate year and above and an orthopaedic surgeon under similar intra-operative conditions. Radiographic assessment of technical accuracy of prosthetic implantation was performed. An error in implantation was defined as technical aspects of procedure known to be associated with early failure of the prosthesis.<sup>4,5</sup> The study considered six potential errors in implantation: length of the neck remnant, measured from the superior margin of the lesser trochanter to the resection margin at the calcar femorale. Neck length of <10mm was considered inadequate; calcar seating of implant; prosthetic head size corresponding to original head or prosthesis up to 1mm larger; intra-operative peri-prosthetic fractures — classified using Vancouver system; the relative metaphyseal fill greater than 70% of the stem of prosthesis in the medullary canal of femur at the level of tip of lesser trochanter on anteroposterior radiograph; and overhanging of the collar of the implant over the calcar.

Data was analysed for various variables. SPSS 21 was used for statistical analysis.

Of the 50 patients, 29(58%) had no error of implantation. The commonest intra-operative error was overhanging of prosthesis, occurring in 21(42%) patients, followed by inadequate length of the neck remnant in 18(36%). Moreover, 9(18%) patients had inadequate calcar seating. None of the patients with incorrect prosthetic head size was identified. Also, 8(16%) patients sustained intra-operative peri-prosthetic fracture: all of them were Vancouver type A2 fractures and were identified during the procedure and managed with cerclage wire.

Besides, 33(66%) patients had a Dorr type A femur morphologic pattern, 13(26%) patients had type B and 4(8%) had Dorr type C. Inadequate proximal metaphyseal fill was observed in 7(14%) patients. Proximal metaphyseal fill greater than 70% was observed in 43(86%) patients. In addition, 12(24%) patients were identified with more than one implantation error (Table).

## Conclusion

The present study demonstrated at least 1 intra-operative error in 21(42%) patients during implantation. A study with 147 patients demonstrated that 48% of them had at least one technical error of implantation.<sup>6</sup> Another study of 47 patients identified at least one technical error in 40%.<sup>7</sup> Our commonest intra-operative error was overhanging of the prosthesis which was found in 21(42%). This overhang had not been addressed by any previous study. Overhanging of the calcar is probably because of poor lateralisation of prosthesis which is determined by entry point at the time of femoral preparation via box punch (Figure). Poor lateralisation results in improper positioning of the implant, causing likelihood of early failure as implant may toggle in proximal femur. This can be avoided by pre-operative templating and careful localisation of starting point. Inadequate length of the femoral remnant was the second-most common error in the current study, and was comparable with other studies.<sup>6</sup> Inadequate length of the calcar is because of miscalculation of resection of the neck from the upper part of lesser trochanter. This also claims to result in prosthetic dislocation, prosthetic subsidence, limb shortening and aseptic loosening necessitating early revision.<sup>8</sup> To avoid this, pre-operative templating may be utilised for neck level resection. In the current study, 5 patients had pre-operative inadequate length of the neck of femur, a factor which cannot be controlled by the operating surgeon, but that can be overcome by proper pre-op planning following rightly selection of implant. All patients had proper prosthetic head size in our study, correlating another study.<sup>6</sup> In our study, there were 8(16%) patients with intra-operative peri-prosthetic fractures-Vancouver type A, with 1(12.5%) occurring while broaching, 5(62.5%) during prosthesis insertion and 2(25%) during hip reduction. They were identified pre-operatively and managed with cerclage wire. This incidence of iatrogenic fracture in literature is found to be between 4.5% and 14%.<sup>7,9</sup> Osteoporosis and Dorr type femoral morphology and incorrect starting point for femoral broaching can be responsible for peri-prosthetic fracture. Ensuring adequate soft tissue release, gentle reduction manoeuvre and adequate lateralisation is essential. Oversizing of the implant to get press-fit stability ends up in splinting the femur most of the times.

Alternatively, option of narrow stem prosthesis or cementing the Austin Moore prosthesis can be considered. Dorr type A proximal morphology is commonly seen among Africans where narrow sclerotic medullary canal predisposes people to iatrogenic periprosthetic fracture.<sup>10</sup> We had 33 patients with Dorr A, followed by type B (13 patients) and Dorr type C (4 patients). Literature recommended us to start with t-handle tapered intramedullary reamer to ream out the canal and attain gradually upsizing. Inadequate proximal metaphyseal fill was observed in 7(14%) patients. A loose stem provides inadequate rotational stability, aiding loosening.<sup>7,9</sup> Surgeons should carefully assess the appropriate size implant corresponding to the proximal femoral anatomy, not compromising on stability and risk of fracture.

We found that uncemented hemiarthroplasty is a technically demanding procedure associated with frequent intra-operative implantation errors. These errors can be avoided by preoperative templating, careful patient selection and proper training of surgeons.

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