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Retrospective study of proximal coated versus fully coated femoral stem used in cementless total hip arthroplasty surgery

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Abstract

Cementless femoral components used in total hip arthroplasty, are designed as proximally coated and fully coated stem. There is still debate regarding differences in clinical outcome scores and thigh pain incidence. We studied these variables in our retrospective study of 50 patients (mean age group was 44.34 years) of which 25 were operated with proximally coated (group A) cementless M/L tapered femoral stem (Zimmer- Biomet) and 25 with fully coated (group B) cementless CORAIL femoral stem (DePuy-Synthes). Patients with minimum follow up of 1 year with post-operative follow up at the interval of 3 months, 6 months and 1 year were selected for the study. We observed no difference with preoperative and postoperative clinical outcome scores (WOMAC, Harris Hip Score) and thigh pain incidence with the two groups. Both proximally coated and fully coated cementless femoral components performed well with no clinical differences at 1 year follow-up.

Keywords: Retrospective, proximal, coated, coated femoral

1. Introduction

There are large number of cementless and cemented implants used for total hip arthroplasty worldwide. The femoral press-fit cementless designs fall into following categories: proximally coated tapered stems that achieve primarily proximal fixation and fully coated stems that achieve primarily distal fixation ^[1]. Both the designs have good to excellent clinical results with mid- to long-term follow-up. Clinical records of both stem designs appear equal to the date but many surgeons, those having good experience of proximally coated stems, argue that fully coated stems have a higher incidence of thigh pain and femoral stress shielding ^[1].

The reported incidence of thigh pain after total hip arthroplasty with a fully coated femoral component varies between 3%-20% ^[1] Clinically, in fully coated stems, only 3% of patients reported the thigh pain (versus 15% in the proximally porous coated group) ^[2]. Most authors recognize the reported incidence of thigh pain will be influenced by the way a patient is asked about its presence ^[1].

Stress-shielding (Femoral remodelling) is the phenomenon in which there is femoral bone loss or resorption around the well-fixed femoral components. This occurs around the most stem designs ^[3-5]. This stress-shielding phenomenon is exacerbated with fully coated stems ^[3, 6]. However clinical relevance of this stress shielding remains to be determined ^[7, 8]. According to Engh *et al.* ^[8], stress-shielding was more likely in females, patients with a low cortical index, and patients with larger stems; and no patients with stress-shielding had femoral loosening, implant fractures, or loss of porous coating.

Potential complications have also included greater and lesser trochanteric avulsion fractures and Pritchett JW ^[9] concluded that the fractures of the greater trochanter generally are stable and usually do not require additional treatment.

So, in this retrospective study, we decided to compare a proximally coated femoral component to a fully coated femoral component to examine differences in the clinical scores (WOMAC and Harris Hip Score [HHS]), and incidence of thigh pain.

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2. Materials and Methods

The study was conducted at Grant Govt. Medical College and Sir JJ groups of institute. 50 patients, operated between 1st Jan 2018 to 31st Dec 2018, were selected for study. Patients with degenerative disorder of the hip, avascular necrosis and pre-existing bone disorder like rheumatoid arthritis or ankylosing spondylitis undergoing primary THA with either Dorr^[10] A or B femoral morphology and between 20 and 75 years of age were selected for this study. We excluded patients with revision hip arthroplasty. Out of the 50 patients, 25 were operated with proximally coated (group A) cementless M/L tapered femoral stem (Zimmer-Biomet) and 25 with fully coated (group B) cementless CORAIL femoral stem (DePuy-Synthes); (Table 1).

The study was conducted as a retrospective comparative study between the groups receiving the two types of femoral stem. The patients were enrolled and evaluated preoperatively and

at 3 months, 6 months and 1 year postoperatively. The clinical outcome scores (WOMAC and HHS)^[11, 12, 13] were obtained and incidence of thigh pain was assessed at each of these visits. To obtain thigh pain incidence at preoperative and at every postop visit, a 10 centimetre visual analogue scale^[14] i.e. VAS (from 0 to 10) was utilized. Each patient was asked specifically to choose number over VAS denoting the pain severity at each visit. Clinical and demographic data for all patients was collected and compiled throughout the treatment and follow-up period meticulously. Stem group demographics were compared to ensure they were similar. Mann-Whitney U test was applied to compare the clinical outcome scores between the two study groups. Incidence of thigh pain was compared using chi-square test. There was no difference in the patient demographic parameters between two groups (Table 1).

Table 1: Demographic characteristics of study subjects

Characteristic	Femoral component	
	Proximally coated femoral stem (Zimmer-Biomet), Group A	Fully coated femoral stem (DePuy-Synthes), Group B
Number	25	25
Mean age (years)	42.88	45.8
Gender (M: F)	68%: 32%	60%: 40%

The femoral implants used were either proximally coated "M/L tapered stem with kineactiv technology (Zimmer-Biomet)" or a fully coated "CORAIL stem (DePuy-Synthes)". The acetabular component used was exclusively followed along the lines of the stem manufacturer. All patients received a 28-mm cobalt-chrome head. With the exception of the femoral stem and acetabular component implanted, all patients with identical care in every other aspect, including

postoperative weight bearing and exercises for both the groups, were included in the study.

3. Results

We observed no significant difference in the WOMAC and Harris Hip Scores (HHS) at the preoperative and each of the postoperative visits at 3 months, 6 months and 1 year between this two implant groups (Table 2).

Table 2: Comparison of clinical outcome measures

Measure of Clinical Outcome	Time	Sum of ranks; Mean rank		Mann-Whitney U; p value
		Zimmer-Biomet, Group A (n=25)	DePuy-Synthes, Group B (n=25)	
WOMAC	Pre-operative	584; 23.36	691; 27.64	259; 0.297
	Post-op (3 months)	615.5; 24.62	659.5; 26.38	290.5; 0.668
	Post-op (6 months)	620; 24.8	655; 26.2	295; 0.733
	Post-op (1 year)	638; 25.52	637; 25.48	312; 0.992
Harris Hip Score (HSS)	Pre-operative	624; 24.96	651; 26.04	299; 0.793
	Post-op (3 months)	655; 26.2	620; 24.8	295; 0.733
	Post-op (6 months)	642; 25.68	633; 25.32	308; 0.93
	Post-op (1 year)	713; 28.52	562; 22.48	237; 0.14

There was a high incidence (100%) of preoperative severe thigh pain in all patients related to the underlying diagnosis of osteoarthritis. At 3 months postoperatively, the incidence of moderate thigh pain in both the groups was not significantly different (Table 3). There was no significant difference in the

incidence of mild thigh pain postoperatively at 6 months (68% Zimmer-Biomet & 76% DePuy-Synthes) and at 1 year (36% Zimmer-Biomet & 48% DePuy-Synthes) between the two groups. The patients who reported thigh pain, most had pain on daily basis rather than weekly or monthly.

Table 3: Post-operative incidence of thigh pain

Time	Incidence of thigh pain		Chi-square; p value
	Zimmer-Biomet, Group A (n=25)	DePuy-Synthes Group B (n=25)	
Post-op (3 months) ^a	13; 52%	16; 64%	0.739; 0.39
Post-op (6 months) ^b	17; 68%	19; 76%	0.397; 0.529
Post-op (1 year) ^b	9; 36%	12; 48%	0.739; 0.39

a- Incidence of moderate pain was compared after 3 months.

b- Incidence of mild pain was compared at 6 months and 1 year post-op follow-up as there were no complaints of moderate pain.

4. Discussion and Conclusion

We performed a retrospective study comparing two different femoral component designs: proximally coated M/L tapered

stem and fully coated CORAIL stem. While both stems have had excellent clinical track records, questions remain regarding each stem design and the relative incidence of thigh

pain.¹ Hence, we evaluated the validated outcome measures like WOMAC, Harris Hip Score (HHS) and the incidence of thigh pain.

Both femoral components provided reproducible results in terms of clinical outcome scores. We observed no significant differences in WOMAC, Harris Hip Scores (HHS) and incidence of thigh pain at any time interval between the two groups in the study. This finding was expected, as both stems have been used widely in clinical practice with good clinical track records^[15-18].

In this retrospective study comparing a proximally coated M/L tapered stem design to a fully coated CORAIL stem design, we observed no differences in thigh pain incidence and clinical outcome scores.

There are few limitations to this retrospective study; first, the follow up period of 1 year is clearly an early postoperative period and demonstrates early trends that will not necessarily be seen with longer-term evaluation and second, we could not include DEXA scan evaluation for every patient and hence stress shielding effect was not compared at all.

5. Disclosure

We received no funding for this study.

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