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Evaluation of Risk Factors for Post- Operative Periprosthetic Fractures Following Primary Total Hip Arthroplasty: An Institutional Based Study

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ABSTRACT

Background: Total Knee Arthroplasty and Total Hip Arthroplasty are two frequently performed surgeries that decrease joint pain and improve the functionality and the quality of life of subjects with knee and hip problems. The optimal technique of component fixation while performing primary total hip arthroplasty is still controversial topic, with various studies trending towards increased use of cementless fixation methods. The aim of the present study is to determine the risk factors for post-operative periprosthetic fractures following primary total hip arthroplasty.

Materials and Methods: The present observational study was performed in the SMS Medical College and Hospital, Jaipur during a period of 2 years. Ethical committee clearance was obtained from the institute's ethical board. All the subjects who underwent hip replacement due to any underlying reason were included in the study. Post-operative periprosthetic femoral fractures were recognized by checking a personal number in the medical database, including re-admissions and re-operations in the hospital.

Results: There were 60% subjects more than 70 years of age and 40% less than 70 years of age who had periprosthetic fractures. There was no significant effect of age group on incidence of periprosthetic fractures. On the contrary there were only 40% of the subjects with fracture that had cortical index more than 0.5. The cortical index exerts a significant effect on the incidence of fracture.

Conclusion: From the above study we can conclude that cortical bone thickness and gender are independent risk factors for periprosthetic fractures. The thickness of the cortical bone should be considered an important factor while planning cases of total hip arthroplasty.

Keywords: Arthroplasty, Hip, Prospective.

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INTRODUCTION

Major advancement in managing chronic pain in joint is Joint arthroplasty. It is generally performed amongst subjects in whom conservative medical treatment has failed. Total Knee Arthroplasty and Total Hip Arthroplasty are two frequently performed surgeries that decrease joint pain and improve the functionality and the quality of life of subjects with knee and hip problems.[1-5] The most common cause for total knee and hip arthroplasty is Osteoarthritis. Other conditions leading to total knee and total hip arthroplasty include inflammatory arthritis, malignant lesions, fracture, dysplasia etc. There exists certain differences in outcomes of both the treatment procedures due to difference in joint anatomy and disease process[6] , most subjects achieve long-term improvement with the procedures. The optimal technique of component fixation while performing primary total hip arthroplasty is still controversial topic, with various studies trending towards increased use of cementless fixation methods.[7-9] Due to great advantages with total knee and total hip arthroplasty, its incidence is rising rapidly.

Recent studies showed that cementless total hip arthroplasty is associated with a increased rate of early revision when compared with cemented hip arthroplasty, and periprosthetic fracture is the leading cause of failure for cementless hip arthroplasty.[10] Periprosthetic fractures have been seen with higher readmission rates,[11] more financial burden,[12,13] reduced functional result, and elevated mortality.[14] The improvements in surgical process, type of implant, and design have produced an excellent long term result of total hip arthroplasty and the implant survival incidence of 93% after 10 years have been seen.[15] The aim of the present study is to determine the risk factors for post-operative periprosthetic fractures following primary total hip arthroplasty.

MATERIALS AND METHODS

The present observational study was performed in the SMS Medical College and Hospital, Jaipur during a period of 2 years. All the subjects were informed were informed about the study and

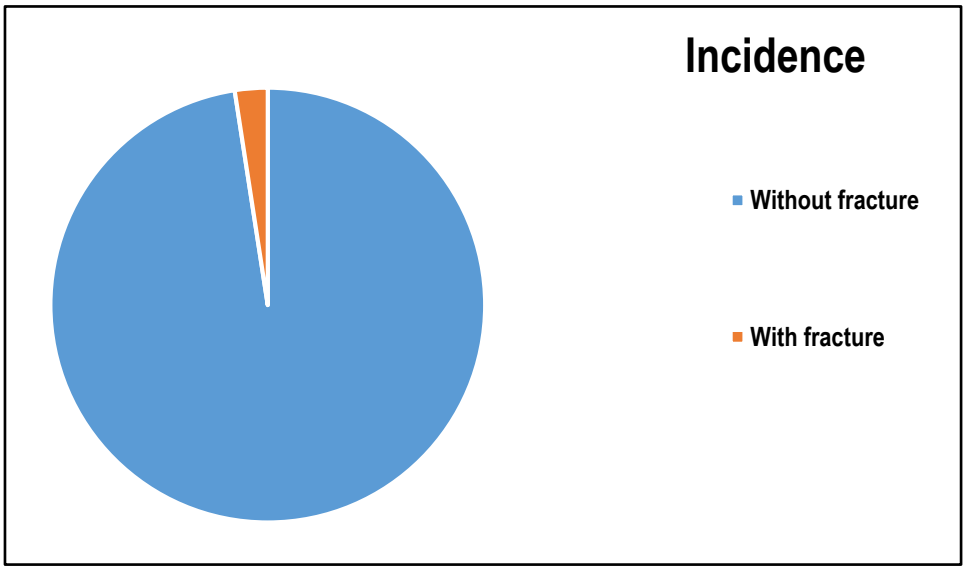
written consent was obtained from all in their vernacular language. All the subjects who underwent hip replacement due to any underlying reason were included in the study. Subjects with non union of proximal femur fracture or revision stems were excluded from the study. All subjects received a single brand double-tapered plasma sprayed titanium alloy with cementless femoral component and a porous cementless acetabular part with a vitamin E-diffused liner (Exceed; Biomet Inc.). All the surgeries were performed by trained specialists. The demographic details of all the patients including body mass index were noted. The weight and height of all the patients were noted in kilograms and centimeter. The body mass index of subjects was evaluated in Kg/m^2.

A complete pre-anesthetic checkup of all the subjects was done before the initiation. Post-operative periprosthetic femoral fractures were recognized by checking a personal number in the medical database, including re-admissions and re-operations in the hospital. All the data was arranged in a tabulated form and analyzed using SPSS software. The data was expressed as percentage of total.

Table 1: Characteristics of subjects with or without fracture

Variable		No fracture	Fracture	P value
Gender	**Male**	80(40%)	1(20%)	<0.05
	Female	120(60%)	4(80%)	
Age group	**<70 years**	104(52%)	2(40%)	>0.05
	>/= 70 years	96(48%)	3(60%)	
BMI	**<25**	70(35%)	2(40%)	>0.05
	25-30	80(40%)	3(60%)	
	>30	50(25%)	0	
Cortical index	**</= 0.5**	36(18%)	3(60%)	<0.05
	>0.5	164(84%)	2(40%)	

Graph 1: Subjects with postoperative fracture



RESULTS

Table 1, Graph 1 reveals the characteristics of subjects and percentage of subjects with periprosthetic fractures. There were 40% (n=80) males and 60%(n=120) females with no fracture. In a total of 5 subjects periprosthetic fractures were observed. There was a significant difference between the genders regarding the incidence of fractures. Majority of the subjects 52% (n=104) were less than 70 years of age. There were 60% subjects more than 70 years of age and 40% less than 70 years of age who had periprosthetic fractures. There was no significant effect of age group on incidence of periprosthetic fractures. Majority of the fractures occurred in subjects with BMI between 25- 30. There were 40% subjects with BMI less than 25 that had fracture. There was no significant effect of BMI on the incidence of fracture. The cortical index was less than 0.5 in 18% subjects and more than 0.5 in 84% subjects without fracture. On the contrary there were only 40% of the subjects with fracture that had cortical index more than 0.5. The cortical index exerts a significant effect on the incidence of fracture.

DISCUSSION

Osteoarthritis the leading cause of disability in older subjects amongst the white populace of the Western societies.[16] In the United States, hips osteoarthritis affects around 5% of the populace above the age group of 60 years[17] and it is a highly progressive condition. It is responsible for majority of the total hip replacements in Western countries. There occurs wide variation in the geographic and racial distribution of the condition and it provides valuable information about the etiological mediators. Few studies about the incidence of osteoarthritis have been done in the

northern and western parts of European countries and United states. According to Birell et al.[18] in the year 1999, a rise of 40% amongst of total hip replacements from the year 1996 to 2026 in United Kingdom was observed. As per this study, there were 40% (n=80) males and 60% (n=120) females with no fracture. In a total of 5 subjects periprosthetic fractures were observed. There was a significant difference between the genders regarding the incidence of fractures. Majority of the subjects 52% (n=104) were less than 70 years of age. There were 60% subjects more than 70 years of age and 40% less than 70 years of age who had periprosthetic fractures. There was no significant effect of age group on incidence of periprosthetic fractures. Majority of the fractures occurred in subjects with BMI between 25- 30. There were 40% subjects with BMI less than 25 that had fracture. There was no significant effect of BMI on the incidence of fracture. The cortical index was less than 0.5 in 18% subjects and more than 0.5 in 84% subjects without fracture. On the contrary there were only 40% of the subjects with fracture that had cortical index more than 0.5. The cortical index exerts a significant effect on the incidence of fracture. Results of the study were like reported by Singh et al,[19] who found female prevalence. They were found to have a 1.48 increased chance for post-operative periprosthetic fractures. According to Berend et al,[20] also female gender was found to be an independent risk factor for periprosthetic fracture. As per a study performed in England decreased prevalence of hip joint replacement was seen in the Northern region compared to the South region, although the need of arthroplasty was significantly more in North.[21] According to a recent study, the majority of hospital admissions are due to fall that occur within the first postoperative month, which is similar with the timing of periprosthetic fractures in this study.[22] Coventry came to the conclusion that total hip arthroplasty, might be the orthopedic operation of the century."[23] Total hip resurfacing, also known as surface replacement arthroplasty, has gained recent widespread approval due to the use of two metal-on-metal hip implants accepted by the FDA in the last 9 years. Hip resurfacing has been conducted for past 15 years in America and Europe and has come up with improved and favorable outcomes.[24,25]

CONCLUSION

Total arthroplasty is a widely-used treatment option these days. From the above study we can conclude that cortical bone thickness and gender are independent risk factors for periprosthetic fractures. The thickness of the cortical bone should be considered an important factor while planning cases of total hip arthroplasty.

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