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ANALYSIS OF THE RADIOLOGICAL ASSESSMENT OF RECONSTRUCTION IN TOTAL HIP ARTHROPLASTY

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Abstract

Background: Total hip Arthroplasty (THA) is one of the most common interventions in Orthopaedic surgery. Increase in incidence of THA appears likely with the growing elderly population. THA has revolutionised the management of the patients suffering from pathologies of the hip. The common indications for THA today are osteoarthritis hip, avascular necrosis hip, ankylosing spondylitis, rheumatoid arthritis and in posttraumatic hip.

Methods: The study was carried as a retrospective study, from February 2013 to July 2014. After getting the approval from the Ethics Committee of the Institute (Annexure I) and the consent from the patients the study was conducted on 49 patients who underwent Total Hip Arthroplasty after fracture acetabulum.

Results: Based on the treatment received for fracture acetabulum, the vertical offset measurement was done for 47 patients. The affected side was compared with the un-affected side in the patient and a restoration of vertical offset on the affected side within 20% of the unaffected side was taken as acceptable. In 31 patients acceptable vertical offset was restored.

Conclusion: Radiological assessment of the patients was done using 4 parameters. Measurement of Vertical offset, Horizontal offset, Body lever arm and Acetabular cup inclination was done. The affected side was compared with the un-affected side in the patient and a restoration of parameters on the affected side within 20% of the unaffected side was taken acceptable.

Keywords: Radiological, Arthroplasty, Reconstruction

Introduction

Total hip Arthroplasty (THA) is one of the most common interventions in Orthopaedic surgery. Increase in incidence of THA appears likely with the growing elderly population. THA has revolutionised the management of the patients suffering from pathologies of the hip. The common indications for THA today are osteoarthritis hip, avascular necrosis hip, ankylosing spondylitis, rheumatoid arthritis and in posttraumatic hip. THA done after fracture acetabulum in particular is a highly challenging surgery and has a higher failure rate when compared to total hip arthroplasty done for degenerative arthritis[1, 2].

After fracture acetabulum, open reduction internal fixation forms the mainstay of treatment with aim to achieve anatomical reduction which is helpful in preserving the acetabular bone stock and subsequent functional outcome[3]. Selected patients with undisplaced fractures of acetabulum where the weight bearing dome is intact may be treated non-operatively[4]. There is a close association with the quality of fracture reduction achieved at the time of surgery and early development of degenerative osteoarthrosis hip. The degenerated hip in due course is likely to require arthroplasty as treatment measure.

Materials and Methods

PATIENT SELECTION:

The study was carried as a retrospective study, from February 2013 to July 2014. After getting the approval from the Ethics Committee of the Institute (Annexure I) and the consent from the patients the study was conducted on 49 patients who underwent Total Hip Arthroplasty after fracture acetabulum.

INCLUSION CRITERIA

Patients who had undergone total hip arthroplasty in the past 7 years following fracture of the acetabulum, by a single surgeon.

EXCLUSION CRITERIA:

1. Debilitating medical or surgical illness or generalized illness or co morbidities leading to restriction of physical activities.
2. Any associated foot, ankle, knee injury or disease likely to affect the overall functional outcome.
3. Associated spine injury.
4. Any neurological or psychiatric ailments interfering with the assessment of general health of the case.
5. THA done more than 7 years ago.

GROUPS

Patients were divided into

1. Four groups based on the diagnosis.

2. Two groups on the basis of treatment received after fracture acetabulum
3. Three groups based on the indication of THA
4. Two groups based on the surgical intervention.

Detailed history of the patients was taken for the aetiology of the primary disease. All the patients included in the study underwent complete clinical and radiological evaluation.

RESULTS

A total of 49 patients with 49 hips with Total hip Arthroplasty were followed as per the predefined inclusion and exclusion. All the patients were included in the study after informed consent. The patients were recruited through the outpatient department of orthopaedics, PGIMER. An independent observer, other than the surgeon who operated, evaluated all these patients at the follow up. The patients were divided into various groups depending on the type of fracture, the indication for the THA and the type hip replacement done.

Radiological assessment of the patients was done using 4 parameters. Measurement of Vertical offset, Horizontal offset, Body lever arm and Acetabular cup inclination was done. The affected side was compared with the un-affected side in the patient and a restoration of parameters on the affected side within 20% of the unaffected side was taken acceptable.

Table 1:

	Radiological Parameter	Acceptable Range (Affected/Un affected side)	Unacceptable range (Affected/ un affected side)
1	Vertical offset	0.8-1.2	Below or above
2	Horizontal offset	0.8-1.2	Below or above
3	Body lever arm	0.8-1.2	Below or above
4	Cup inclination	0.8-1.2	Below or above
5	Cup inclination	30-50 degrees	Below or above

VERTICAL OFFSET

Based on the treatment received for fracture acetabulum, the vertical offset measurement was done for 47 patients. The affected side was compared with the un-affected side in the patient and a restoration of vertical offset on the affected side within 20% of the unaffected side was taken as acceptable. In 31 patients acceptable vertical offset was restored.

Table 2: Treatment for fracture acetabulum

RATIO PO VERTICAL		Treatment	
		Non Operative	Operative
Acceptable	Number	9	22
	Percent	29.0	71.0
Non Acceptable	Number	9	7
	Percent	56.3	43.8

*The acceptable range was better achieved in patients where ORIF was done

HORIZONTAL OFFSET

Based on the treatment received for fracture acetabulum, the horizontal offset measurement was done for 47 patients. The affected side was compared with the un-affected side in the patient and a restoration of horizontal offset on the affected side within 20% of the unaffected side was taken as acceptable. In 22 patients acceptable horizontal offset was restored whereas it was out of the range in 25 patients.

Table 3: Treatment of fracture acetabulum

			TREATMENT		Total
			NON OPERATIVE	OPERATIVE	
HOFFSET	Acceptable	Count	7	15	22
		% within HOFFSET	31.8%	68.2%	100.0%
		% within TREATMENT	38.9%	51.7%	46.8%
	non Acceptable	Count	11	14	25
		% within HOFFSET	44.0%	56.0%	100.0%
		% within TREATMENT	61.1%	48.3%	53.2%
Total		Count	18	29	47
		% within HOFFSET	38.3%	61.7%	100.0%
		% within TREATMENT	100.0%	100.0%	100.0%

BODY LEVER ARM

Based on the treatment received for fracture acetabulum, the body lever arm measurement was done for 46 patients. The affected side was compared with the un-affected side in the patient and a restoration of body lever arm on the affected side within 20% of the unaffected side

was taken as acceptable. In 40 patients acceptable body lever arm was restored.

Table 4: Treatment for fracture acetabulum

BLA		TREATMENT	
		NON OPERATIVE	OPERATIVE
Acceptable	Number	15	25
	Percent	37.5	62.5
Non Acceptable	Number	2	4
	Percent	33.3	66.7

*BLA was better restored in the operative group.

CUP INCLINATION

Based on the treatment received for fracture acetabulum, the cup inclination measurement was done for 47 patients. The affected side was compared with the un-affected side in the patient and a restoration of inclination on the affected side within 20% of the unaffected side was taken as acceptable. In 29 patients acceptable inclination was achieved.

Table 5: Treatment for fracture acetabulum

INCLINATION		TREATMENT	
		NON OPERATIVE	OPERATIVE
Acceptable	Number	8	21
	Percent POINC	27.6	72.4
non Acceptable	Number	10	8
	Percent POINC	55.6	44.4

*Cup inclination during THA was better restored in the operative group

INCLINATION BASED ON “safe range”

Inclination on the basis of restoration in the safe range and out of range was also done in 46 patients who received ORIF and others who were managed non-operatively. We were able to achieve the inclination in the safe range in 28 cases whereas 16 cases were out of range. In achieving inclination within safe range, comparable results were found in both the non-operative and operative patients.

Table 6:

TREATMENT		INCLINATION	
		WITHIN SAFE RANGE	OUT OF RANGE
NON OPERATIVE	Number	11	7
	Percent TREATMENT	61.1	38.9
OPERATIVE	Number	17	11
	Percent TREATMENT	60.7	39.3
p-value		0.979	

*Comparable results were found in both the non-operative and operative patients.

Discussion

Total hip arthroplasty is a common, one of the most successful and cost-effective procedures in Orthopaedics. It remains the treatment of choice for long-term pain relief and restoration of function for patients with pathologies of hip. In recent time, we have seen a constant rise in the post traumatic hip as the indication for hip arthroplasty. Planning a THA after fracture acetabulum poses a number of challenges to the surgeon.

With different aetiologies, different biomechanical situations are dealt with during THA after acetabular fracture. The aim of this study is to find out the quality of reconstruction in total hip arthroplasty done in patients after acetabular fracture and further correlate the quality of reconstruction with the affected hip function and quality of life in these patients.

There are very few studies in the world on total hip arthroplasty following acetabulum fracture. There has been no study or evaluation on this very important topic in our population. Similarly, there has been no study in the world using hip functional and quality of life scores to evaluate the patients after THA following acetabulum fracture.

Conclusion

Radiological assessment of the patients was done using 4 parameters. Measurement of Vertical offset, Horizontal offset, Body lever arm and Acetabular cup inclination was done. The affected side was compared with the un-affected side in the patient and a restoration of parameters on the affected side within 20% of the unaffected side was taken acceptable.

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