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COMPARISON OF FUNCTIONAL OUTCOME BETWEEN COMPRESSION SCREWS WITH BUTTRESS PLATE AND COMPRESSION SCREWS FOR HOFFA FRACTURE – A PROSPECTIVE STUDY

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ABSTRACT: Background: Hoffa fracture management is almost always surgical since it involves the intraarticular part of the femur. It can be managed either with cannulated cancellous screw alone or with the addition of a buttress plate. The study aimed to evaluate and compare the functional outcome of fracture fixation between the CC screw &CC screw with a buttress plate. **Method:** This was a prospective study of 30 patients with Hoffa fracture conducted between January 2020 to December 2021. Patients were allotted into 2 groups. Group A was treated with CC screw fixation, Group B was treated with CC screw + buttress plate. Post-operatively, follow-up was done for 1 year. **Results:** There were 14 males and 16 females in our study with both sides equally injured. The mean age of patients was 36.1 ranging from 23 to 52 years. RTA was the most common mode of injury. The average blood loss during group A was 117 ml and for group, B was 182.1 ml which is statistically significant. The average postoperative LKSS score after 3 months was 76.1 for group A and 88.1 for group B which is statistically significant. **Conclusion:** Hoffa fracture treated with CC screws alone had less blood loss and hospital stay but not significantly better than CC screw with a buttress plate in terms of knee ROM and functional score. Both procedures didn't have significant complications.

INTRODUCTION: The Hoffa fracture of the distal femur is a coronal fracture involving one or both of the femoral condyles [1]. These fractures are quite rare and so can be picked up only with a high index of suspicion. Lateral condylar and bilateral condylar fractures are more common than medial condylar fractures [2]. As per the AO/OTA classification, Hoffa fractures come under type 33-B3 [3].

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This type of fracture is associated with high-energy trauma such as accidents that may exert an axial load on a flexed knee [3]. Since they involve the intra-articular portion of the knee, there are high chances of fracture displacement, causing a reduction in the range of knee movements and attaining early knee osteoarthritis [4]. If these fractures are treated conservatively with plaster immobilization, it will result in post-traumatic knee stiffness [5].

So, these fractures should be fixed with good joint congruity to overcome the above complications. These fractures can be fixed either with only CC screws or along with a buttress plate. Fixation with a CC screw is less invasive than the one with a buttress plate [6].

This study aimed to compare the functional outcome in Hoffa fracture patients treated with only CC screws and those treated with a buttress plate and CC screws using a visual analogue scale and Lysholm knee scoring system.

MATERIALS AND METHOD:

Source of Data: The data was collected from the patients visiting the Emergency Department& Department of Orthopaedics.

Study Period: The study was conducted from January 2020 to December 2021.

Study Design: Prospective study.

Ethical Committee Approval: Obtained (IEC approval number: **SMC/IEC/2020/11/68**).

Method of Collection of Data:

Procedure: A study was conducted prospectively, including 30 patients with Hoffa fracture studied between January 2020 to December 2021 at the Department of Orthopaedics in our institution. Patients who sustained Hoffa fracture of femoral condyles aged 20 to 60 years and who wanted treatment &regular checkups were included in the study, while pediatric patients, patients with more than 60 years of age, patients with old fractures, and patients who wanted treatment & regular checkups were included not willing to follow up were excluded. All patients were seen in the ER or orthopaedic department.

A thorough history will be taken regarding the injury details (mode, time, place) and elicited history to rule out any associated fractures and head/ chest/ abdominal injury. The vitals of the patient was monitored regularly. A physical examination was carried out. General examination of the entire body was done, especially chest compression, spine tenderness, pelvic compression & distraction tests. Local examination of the affected knee was done, and findings such as the tenderness over the knee, range of movements of joints of the affected limb, and examination to rule out any neurovascular injury were done. The patients were then radiologically evaluated using standard X-ray trauma series such as chest anteroposterior view, X-ray pelvis with both hips anteroposterior view, X-ray C-spine anteroposterior & lateral views, and X-ray of affected knee anteroposterior, lateral and oblique views were taken. Routine blood investigations were done. All fractures were classified using Letenneur and AO classification. An above-knee POP slab was applied in ER. The patients were randomly allocated into two groups using the lottery method. Group A underwent CC screw fixation. Group B underwent CC + buttress plating fixation. The patients underwent surgery after obtaining informed consent & fitness for surgery.

All procedures were done under spinal/ general anaesthesia using antibiotic cover. Intravenous. Cefaperazone + Sulbactam 1.5 grams was given one hour before surgery& continued for 5 days postoperatively. The procedures were performed by placing the patient in the prone position under C-arm guidance. A standard posterior approach was used for the exposure in both procedures.

In CC screw fixation, after adequate exposure guide wires were inserted perpendicular to the fracture, then drilling was done using it as a guide. 2 CC screws were inserted in posterior to anterior manner to produce compression of the fracture. In CC + buttress plate fixation, incision and exposure were larger when compared to CC screw fixation. Similar steps were followed then a $1/3^{rd}$ tubular plate was placed posteriorly from the metaphysis to the condyle and fixed with 3-4 screws proximally giving adequate buttress to the fracture fragment.

After both procedures, haemostasis was ensured. The closure was done properly, and a clean dressing was done. The patients were asked to sit upon the same evening, then started on the active ankle, knee mobilization, and isometric quadriceps exercises. The patient was made for walking without weight-bearing using his operated limb using a walking frame. Post-operative X-rays were done, and the reduction of fracture was satisfactory with an implant in place. Periodic sterile dressing was done on postoperative days 2 and 5. Removal of sutures was done on day 12. After discharge, the patients were reviewed at 1^{st}, 3^{rd}, and 6^{th} months. Radiological evaluation was done on each review, and functional outcome was measured using Lysholm Knee Scoring Scale and documented. The data collected were analyzed using the 22.0 version of SPSS. Variables that are continuous were given as mean ±standard deviation and variables that are

categorical were given as percentages & numbers. The comparison of categorical variables was done using the Chi-square test. If p-value was less than 0.05 then it was taken as statistically significant.

RESULTS: 30 patients with Hoffa's fracture treated with either CC screw or CC screw + buttress plate were taken into this study between January 2020 and December 2021. The study group had 14 gentlemen and 16 women **Fig. 2**. Among 30 patients, both sides were equally injured **Fig. 3**. The average age of patients was 36.1 years **Fig. 1**.

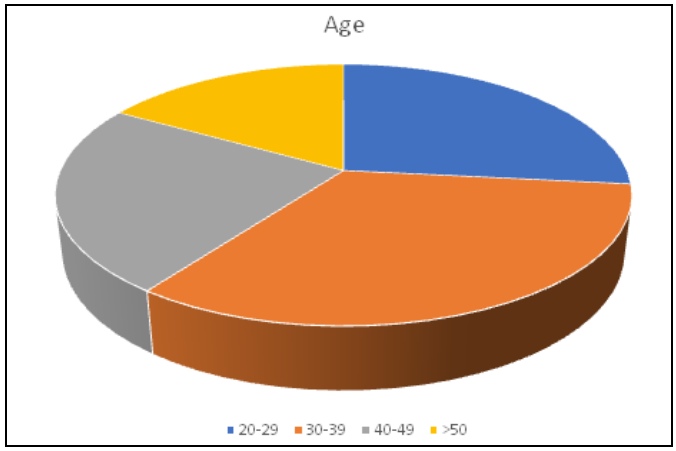


FIG. 1: AGE OF THE PATIENT

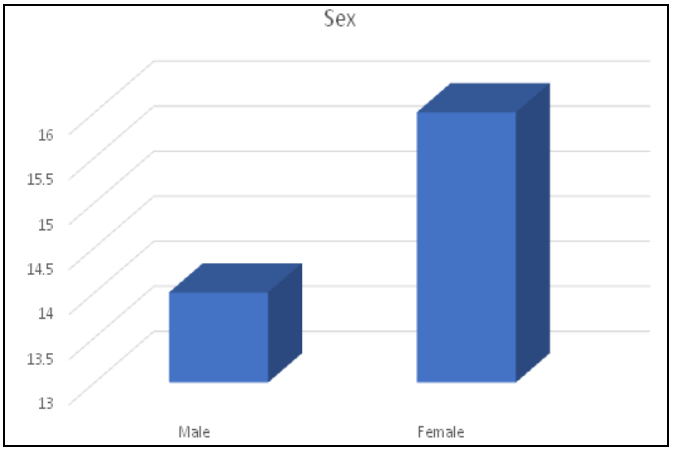


FIG. 2: GENDER DISTRIBUTION

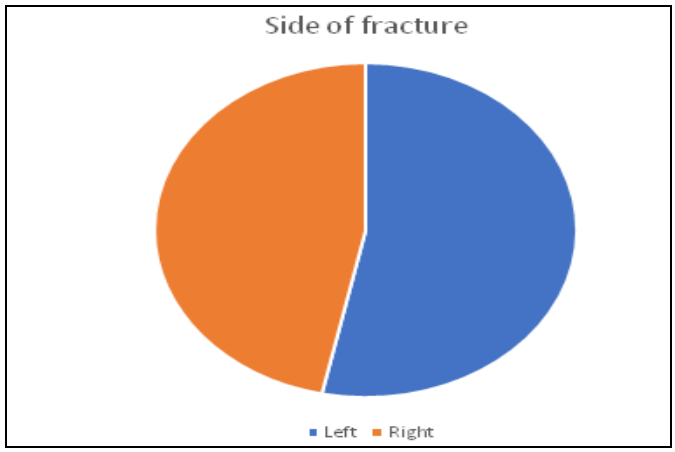


FIG. 3: SIDE INVOLVEMENT

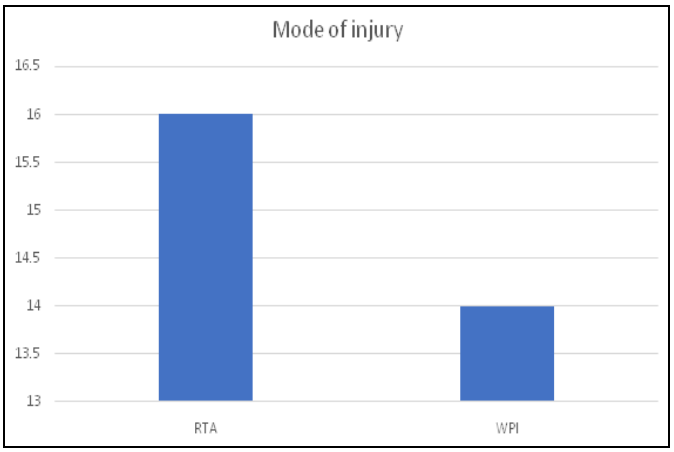


FIG. 4: MODE OF INJURY

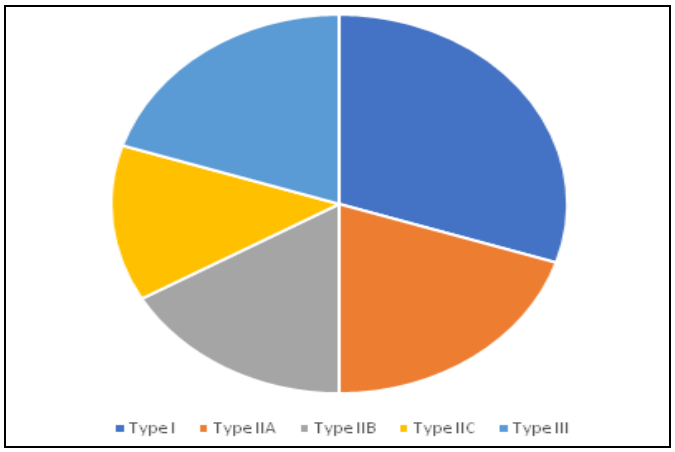


FIG. 5: LETENNEUR CLASSIFICATION

RTA was the more common mode of injury in our study, accounting for 16 patients **Fig. 4**. 14 patients underwent CC screw fixation and 16 patients underwent CC screw + buttress plate fixation. According to Letenneur classification, Type 1 fracture was more commonly seen in this study

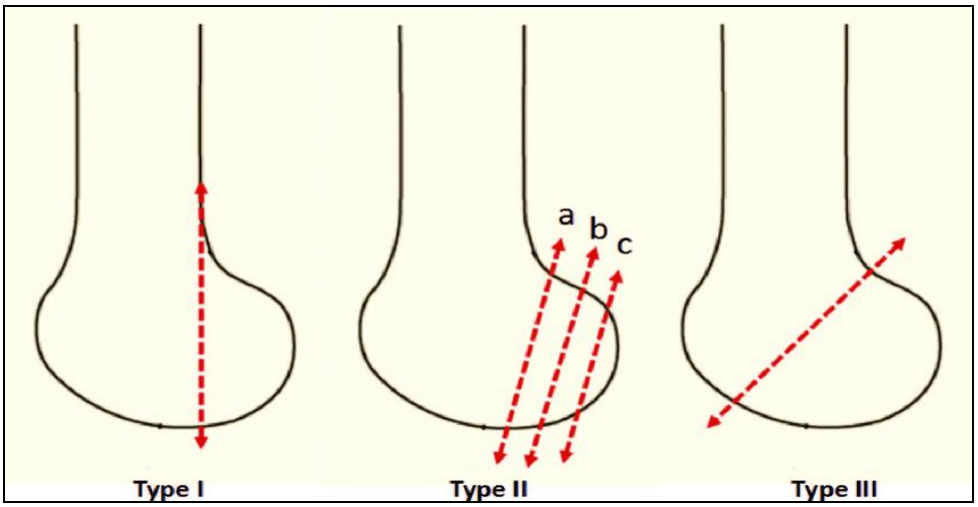
Fig. 5. The average surgery time for group A was 64.9 minutes and 90.6 for group B. The average blood loss in group A was 117 ml and for group, B was 182.1 ml which is statistically significant. The average hospital stay was 7 days for group A and 14 days for group B which is statistically significant. The average time for clinical union of fracture was 13 weeks for group A and 11 weeks for group B. The average knee ROM attained postoperatively was 96.2° for group A and 121.1° for group B. The average postoperative LKSS score after 3 months was 76.1 for group A and 88.1 for group B. 2 patients in group A developed a superficial surgical infection which was resolved with oral antibiotic treatment. All patients came back to pre-injury level after 14 weeks with no gait abnormalities. In this study, there were no other complications such as loss of reduction, deep infection, screw prominence or screw back out or screw cut through or stiff knee. No patients were lost during the review **Table 1.**

TABLE 1: PATIENT DEMOGRAPHICS AND DATA

S. no.	Age	Sex	Side	Femoral condyle	Mode of Injury	Fracture type	Surgery	Surgical time	Blood loss (ml)	Knee ROM	LKSS 1 month	LKSS 2 months	LKSS 3 months
1	25	M	L	Lateral	RTA	I	CCS	60	100	114	74	78	82
2	37	F	R	Medial	RTA	IIA	CCS+BP	90	200	123	81	86	90
3	42	M	R	Medial	WPI	I	CCS	56	110	115	74	78	84
4	27	F	L	Lateral	WPI	IIB	CCS+BP	88	210	125	66	69	75
5	35	F	L	Lateral	RTA	III	CCS+BP	92	250	128	73	77	80
6	40	M	R	Medial	WPI	I	CCS	61	120	110	72	76	81
7	52	F	L	Lateral	RTA	IIC	CCS+BP	79	240	120	83	87	91
8	28	M	R	Medial	WPI	IIA	CCS	59	130	102	77	80	84
9	32	M	L	Lateral	RTA	IIB	CCS+BP	82	220	113	79	83	86
10	38	M	L	Medial	WPI	III	CCS+BP	100	260	117	74	78	82
11	24	F	R	Lateral	RTA	I	CCS	63	110	110	75	80	84
12	29	F	R	Lateral	WPI	IIA	CCS	72	140	123	69	72	76
13	42	M	L	Medial	RTA	IIC	CCS+BP	89	240	117	74	77	81
14	46	F	L	Medial	WPI	I	CCS	67	90	110	76	79	83
15	51	F	R	Lateral	RTA	IIA	CCS	71	120	120	71	75	78
16	23	F	R	Medial	WPI	IIB	CCS+BP	86	220	130	77	81	85
17	34	M	R	Lateral	RTA	I	CCS	61	110	108	73	77	82
18	52	F	L	Medial	WPI	III	CCS+BP	98	250	128	75	79	83
19	29	M	L	Lateral	WPI	I	CCS	61	120	118	78	82	86
20	31	M	L	Lateral	RTA	IIC	CCS+BP	100	230	123	72	75	78
21	40	F	R	Medial	WPI	IIA	CCS	67	140	108	67	71	75
22	36	F	L	Lateral	RTA	III	CCS+BP	102	270	115	73	77	81
23	30	M	R	Lateral	WPI	I	CCS	67	110	112	78	82	85
24	28	F	L	Medial	RTA	IIA	CCS	81	130	122	68	72	75
25	26	M	R	Lateral	WPI	I	CCS	63	100	128	77	81	84
26	38	F	L	Medial	RTA	III	CCS+BP	97	240	126	72	76	79
27	42	M	R	Lateral	WPI	IIB	CCS+BP	87	220	112	81	86	90
28	48	F	L	Medial	RTA	IIC	CCS+BP	91	230	121	78	82	86
29	30	F	R	Lateral	WPI	III	CCS+BP	104	260	126	75	79	83
30	50	M	R	Medial	RTA	IIA	CCS	65	150	115	71	76	80

DISCUSSION: Hoffa fracture is an intra-articular coronal fracture of the distal femur [8]. It is one of the more difficult fractures to treat. If conservative management is done, the results are unsatisfactory and go for non-union [15]. So, open reduction with internal fixation is the treatment of choice [9]. Screw fixation is the standard method for treating Hoffa fracture, but continuous improvement is seen in the internal fixation method for these fractures [10]. At least 2 screws should be used to give biomechanical stability to the fracture, and the screws should cross the fracture line perpendicular to the fracture line to achieve compression of fracture fragments [11, 12]. The screws can be inserted in either anterior to the posterior direction or posterior to the anterior direction [15]. Fixation stability is an important aspect of fracture healing. A buttress plate was used to get good fracture

reduction and fixation, and it was associated with good outcomes. Various studies have shown to determine the functional outcomes of Hoffa fracture with either cannulated screw fixation or with screw fixation plus buttress plating separately. A retrospective study compared the outcome of the two modes of fixation but never a prospective comparative study. Multiple factors were used to see which fixation is better. These outcomes are surgical time, blood loss, hospital stay, time for clinical union, knee ROM, functional outcome using a visual analogue score, and Lysholm Knee Scoring Scale [13].



All the patients presented to our hospital at an average of 2 days after the initial injury. The more common mode of injury was RTA accounting for 16 patients. Hoffa fracture can be classified according to Letenneur classification into type I, type II A/B/C, and type III. The more common type was the type I fracture. Both fixation methods were done using the posterior approach. The screws were fixed in this study's posterior to the anterior direction. The incision was bigger in the screw with the group A for the placement of the plate. A 1/3rd tubular plate was contoured to femoral condyle to provide more fracture stability. The screw fixation group was statistically significant when compared to the screw with buttress plate group based on the average surgical time, blood loss, and hospital stay(p less than 0.05).

The average time to fracture union was 13 weeks in group A and 11 weeks in group B. The average knee ROM was 96.2°ingroup A and 121.1°ingroup B which is statistically significant (p less than 0.05). There was a significant increase in the Lysholm Knee Scoring Scale from an average of 50.1 preoperatively to 76.1 in group A and 88.1 in group B. The functional outcome was statistically better in group B (p less than 0.05). By the end of 14 weeks, all the patients went back to their pre-injury levels and could walk comfortably without pain. There were no complications seen during the study, and no patients were lost to follow-up. All of our patients were satisfied with the outcome. Tolga Onay *et al.* concluded that Hoffa fracture fixation may be sufficient with 2-4 screws and had a relatively good functional outcome [16]. The study didn't include posterior buttress plating since it was a new concept at that time. Bangboa Lu *et al.* came to the conclusion that average surgery time and blood loss were significantly higher in the screw with buttress plating group, which was a similar finding in our study [17]. Patients in the screw plus buttress plating group had better outcomes in terms of ROM and LKSS values at the 4th and 12th-month reviews.

But at the final review, all patients had normal fracture healing; however, patients in group B had better outcomes in terms of ROM and LKSS. We had a union rate of 100% in our study, with no cases of implant failure or non-union at the time of the last follow-up. After reviewing other studies, we concluded that there were statistically significant differences in knee ROM and functional score using LKSS between group A and group B. The screw and the buttress plating fixation were better. So, in this study, internal fixation using screw + buttress plate had better knee ROM and good functional results.

CONCLUSION: Hoffa fracture treated with CC screws alone had less blood loss and hospital stay, but the CC screw with a buttress plate was better in knee ROM and functional score. Both procedures didn't have any significant complications.

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CONFLICT OF INTEREST: None to declare.

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