



Clinical Outcomes Following Management of Adult Femoral Shaft Fractures by Surgery and Traction at Thika Level 5 Hospital.

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SUMMARY

Objective: To compare the clinical outcomes of femoral shaft fractures managed surgically and conservatively by traction.

Design: A prospective quasi experimental study at the Thika level 5 hospital.

Methods: 148 adult patients who had sustained traumatic fractures of femur were prospectively enrolled and assigned into two treatment groups. 69(46.6%) patients were enrolled in group A and managed surgically by intramedullary nailing while 79 (53.4%) patients were enrolled in group B and managed by skeletal traction. Patients were purposively assigned into group A after they were able to afford the implants into the surgical group and the rest into the conservative group. Clinical outcomes that were assessed in the wards and clinics included malunion rates, mobility and limb length discrepancy up to three months post discharge. Data was collected by history, physical examination and radiological evaluation using a standardized questionnaire. The data was compiled and analyzed using SPSS version 17. Persons' chi square, odds ratio and logistic regression were used to measure associations, risk analysis and multivariate analysis.

Results: No significant difference was noted between the two groups in terms of demographic data, fracture type and co-morbidities. Malunion rate of more than 5 degrees was seen in 11(15.9%) patients in group A compared to 34(43.1%) patients in group B ($p < 0.001$). Seven patients (10.1%) in group A had limb shortening greater than 2 cm compared to 20 patients(25.3%) in group B ($P < 0.011$). Good functional outcomes were achieved in 38 patients (55.1%) who underwent surgery compared to 23 patients (29.1%) managed by traction ($p < 0.004$)

Conclusion: The data indicates a better clinical outcome of managing femoral shaft fractures by surgery as compared to traction. It also indicates that clinicians in regional referral hospitals should be encouraged to use operative methods in femoral shaft fracture management primarily without delay.

Key words; fracture shaft femur, clinical outcome, malunion, functional outcome, limb shortening.

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Introduction

Trauma is a growing global public health concern with consequent disability and massive economic burden on low resource setting countries [1–7]. Femoral fractures are the most common musculoskeletal injury accounting for 9% of non fetal injuries globally [2]. The goal of treatment is usually restoration of limb anatomy and early mobilization without long term complications [6, 7]. Traditionally in third world countries femoral shaft fractures are managed conservatively by traction and to a small extent by surgery using various nailing and plating techniques. However the art and science of fracture management has tremendously advanced over the years from the earlier days when external splints were used to the current era of sophisticated instrumentation [1].

At the Thika Level 5 hospital intramedullary fixation of traumatic femoral fractures using interlocking nails is a relatively new procedure compared to the use of traction. Traction has been in use for centuries and all the different techniques are based on the same underlying principle: alignment of a long bone fracture can be achieved and maintained by continuously pulling (isotonic traction) on the soft tissue envelope along its longitudinal axis. Bed rest and immobilization have been advocated as part of the conservative management of closed femoral fractures for many decades by renowned orthopaedic leaders such as Watson and Apleys [6,7]. In 1953, Perkins introduced his traction technique in which he introduced early active range of motion for the knees in adult patients on tibial traction. Conservative management of adult femoral fractures is now used almost exclusively in environments where resources are significantly limited

especially in the developing countries. Changes in management have been associated with improvement in both functional and clinical outcomes [7,8].

The commonest cause of femoral fractures is blunt trauma that mainly follows road traffic accidents. The estimated annual economic cost of road traffic injuries in Kenya in 1988, using human capital approach that comprises healthcare costs, administrative expenses, vehicle and property damage was 2.9 billion (\$ 37 million) or 3.6% of the Gross National Product (GNP) for the year with reference to the transport industry [4]. This costs rose to 3.8 billion or 5% of GNP in 1991 and by 1996 the costs were estimated at between 5 and 10 billion shillings [4]. This translates into a loss of 26 –52% of earnings from the road transport industry which is a major income earner for the Kenyan economy.

Despite the documented advantages of surgery, its use is limited by cost of implants and instrument including fluoroscopy. This study was carried out to compare clinical outcomes of managing femoral shaft fractures conservatively versus surgery at a regional referral hospital in Kenya.

Patients and Methods

This prospective quasi-experimental study was carried out at Thika level 5 Hospital located in Central Province of Kenya from June 2010 to June 2011. Patients were consecutively recruited at casualty and allocated to either of the treatment groups based on treatment modality. At casualty detailed history about injury, co morbidity and clinical findings were recorded in a questionnaire. After basic data was collected and investigations done the patients in group A underwent surgery while those in group B were managed by



skeletal traction (Perkins method). While in the ward and after discharge all the patients were followed up regularly and evaluated for clinical and radiological union and complications. Review after discharge was done every two weeks for first two months, then monthly thereafter.

In this comparative study 148 patients with posttraumatic femoral shaft fractures were recruited into the study and divided into two groups. 69(46.6%) patients were enrolled in group A and managed surgically by intramedullary nailing while 79 (53.4%) patients were enrolled in group B and managed by skeletal traction. The surgery was done by using Surgical Implant Generation Network (SIGN) nail without fluoroscopy. The surgery was undertaken by these two General surgeons and one orthopaedic surgeon with experience ranging from six years to twelve years. The frequencies and crosstabs procedure were used to create two way and multiway tables. Statistics and graphical displays were used for describing variables, charts and graphs. After tabulation p values were determined using Pearson's chi-squares. P value of less than 0.05 was considered significant. All the statistical methods were carried out through the

SPSS for windows version 16.0. The results were analyzed for risk of occurrence and associations using the odds ratio and logistic regression.

Results

Socio demographics of study population

A total of 148 cases of femoral shaft fractures were seen in the study. A high proportion of patients 102(75.7%) were aged between 18 and 50 years. Among the 148 patients 115(77.7%) were males and 33(22.3%) were females with a male to female ratio of 3.5:1 (Table 1). Age range was 19 to 96 years with a mean age of 42 years. Right femoral fracture was seen in 120(81.1%) patients and left femur fracture in 28(18.9%).

Severe trauma due to road traffic accidents was the most common injury mode seen in 83.1% of the patients and mild trauma due to falls was seen in 16.9% of the study patients. The mean duration of hospital stay in the surgery groups was thirty days and sixty days in the conservative group. The mean duration of hospital stay in the surgical group was 30 days and 60 days in the conservative group.

Table 1: Summary of age distribution in study population

Treatment option	Mean age in years \pm SD	Range
All (n=148)	42 \pm 19	18-96
Surgery option(n=69)	35 \pm 14	18-73
Conservative option(n=79)	47 \pm 22	18-96

A significantly higher proportion of patients managed surgically (88.4%) had a significantly shorter duration of

hospital stay lasting less than one month compared to those who underwent conservative treatment (30.4%),



(OR=15;95% CI: 5.00–50.40; $p < 0.001$) when a reference for analysis [table 2].
hospital stay duration of 12–16 weeks was used as the

Table 2: Bivariate analysis of the effect of treatment option on the duration of Hospital stay

Duration in weeks	Total (n=148)		Surgery (n=69)		Conservative (n=79)		OR	95% CI		p value
	N	%	N	%	N	%		Lower	Upper	
<4 weeks	85	57.4	61	88.4	24	30.4	15.89	5.00	50.49	<0.001
8 weeks	34	23.0	4	5.8	30	38.0	0.83	0.19	3.68	0.810
12 – 16weeks	29	19.6	4	5.8	25	31.6	Reference			

Injury patterns

Fracture was seen most commonly in the middle third of the diaphysis. The most common fracture pattern was comminuted and oblique [table 3].

Table 3: Fracture patterns among the study patients by treatment method

Variables	Total (n=148)		Surgery (n=69)		Conservative (n=79)	
	N	%	n	%	n	%
Plain femur X-ray						
Right	120	81.1	53	76.8	67	84.8
Left	28	18.9	16	23.2	12	15.2
Fracture pattern						
Transverse	34	23.0	14	20.3	20	25.3
Spiral	20	13.5	13	18.8	7	8.9
Oblique	57	38.5	22	31.9	35	44.3
Comminuted	37	25.0	20	29.0	17	

62.8% of the patients had fracture femur plus one associated systemic injury while 22.3% had two more systemic injuries and 14.9% had more than three

systemic injuries. The most common associated injury was head injury in 27(18.2%) patients followed by other musculoskeletal injuries in 20(13.5%) [Table 4].



Table 4: Other systemic injuries among the study patients by treatment method

Variables	Total (n=148)		Surgery (n=69)		Conservative (n=79)	
	N	%	N	%	n	%
Head Injury						
Absent	121	81.8	54	78.3	67	84.8
Present	27	18.2	15	21.7	12	15.2
Chest respiratory injury						
Absent	134	90.5	60	87.0	74	93.7
Present	14	9.5	9	13.0	5	6.3
Abdominal injury						
Absent	141	95.3	64	92.8	77	97.5
Present	7	4.7	5	7.2	2	2.5
Pelvic Injury						
Absent	134	90.5	61	88.4	73	92.4
Present	14	9.5	8	11.6	6	7.6
Other musculoskeletal disorder						
Absent	128	86.5	55	79.7	73	92.4
Present	20	13.5	14	20.3	6	7.6
Number of injuries						
1 injury	93	62.8	38	55.1	55	69.6
2 injuries	33	22.3	15	21.7	18	22.8
3 or more injuries	22	14.9	16	23.2	6	7.6

Functional outcomes

Majority of the patients (55.1 %) attained normal mobility without any support compared to 29.11% in the group managed by traction (OR 3.80 and $p=0.004$) at discharge. More patients (43.1%) in the conservative group developed malunion compared to the surgery

group with 30.4% having angular malunions greater than 10 degrees radiologically (Figure 1, table 5). Overall 58 (84.1%) patients in the surgery group achieved union without malunion compared to 45(57%) patients in the conservative group ($p 0.001$).



Figure 1: Distribution of malunion rate by treatment modality

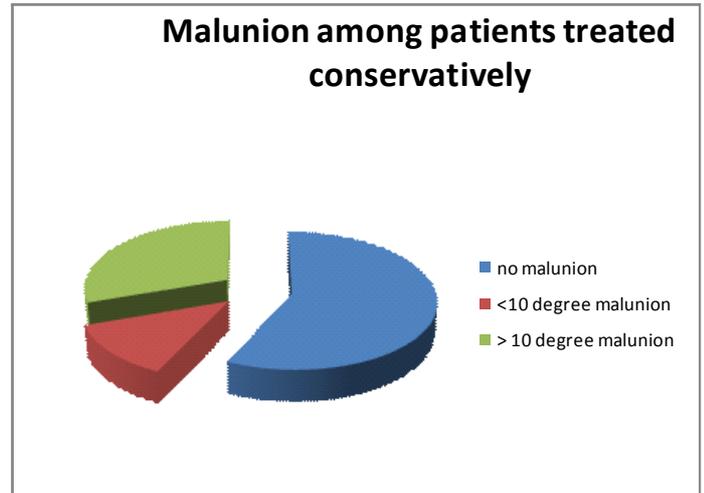
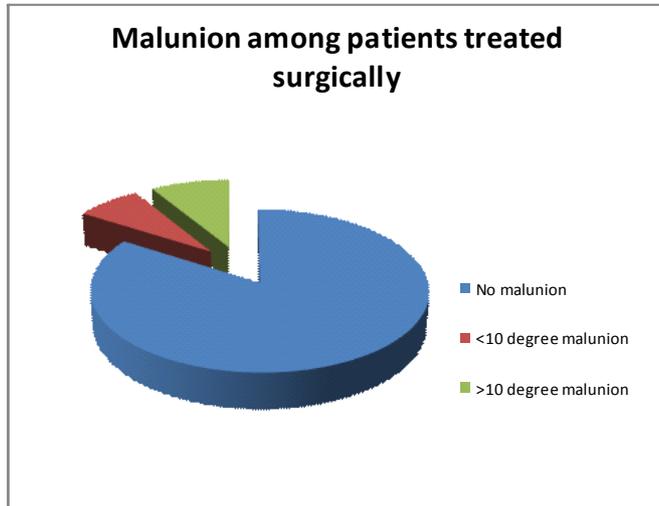


Table 5: Functional outcome among the study patients by treatment method

Variables	Total (n=148)		Surgery (n=69)		Conservative (n=79)		OR	95% CI		p value
	N	%	n	%	N	%		Lower	Upper	
Mobility										
Normal mobility	61	41.2	38	55.1	23	29.11	3.80	1.54	9.39	0.00
Limping	33	22.3	10	14.5	23	29.1	Reference			4
Walking with Aid	44	29.7	17	24.6	27	34.2	1.45	0.56	3.78	0.449
Not ambulatory	10	6.8	4	5.8	6	7.6	1.53	0.35	6.65	0.568
Malunion										
No malunion	103	69.6	58	84.1	45	57.0	5.16	1.94	13.68	0.00
<10 degrees	15	10.1	5	7.2	10	12.7	2.00	0.49	8.09	0.331
>=10 degrees	30	20.3	6	8.7	24	30.4	Reference			
Limb shortening										
No shortening	115	77.7	62	89.9	53	67.1	3.34	1.31	8.52	0.01
1 – 2 cm	6	4.1	0	0.0	6	7.6	UD	UD	UD	0.999



Variables	N	%	n	%	N	%	OR	95%CI		P Value
								Lower	Upper	
2 – 3 cm	27	18.2	7	10.1	20	25.3	Reference			
Number of successful functional outcomes (Normal mobility/No–malunion/No–limb shortening)										
None	19	12.8	5	7.2	14	17.7	Reference			
1 successful outcome	35	23.6	7	10.1	28	35.4	0.70	0.19	2.61	0.595
2 successful outcomes	38	25.7	20	29.0	18	22.8	3.11	0.93	10.36	0.065
3 successful outcomes	56	37.8	37	53.6	19	24.1	5.45	1.71	17.42	0.004

Twenty six patients in the conservative group had limb shortening compared to 7 patients in the surgery group. Lack of limb shortening was significantly associated with surgical management compared to conservative management ($p=0.011$, OR 3.34). When functional outcome was combined 56 patients in the whole study had excellent results due to presence of normal mobility, no malunion and no limb shortening with 53.6% of them having undergone surgery ($p=0.004$). Age and treatment mode were found to significantly influence good clinical outcome on multivariate analysis [Table 6].

Adjusting for other factors, patients within the age range of 18 to 30 years had a significantly *better functional outcome defined by normal mobility, no malunion and no limb length discrepancy* (AOR=4.95; 95% CI: 1.73– 14.20; $p=0.003$) when compared to those treated by conservative method of Perkins traction.

Adjusting for other factors, patients within the age range of 31 to 50 years had a *good functional outcome defined by normal mobility, no malunion and no limb length discrepancy* (AOR=3.91; 95% CI: 1.17 – 13.09; $p=0.026$).

Table 6: Predictors of normal mobility as a functional outcome

Predictors	AOR	95% CI		p value
		Lower	Upper	
Treatment option				
Surgery	2.41	1.17	4.95	0.017
Conservative	Reference			
Age in years				
18 – 30 yrs	4.95	1.73	14.20	0.003
31 – 50 yrs	2.76	0.95	7.97	0.061
>50 yrs	Reference			



Discussion

The art and science of fracture management has tremendously advanced over the years from the earlier days when external splints were used to the current era of sophisticated instrumentation. Changes in management have been associated with improvement in functional and clinical outcomes [6–9]. Intramedullary nails are the most widely used techniques in the west and this follows the work of Kuntscher in Germany and Rush in the USA [8]. At the beginning of the era of intramedullary nails, the technique was mainly reserved for transverse fractures due to the reduced complication rates and early return to function.

The shortcoming of these techniques was lack of rotational stability and maintenance of axial length in fixation of comminuted fractures. Advent of interlocking nails has widened the spectrum of femoral shaft fractures that can be managed by nailing techniques due to the reduced incidence of limb length discrepancy and malunion [6,7]. There are very few studies in developing countries comparing clinical outcomes after management by surgery and interlocking nails in regional hospitals. Conservative management of fracture femur by traction is still a common mode of management in Africa at both rural and referral facilities with varied clinical outcomes reported.

The study found a significant association between clinical outcome in the two groups and the sociodemographic characteristics such as age as has been reported in other studies [6]. Patients aged 18–30 years were six times more likely to have a good outcome when managed surgically compared to when they were managed by traction ($p = 0.003$ and odds ratio 6.03). There was no association between outcome and

sex and fracture characteristics [6, 7, 8]. As reported in other studies [7, 8] males were affected more than females in this study in a ratio of 3.5 to 1. Thika being peri urban has a higher population of young adults aged 18 to 50 years with most of those in formal and non formal employment being male. These males are therefore more likely to be involved in road traffic accidents as reported in this study (83.1%).

The study found a higher duration of hospital stay of 60 days in the conservative group of patients as compared to 30 days in the surgical group which compares favourably with other studies done in similar settings to ours. This duration of hospital stay is higher than the expected and this can be attributed to the fact that most patients (56%) in group A who underwent surgery were on traction for an average of two weeks prior to surgery. Bezabeh and colleagues in a prospective study at Addis Ababa University hospital in Ethiopia on 68 reported an average hospital stay of 45 days, in patients managed by Perkins traction [7]. In their study males (88.2%) were more affected than females (11.8%) and the main injury mode was road traffic accidents (49.2%). Gosselin and Loyal in a retrospective study involving 53 adult patients in Sierra Leone reported a mean duration of hospital stay in patients managed by Perkins traction as 52 days (range 25–108 days) [8].

The treatment method was found to influence clinical outcome both on bivariate and multivariate analysis ($p = 0.017$). This is consistent with many studies done globally that have demonstrated a definite advantage of surgery over conservative management [11, 13]. However Gosselin and Loyal recently reported no significant difference in fracture union after management by surgery and Perkins traction in a



retrospective study of 53 adult patients [8]. The higher rate of malunion and limb shortening seen in the conservative group is consistent with results from other studies [10]. Bezabeh and colleagues in a prospective study at Addis Ababa University hospital in Ethiopia, reported limb shortening of more than 2 cm in 11 (16.2%) of patients managed by Perkins traction [7]. The percentage of associated injuries is slightly higher than in other studies [6, 7]

Conclusions

Based on the results of this study we recommend routine use of intramedullary nailing for management of posttraumatic femoral shaft fractures especially those with significant combination and oblique fracture patterns. This has definite advantages of reduced hospital stay and early return to function compared to conservative management.

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