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EXTERNAL FIXATION AS DEFINITIVE TREATMENT OF CLOSED TIBIAL FRACTURES IN THI-QAR:2017-2020

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ABSTRACT

Background: In developing countries, where high incidence of infectious disease and contamination risk is very high, a complete, definitive, and urgent Tibial fractures osteosynthesis can be is applicable in majority of the tibia fracture cases, where the temporary way of fixation inform for tibial fractures can be considerednot merely in open fracture but also in closed fracture.

Aim: to evaluate the outcome of our policy on dealing with closed tibial fracture treated by application of external tubular device fixator , and to appraise the effectiveness of this apparatus and to be considered as a reasonable method of treatment in such type of injury.

Material and method: A prospective cross sectional analytical study extended from January of 2017- to March of 2020, where 38 of the closed tibial fracture of young adults were included in the study. An external fixation was done by using external tubular device fixator (AO group of ASIF), P value <0.05 considered significant.

Results: A total of 38 cases with closed tibial fracture underwent external fixation, 30 male with mean age of 37.93± 10.6 and 8 female with mean age of 32.5±13.9 years, where there was no significant statistical difference according to gender categories in form of time from injury to surgery –days, Radiological consolidation-weeks, Removal of external fixation (weeks) and Follow up--(months)…P value>0.05

Conclusion: An acceptable rate of complications, a low rate of re-operations and good functional outcome and there was no considerable functional impairment.The current external fixation system was firstly used exclusively for steadying of open fractures; we recommended to be used for closed fracture

.**Keyword:** Closed tibial fracture, External fixation, Thi-Qar.

I. INTRODUCTION

A complete, definitive, and urgent Tibial fractures osteosynthesis can be is applicable in majority of the tibia fracture cases, where the fixation inform of temporary way for tibial fractures should considered in following situations as a different entities: firstly for open fractures- high-energy which requiring iterative procedures; secondly patients who traumatized severely with vital and energetic lesions association, thirdly with an aim of surgical violence limitation; lastly in a precocious unwarrantable health context by restrictive means of the technique or immense and huge casualty circumstances[(1,2)]. This approach and policy is fragment of a stratagem of harm and damage control orthopedics (DCO), whose aimed to warrant the urgent and impermanent initial and early tibia stabilization, allowing for postponed absolute and accurate fixation without restraining the technical and mechanical options. Whereas a unpretentious plaster orthopedic support (brace) is imaginable in the fractures of isolated closed type, external fixation temporarily is essential and mandatory for the steadying of fractures of segmental type, open fractures, and in patients with multiple trauma[(2,3)].

Generally , the tibia ultimate fixation with intra-medullary nailing (I.M nailing) is favored to accelerate , healing, functional recovery and reduction, comprising in fractures of Gustilo type III[(4-8)]. However, a transfiguration to stable, progressive, and definitive external fixation is frequently demanded in open fractures of high-energy type, specifically in practice of military[(1,2,9,10)].

The temporary fixator usage does have its weaknesses and drawback, particularly if planning for internal osteosynthesis as secondary line for management. One of the chief restrictions is the medullary cavity fixator screws penetration. The medullary cavity brought by screws to contacting the external environment, presenting an infection risk during IM nailing conversion[11]. To stunned-up this problematic situation, at 1990s and in order for provision of painless fixators he to provide temporarly stabilization for open tibia fractures, but their use has always been marginal[12,13]. Recently Temporary external tubular device fixator (AO group of ASIF) were developed as a line of treatment[1]. Where principle is grounded on the identical qualifications as painless unproblematic fixators. It is a matter of concerning in respect to the intramedullary space by contribution excellent unicortical anchorage using reliable, fast, and simple, and implantable technique

Although many advantages of this type of fixator , through, limiting the deep bone infection risk, it also facilitating the tibial secondary nailing that can be done with the in place- fixator.

II. THE AIM OF THE STUDY

The aim of our study was to evaluate the outcome of our policy on dealing with closed tibial fracture treated by application of external tubular device fixator (AO group of ASIF), and to appraise the effectiveness of this apparatus and to be considered as a reasonable method of treatment in such type of injury in developing country.

III. MATERIAL AND METHOD

A prospective cross sectional analytical study extended from January of 2017- to March of 2020, where all of the closed tibial fracture of young adults were included in the study, exclusion criteria: Patient with immune compression, careless patients with Non-compliant with lack of ability to caring pin and wire, and those with internal fixator that intervene with placement of the wire and pin and lastly those with preexisting bone pathology.

A well prepared questionnaire had been filled for each patient enrolled in this study, where age , gender, mechanism of injury: [Sport Accidents (SA), Motor cycle accident (MCA), Fall from a height (FFH), Vehicles hit a Pedestrian (VHP), Passenger in Vehicles Accident (PVA)], side of injury (left, right), site (upper 1/3 diaphysis, middle 1/3 diaphysis, lower 1/3 diaphysis and or more than 1/3 diaphysis whether middle and upper and or lower), fracture configuration (transverse, oblique, segmental, spiral and comminuted), time from injury till operation, time of removal, time of radiological consolidation, secondary operation (if need) and complications as listed below:

1. Pin tract infection
2. Pin loosing
3. Leg length discrepancy
4. Re- fracture
5. General complication (post operative medical complication)
6. Compartmental syndrome
7. Mal union, Non- union and delayed union.
8. Need for bone graft
9. Gait abnormalities
10. Joint stiffness (knee and ankle)
11. osteomyelitis

Ethical consideration: a written consents had been taken from all patients

Statistical analysis: Data entered in excel sheet and SPSS version 25, where frequency and percentages has been estimated and compared properly by ANOVA and t test to determine the significance differences between and

within groups of comparison while qualitative assessment and association done by estimation of the Fischer Exact test and Chi-sequare tests through which P value consider as significant as lower than 0.05.

IV. RESULTS

A total of 38 cases with closed tibial fracture underwent external fixation, 30 male with mean age of 37.93± 10.6 and 8 female with mean age of 32.5±13.9 years, where there was no significant statistical difference according to gender categories in form of time from injury to surgery –days, Radiological consolidation-weeks, Removal of external fixation-weeks and Follow up-months…P value>0.05

Table 1- Group EEstatistics of some parameters according to gender

	Gender	N	Mean	S.D	ANOVA	Sig.
Age	Male	30	37.9333	10.6380		
	Female	8	32.5000	13.8770	1.392	.246
Time from injury to surgery –days	Male	29	3.66	1.675		
	Female	8	3.25	.886	3.792	.060
Radiological consolidation-weeks	Male	30	29.23	7.025		
	Female	8	26.13	4.824	.931	.341
Removal of external fixation- weeks	Male	30	31.23	7.025		
	Female	8	28.13	4.824	.931	.341
Follow up-months	Male	30	10.53	6.745		
	Female	8	8.63	1.996	.766	.387

Most of the cases were due to Passenger in Vehicles Accident (42%), right sided injury (68%),, Middle 1/3diaphysis (42%), and of oblique and transverse (31%), (34%), fracture disfiguration, as shown in table 2.

Table 2: Characteristics of tibia fracture

Fracture characters		Frequency	Percent
Mechanism of injury	Falling from height	6	15.8
	Motor cycle accident	6	15.8
	Passenger in Vehicles Accident	16	42.1
	Sport Accident	3	7.9
	Vehicles hit a Pedestrian	7	18.4
Side of injury	Left	12	31.6
	Right	26	68.4
Site of fracture	Lower-1/3diaphysis	8	21.1
	Middle 1/3diaphysis	16	42.1
	Upper 1/3diaphysis	11	28.9

	Upper +Middle	3	7.9
Fracture Configuration	Comminuted	4	10.5
	Oblique	12	31.5
	Spiral	9	23.7
	Transverse	13	34.2
	Total	38	100.0

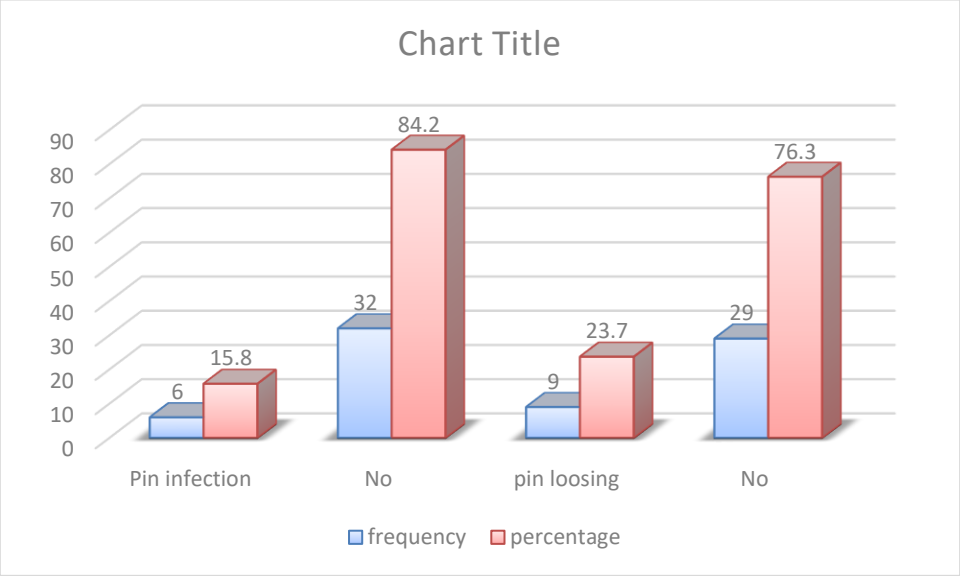

Figure 1: Complications regarding pin

Most of the cases don't express bad sequel or complication, in term of Leg length discrepancy, Re-fracture, compartmental syndrome, general complication, osteomyelitis, joint stiffness, gait abnormalities and bone graft.

Table 3: Complications of external fixation in closed tibia fracture

Complications		**Frequency**	**Percent**
Leg length discrepancy			
	No	36	94.7
	Shortage 2 cm	2	5.3
Re-fracture	No	36	94.7
	Yes	2	5.3
General complication	No	34	91.1
	Pneumonia	2	5.3
	Pulmonary embolism	1	2.6
Compartment Syndrome	No	36	94.7
	Yes	2	5.3
Bone graft	No	31	81.6
	Yes	7	18.4

Gait abnormality	No	29	76.3
	Mild	3	7.9
	Very mild	6	15,8
Ankle joint stiffness	No	31	81.6
	Mild	6	15.8
	Moderate	1	2.6
	Total	38	100.0

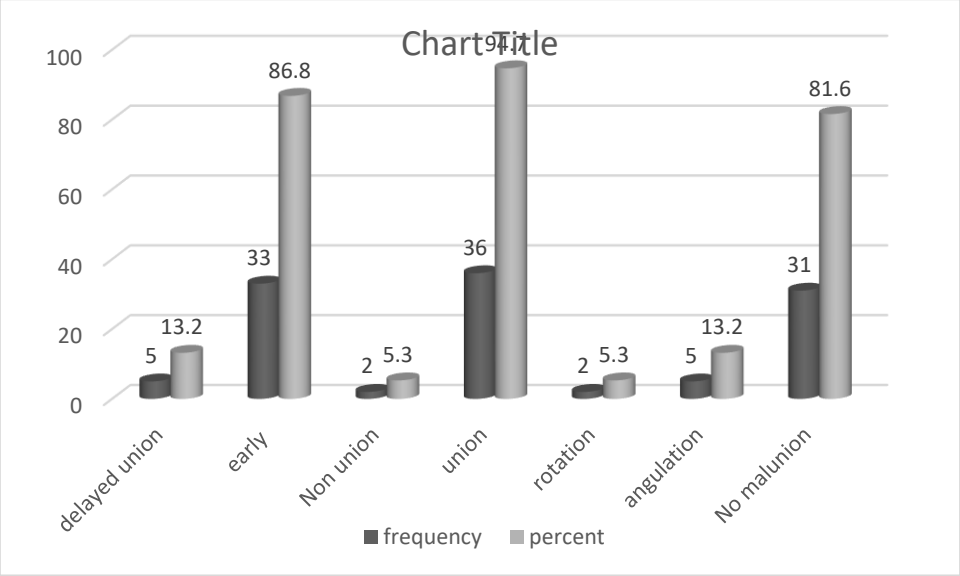

Figure 2: Distribution according to the union (delayed, none and Malunion)

There was significant statistical differences between the site of the fracture and Time from injury to surgery, radiologicalconsildation and Removal of external fixation time. As in table 4

Table 4-A:Some parameters according to site of fracture

B- According to fracture configuration

A-Site of fracture		age	Time from injury to surgery	Radiologicalconsolidation	Removal of external	Follow up
Lower	Mean	24.5000	2.75	27.88	29.88	8.75
	S. D	2.44949	.707	8.543	8.543	2.712
Middle	Mean	33.5625	3.60	31.13	33.13	12.00
	S. D	4.47167	1.639	6.965	6.965	8.764
Upper	Mean	50.3636	4.00	26.09	28.09	8.91
	S. D	7.91546	1.673	4.437	4.437	2.625
Upper +Middle	Mean	37.0000	4.00	26.00	28.00	8.33
	S. D	14.9331	2.000	3.464	3.464	.577

Total	Mean	36.7895	3.57	28.58	30.58	10.13
	S. D	11.4092	1.537	6.689	6.689	6.086
ANOVA		1.735	3.252	3.011	3.011	.187
P		.178	.034	.043	.043	.905
	Eta	.364	.478	.458	.458	.127

B-Fracture Configuration		Age	Time from injury to surgery	Radiological consolidation	Removal of external fixation
comminuted	Mean	39.7500	4.25	25.00	27.00
	S D	11.44188	1.708	3.830	3.830
Oblique	Mean	33.9167	3.08	32.17	34.17
	S . D	9.68089	1.084	9.173	9.173
Spiral	Mean	43.4444	4.67	29.89	31.89
	S . D	11.57704	2.062	2.848	2.848
Transverse	Mean	33.9231	3.00	25.46	27.46
	S . D	11.83541	.953	4.772	4.772
Total	Mean	36.7895	3.57	28.58	30.58
	S . D	11.40924	1.537	6.689	6.689

There was no significant statistical association between the site of the fracture and fracture configuration as in table 5.

Table 5: Distribution of the fracture configuration according to site of the fracture:

Site of fracture		**Fracture Configuration**				**Total**	**X^2, p vale**
		Comminuted	**Oblique**	**Spiral**	**Transverse**		
Lower-1/3diaphysis		1	5	0	2	8	12.300 0.116
		25.0%	41.7%	0.0%	15.4%	21.1%	
Middle 1/3diaphysis		0	4	5	7	16	
		0.0%	33.3%	55.6%	53.8%	42.1%	

		Upper 1/3diaphysis	3	3	3	2	11
			75.0%	25.0%	33.3%	15.4%	28.9%
		Upper +Middle	0	0	1	2	3
			0.0%	0.0%	11.1%	15.4%	7.9%
Total			4	12	9	13	38
			100.0%	100.0%	100.0%	100.0%	100.0 %

Table 6: distribution of complications according to fracture configuration

			Fracture Configuration				Total	
			comminuted	Oblique	Spiral	Transverse		FE test, P value
Pin infection	No		2	11	8	11	32	3.544
			50.0%	91.7%	88.9%	84.6%	84.2 %	.294[b]
	Yes		2	1	1	2	6	
			50.0%	8.3%	11.1%	15.4%	15.8 %	
Pin loose No			4	9	7	9	29	1.342
			100.0%	75.0%	77.8%	69.2%	76.3 %	.830[b]
			0	3	2	4	9	
Yes			0.0%	25.0%	22.2%	30.8%	23.7 %	
Leg length discrepancy No			4	11	8	13	36	1.989
			100.0%	91.7%	88.9%	100.0%	94.7 %	0.617
Short 2c			0	1	1	0	2	
			0.0%	8.3%	11.1%	0.0%	5.3%	
Re-fracture no			4	12	9	11	36	4.060[a]
			100.0%	100.0 %	100.0 %	84.6%	94.7 %	.459
Yes			0	0	0	2	2	
			0.0%	0.0%	0.0%	15.4%	5.3%	
General complication			4	9	9	12	34	8.738
			100.0%	75.0%	100.0 %	92.3%	89.5 %	0.049
			0	3	0	1	2	
			0.0%	25%	0.0%	7.7%	5.3%	
Compartment Syndrome			4	12	8	12	36	1.660[a]
			100.0%	100.0 %	88.9%	92.3%	94.7 %	0.783

Yes		0	0	1	1	2	
		0.0%	0.0%	11.1%	7.7%	5.3%	
Delayed union		4	9	7	13	33	4.296
		100.0%	75.0%	77.8%	100.0%	86.8 %	0.186
		0	3	2	0	5	
		0.0%	25.0%	22.2%	0.0%	13.2 %	
Non-union no		4	10	9	13	36	4.574[a]
		100.0%	83.3%	100.0 %	100.0%	94.7 %	0.079
Yes		0	2	0	0	2	
		0.0%	16.7%	0.0%	0.0%	5.3%	
Mal union no		3	9	8	11	31	2.066[a]
		75.0%	75.0%	88.9%	84.6%	81.6 %	0.933
Angulation		1	2	1	1	5	
		25.0%	16.7%	11.1%	7.7%	13.2 %	
Rotation		0	1	0	1	2	
		0.0%	8.3%	0.0%	7.7%	5.3%	
Bone graft no		4	9	7	11	31	1.415[a]
		100.0%	75.0%	77.8%	84.6%	81.6 %	0.836
Yes		0	3	2	2	7	
		0.0%	25.0%	22.2%	15.4%	18.4 %	
Joint stiffness No		3	11	7	10	31	10.745
		75.0%	91.7%	77.8%	76.9%	81.6 %	0.039
Mild		1	0	2	3	6	
		25.0%	0.0%	22.2%	23.1%	15.8 %	
Moderate		0	1	0	0	1	
		0.0%	8.3%	0.0%	0.0%	2.6%	
		4	12	9	13	38	
		100.0%	100.0 %	100.0 %	100.0%	100.0 %	

V. DISCUSSION

The consecutivehandling of closed tibial fracture is a subject of plentiful studies, particularly since the best fixation way for this fractures restsquestionable between intramedullary nailing and external fixation[5-8,11,14-17]

The current study including 38 cases with closed tibial fracture underwent external fixation, 30 male with mean age of 37.93± 10.6 and 8 female with mean age of 32.5±13.9 years, where there was no significant statistical

difference according to gender categories in form of time from injury to surgery –days, Radiological consolidation-weeks, Removal of external fixation- weeks and Follow up-months…P value>0.05.

Mal-union rate tend to be lower than IM nailing, where, not all meta-analyses show variances infectious complications rate and non-union between the internal and external fixation techniques[8,17,18].

Desires of orthopedists were meet by usage of external fixators in emergency departments, chiefly since theyare installed quickly, with simplicity no great complexity, do not need sub-specialists,not need fluoroscopyorspecialmaterials,andarehighly adaptable and useful finally lesslikely to cause iatrogenic lesions.

In the current study the external fixator used as a definite treatment as in Roderigo study[19]but differ from other past study done Muller et al.[20],who determine external fixators as intermediate fracture treatmentmethods.

Also many cases of severely or multiple traumatized patients maintain external fixationas a definitive treatment because of most of them had difficult to obtain places in the surgical practice that make the conversion into internal fixatorimposible, so early conversion of external fixators into internal osteosynthesis impossible. clinical situation of arrival and arrival time and soft-tissue injuries severity are the 2 main indications for using external fixators specifically with presence of other,

the environmental condition where might be a poor sanitation and high rate of contamination in our society obstacle the conversion into internal osteosynthesis, even it consider as closed tibia fractures ideal .Inthis study the rate of complication was low that allow to option this strategy of treatment as a final definite type of treatment and consider as a valid type of treatment in such situation, the result of our study is compatable to the results of many studies ,where, Ferreira et al.[21]finished situation to the reading by Court- Brownetal[22]andcontendedwho use the externalfixation strategy, intern might be causing could cause social, esthetic, professional, psychological, and family problems. The rate of infection in tibia fracture might be higher than the other sites because the anatomy of tibia.

Brum[6]illuminated that in spite of the variety of outcomes thatmight be gotten by means of the method of external fixation, this stay remains to be the process greatest used amongst Brazilian orthopedic surgeon, where definitive or provisional managementin emergencyunites.

Recovery rate is also not differ from other studies that using the internal nailing process, which leading to faster rehabilitation as compatible with other study[17]. Attaining of good consolidation ratesalso noticed as in internal fixation rate of bone consolidation. Also our study show was significant statistical differences between the site of the fracture and Time from injury to surgery, radiologicalconsolidation and Removal of external fixation time. But there was no significant statistical association between the site of the fracture and fracture configuration, also the fracture disfiguration had no statistical differences according to main listed complications such as pin loose, infection, joint stiffness, bone graft, mal-union delayed union…etc. as Panel study.[23] , Yokoyama [24], Bone *[25], Papakostidis[26] , where carrying higher infection rate but similar rate of mal alignment.and nobig differences regarding the other complication

VI. CONCLUSION

Applicationof external tubular device fixator (AO group of ASIF) was an effective apparatus and this method considered as a reasonable procedure of treatment in closed tibial fracture in developing country with an acceptable rate of complications, a low rate of re-operations and good functional outcome and there was no considerable functional impairment.

The current external fixation system was firstly used exclusively for steadying of open fractures; we recommended to be used forclosed fracture

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