The Psychological Impact Of External Fixation And Internal Fixation On Resilience Of Patients With Tibial Fractures

Sheshagiri V[1], Shivanand M[2], Vidya CS[3], Madhan Kumar K[4]

[1] Associate Professor, Department of Orthopaedics, JSS Medical College
[2] Assistant Professor, Department of Psychiatry, JSS Medical College
[3] Professor & Head, Department of Anatomy, JSS Medical College
[4] Postgraduate student, Department of Orthopaedics, JSS Medical College

Corresponding author

Dr Vidya C S
Professor of Anatomy
JSS Medical College
JSS AHER, SS Nagar Mysuru

Orcid ID: 0000-0003-4876-7326

Abstract

Tibial fractures are among the most frequent types of long bone fractures. Depending on the patient's profile, the fracture's severity and the injury's compound nature dictate the treatment mode. There is limited literature about resilience, which is one of the key components in bouncing back from traumatic circumstances. Our prospective comparative study aims to assess the impact of different procedures, including external and internal fixators, on resilience. The sample size was collected using a validated formula. Both male and female patients in the age group of 18-59 years who were admitted for operative procedures for tibial fracture, and who gave informed consent were recruited. Connor Davidson's resilience scale was used to assess resilience at preoperative, first, third and sixth months postoperative. Patients operated on with an Ilizarov external fixator showed a decline in resilience score post-surgery at all 3 points compared to the nail group. Under circumstances if tibial fracture can be treated by both Ilizarov and IMIL nail, the option of nail should be considered until and unless there is a absolute indication for Ilizarov external fixator.

INTRODUCTION

Tibial fractures are among the most frequent type of long bone fractures. Most tibial fractures are caused by either high-energy trauma, such as motor vehicle accidents, in young patients or low-energy trauma, such as falls, among older adults.(1)

The incidence of proximal, diaphyseal and distal tibia fractures was 26.9, 15.7 and 9.1 respectively per 100,000 and year.(2)

Proximal tibia fractures/Tibial Plateau Fracture are treated by closed reduction and cast application in selected cases and operative options include percutaneous or open screw fixation , fixation using buttress plates, and external ring fixators.(3)

Un-displaced tibial shaft fractures in good compliant patients can be treated conservatively. Intramedullary nailing with high biomechanical stability seems to be the implant of choice. Plate osteosynthesis and use of External fixators is usually rare in tibial shaft fractures unless it is open type of fractures.(4)

The majority of studies about orthopaedic trauma till date have focused on functional outcomes after surgeries but very limited knowledge is available about the clinical consequences of psychological morbidity associated with orthopaedic trauma. There is an perception that patient outcomes following orthopaedic trauma surgery do not rely exclusively on the success of the procedure performed.

In orthopaedic rehabilitation, recently there is progress in admiring the impact of mental health on functional outcome post-surgery, but data evaluating the influence of psychological characteristic, such as resilience during the course of the treatment, are comparatively limited.

Psychological Resilience is defined as the ability to effectively negotiate, adapt to, or manage significant sources of stress or trauma.(5)

Assessing resilience may allow clinicians to a better management of intervening events after an orthopaedic surgery in patients, distinguishing who are likely to “bounce back” from those who may have a more difficult course in order.

METHODS

Study design: This is a prospective comparative study.

Study setting: The study was conducted from DECEMBER 2020 to MAY 2022 in a tertiary referral centre.

Inclusion criteria:

Patients aged between 20 to 60 years irrespective of sex with a history of trauma to the tibia (both closed and open type) and electively operated primarily by external fixation or internal fixation.

Exclusion Criteria

Patients with fractures of both upper and lower limbs, with multiple organ injury or head injury, with previously treated psychiatric illness / newly detected psychiatric illness on medication. Pathological fracture and non-union were not included in the study.

The study was approved by the institutional ethical committee. The informed consent was taken from the patient before the study.

Study Conduct

Patient presenting to hospital with tibial fracture irrespective of site and type of fracture, operated electively with Ilizarov external fixator or intramedullary interlocking (IMIL) nail.

Resilience was measured using the CD-RISC scale**.** Each scale consists of 10 questions which are to be answered by the patient at every follow-up

On the day before surgery, after taking required consent, patient will be asked to fill the CD-RISC -10 questionnaire regarding their past 30 days.

Post internal fixation of the tibial fracture, the patient will be followed up at 1 month, 3 month and 6 month and will be reassessed with the same questionnaire.

Post-external fixation of the tibial fracture, the patient will be followed up at 1 month, 3 month and 3 months post Ilizarov removal and will be reassessed with the same questionnaire.

Our sample consisted of 98 patients. 43 patients underwent Ilizarov external fixator and 55 patients underwent IMIL nailing during the study period.

CD-RISC-10 is one of the most widely used scales for measuring psychological resilience and is abbreviated from the original 25-item scale(6) after removing redundant items with poor fit to the underlying latent construct. Besides being more concise, CD-RISC10 has also demonstrated more stable psychometric properties than the 25-item version.(7,8) It asks respondents about their self-perceived ability to overcome or to adapt to challenges in the past 1 month.

The CD-RISC-10 consists of 10 statements describing different aspects of resilience. The scale serves mainly as a measure of hardiness, with items corresponding to flexibility (1 and 5), sense of self-efficacy (2, 4 and 9), ability to regulate emotion (10), optimism (3, 6 and 8) and cognitive focus/maintaining attention under stress (7). Each item is scored on a five-point scale ranging from 0 to 4, with 0 representing that the resilience statement is not at all true and a score of 4 indicating that the statement is true nearly all the time. The total score is obtained by adding up all 10 items. The total can therefore range from 0 to 40.

The score is interpreted in quartiles, lowest quartile is scored between 0-29. The second quartile is scored between 30 and 32. The third quartile is between 33 and 36 and the Top quartile is scored between 37 and 40.

Higher scores suggest greater resilience and lower scores suggest less resilience, or more difficulty in bouncing back from adversity and the CD-RISC can change during treatment, counselling or stress management.

Statistical analysis: Statistics were done using the SPSS 21.0 version for windows. $P < 0.05$ was considered significant. Chi-square test/Fisher exact test was used comparing two or more independent proportions.

Results: Preoperatively there was no statistical significance in the resilience score between the two groups. The important findings in the present study were, patients operated with Ilizarov external fixator showed a decline in resilience score post-surgery at all 3 points compared to the nail group, which was statistically significant **(p <0.001, p <0.001 and p 0.004 respectively)**.

32.6 % of patients of the Ilizarov group and 30.9 % of the nail group had complications such as intermittent pain, pin tract infection, surgical site infection and knee stiffness.18.6 % of patients of Ilizarov group and 7.3 % of the Nail group had more than 1 complications. Complications were more among the Low resilience patients belonging to the 1st and 2nd quartile.

Discussion

Being resilient suggest that the person has the ability to adapt in the face of tragedy, trauma, adversity, hardship, and ongoing significant life stressors.(9)

Being resilient can be considered one of the key issues for functional recovery after fracture. Resilience plays an important role, and they interact in determining the functional outcome after orthopaedic surgery. Low resilience were associated with a poorer functional status at onset, whereas high resilience was associated with higher functional status on admission and at discharge.(10)

Sciumè L et al in his study found that Resilience plays a significant role in reaching optimal functional recovery in hip-fractured patients. Specifically, high-resilient patients with hip fractures achieved significantly higher functional outcome than low-resilient patients.(11).Nehra D et al found that his Patients with low resilience demonstrated worse functional and psychosocial outcomes 6 months after injury.(12)

Results of the study done by Trinh JQ et al suggest that patients with low resilience are less likely to achieve a clinically important improvement in global physical health postoperatively, suggesting that factors that lead to high resilience (such as optimism, coping, and social support) make important contributions to one's postoperative course and rehabilitation.

Patients with low resilience and depression are more likely to have worse postoperative global physical and mental health. These findings suggest not only that patients should have resilience assessed preoperatively, but also that stratification of scores provides further detail for risk assessment when predicting postoperative outcomes. (13)

No previous study have shown the impact of external fixator and IMIL nail on the Resilience of patient. Resilience is a Dynamic concept. This study has shown patients operated with Ilizarov external fixator had more suppression of their individual resilience postoperatively and even 3 months after removal of external fixator.

Various studies have shown the ability of resilience on surgical outcomes, but this study has proven the impact of type of surgical fixation on the resilience of the patient. Tibial fractures treated with IMIL nail have less impact on the resilience during the course of the treatment and less complications compared to the Ilizarov external fixators where the resilience is affected drastically which may be the cause of more complications and patients feel difficulty to adapt to the external fixator and even undergo significant sources of psychological stress post external fixator removal.

So, under circumstances if tibial fracture can be treated by both Ilizarov and IMIL nail, the option of nail should be considered until and unless there is a absolute indication for Ilizarov external fixator.
However, if patients are operated with Ilizarov external fixators, postoperatively the therapist should look into the resilience levels and resilience building stratergies should be implemented.

However, further studies could focus on measurements of perceived stress, quality of life and other psychological parameters and correlate them with resilience of the individual.

Limitations of the study was that the sample size of this study was relatively small and only consisted of patients from single institution. For more generalizable results, a multicentre study with larger sample size and longer follow up period would be beneficial. Further study is required to understand the importance of patient resilience and its relation to patient outcomes after surgery.

Conclusion: Resilience, which is the ability to bounce back after trauma or adverse events, plays a psychologically significant role in the postoperative period of tibia fractures. This study demonstrates the impact of type of surgical fixation on the resilience of the patient. Ilizarov external fixator frame had more negative impact on resilience of the patients in the follow up period.

This study findings suggest the potential for screening and deploying interventions targeting improving resilience in the peri-operative and follow-up period of tibia fractures, exclusively in Ilizarov external fixation. The type of surgical fixation impacts on the well-being of the patient, and it is essential for the treating orthopedician to discuss about the choice of implant and counsel regarding these psychological aspects.

Table 1

Demographic data of study population

	Ilizarov external fixator	**IMIL Nailing**
AGE	41.7 ±12.0	37.9±12.2
GENDER		
Male	36	47
Female	7	8
MARITAL STATUS		
Single	7	10
Married	36	45
OCCUPATION		
Student	6	8
Farmer	12	20
Skilled	13	15
Unskilled	12	12
MODE OF INJURY		
Road traffic accident	33	46
Self fall	10	9

Table 2

Resilience score analysis in patients operated with Ilizarov External Fixator and IMIL nail

	Ilizarov External Fixator	IMIL Nail	p value
RESILIENCE PRE-OP	33.4 ± 3.7	33.3 ± 3.1	0.9
RESILIENCE POST-OP 1 MONTH	20.0 ± 5.1	24.7 ± 4.4	<0.001
RESILIENCE POST-OP 3 MONTH	25.7 ± 6.2	30.5 ± 4.5	<0.001
RESILIENCE POST OP 6 MONTHS / 3 MONTHS POST-ILIZAROV EXTERNAL FIXATOR REMOVAL	29.6 ± 5.0	32.4 ± 4.3	0.004

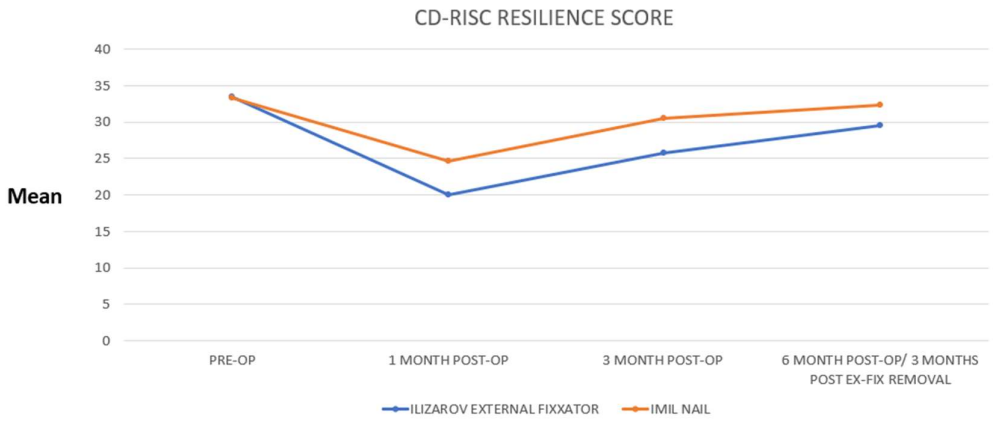
Table 3

Resilience scores based on Quartiles of the Two groups in different times

		TYPE OF FIXATION				
		Ilizarov External Fixator		IMIL Nail		
	Quartile	n	%	n	%	p
RESILIENCE PRE-OP	0-29	9	20.9%	7	12.7%	0.1
	30-32	8	18.6%	15	27.3%	
	33-36	14	32.6%	26	47.3%	
	>37	12	27.9%	7	12.7%	
RESILIENCE POST-OP 1 MONTH	0-29	43	100.0%	42	76.4%	0.001
	30-32	0	0.0%	13	23.6%	
RESILIENCE POST-OP 3 MONTH	0-29	23	53.5%	21	38.2%	0.013
	30-32	16	37.2%	13	23.6%	
	33-36	4	9.3%	20	36.4%	
	>37	0	0.0%	1	1.8%	
RESILIENCE POST OP 6 MONTHS / 3 MONTHS POST-ILIZAROV EXTERNAL FIXATOR REMOVAL	0-29	17	39.5%	17	30.9%	0.06
	30-32	9	20.9%	5	9.1%	
	33-36	17	39.5%	28	50.9%	
	>37	0	0.0%	5	9.1%	

Graph 1

Comparision of the trend of resilience scores of the two groups in different times



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