

# Assessment of Signs of Anxiety and Depression Post Ilizarov Fixation: A Prospective Observational Study

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## ABSTRACT

**Introduction:** The management of various lower limb bones and in some cases upper limb bones, using the Ilizarov ring fixator is a well-known method of fixation. However, the psychological effects it has post-fixation on the mental health of patients are often overlooked. The authors conducted a study to assess signs of anxiety and depression following fixation to illuminate this aspect.

**Aim:** To thoroughly investigate and highlight the signs of anxiety and depression that may emerge in patients after undergoing Ilizarov fixation surgery.

**Materials and Methods:** This is a prospective observational study conducted from June 2023 to June 2024 in the Orthopaedics Department of Dr. D. Y. Patil Hostel, Pimpri, Chinchwad, Pune, Maharashtra, India. A total of 20 patients were selected for the study, which included cases of unilateral compound tibia fractures, tibia non union, femur non union and compound femur fractures in patients who underwent Ilizarov fixation. To evaluate signs of anxiety and depression, the used

the Hospital Anxiety and Depression Scale (HADS). For each patient, the scale was administered during the hospital stay and three months following discharge. A paired t-test was used to compare the statistical values of the HADS system at the time of hospital stay and at the three-month follow-up following discharge. A p-value  $\leq 0.05$  was considered significant.

**Results:** The results indicated a notable difference in anxiety and depression, with significantly lower p-values. Specifically, the p-value for anxiety was 0.008 when comparing hospital stay to three months post-discharge, whereas the p-value for depression was 0.005, which signifies active signs of anxiety and depression following the procedure.

**Conclusion:** While the Ilizarov procedure has numerous benefits in improving the status of the affected limb over time, it also has debilitating effects on the mental status of patients, as demonstrated in the present study. Recommendations include counselling patients during follow-up to encourage psychological support and regular mental check-ups whenever possible.

**Keywords:** Femur non union, Psychiatry and mental health, Tibia non union

## INTRODUCTION

Non unions of the long bones of the upper or lower limb often involve complications such as weakened bone tissue, bone loss, damage to nearby soft tissues, limb shortening, deformities and joint contractures. These factors can significantly hinder treatment progress and increase the risk of treatment failure. In cases of tibial or femoral non union, the Ilizarov method proves beneficial by promoting bone fusion, addressing potential infections, restoring limb length equality and correcting any deformities that may have developed during treatment.

The principle by which Ilizarov ring fixation works is distraction osteogenesis, which is typically carried out over an extended duration to help achieve union of the long bone and allow for weight-bearing while simultaneously reducing the risk of infection, if present. While there have been studies demonstrating the effectiveness of Ilizarov fixation [1], including one involving 50 patients with complex femoral non unions and fractures, which showed excellent rates of bone union and eradication of infection, a meta-analysis conducted by [2] concluded that Ilizarov fixation is a viable option in the management of tibial and femoral non unions.

Considering this, the physiological outcomes of patients following Ilizarov fixation have dramatically improved over the years due to various modifications [3]. However, the postoperative care required, along with the cumbersome nature of this device, often demoralises patients and makes them susceptible to mental health issues such as anxiety and depression. This, in turn, can contribute to conditions like diabetes, hypertension, or cancer [4].

The goal of the present study is to thoroughly investigate and highlight the early warning signs of anxiety and depression that may

emerge in patients after undergoing Ilizarov fixation surgery. This was achieved by administering the Hospital Anxiety and Depression Scale (HADS) among the patients considered for the present study. By closely monitoring patients throughout their postoperative recovery, the study seeks to pinpoint specific indicators of psychological distress. This involves assessing various symptoms and behavioural changes that could signal the onset of anxiety or depression and raising awareness of this occurrence among orthopaedic surgeons to improve patients' postoperative recovery, not just physiologically but mentally as well, by advising psychological counselling when indicated.

## MATERIALS AND METHODS

The present is a prospective observational study conducted from June 2023 to June 2024 in the Orthopaedics Department of Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Chinchwad, Pune, Maharashtra, India. Approval for the research was obtained from the Institutional Review Board of the study Institute, with the ethics approval number IESC/W/166/2024. Written informed consent was obtained from all participants. A total of 20 patients were selected for the study, which included cases of unilateral compound tibia fractures, tibia non union, femur non union and compound femur fractures. The study was time-bound and only subjects that met the inclusion criteria were considered.

**Inclusion and Exclusion criteria:** The age group included in the present study ranged from 18 to 65 years, with both males and females participating. Patients below the age of 18 years and above the age of 65 years, as well as cases of upper limb long bone infective non union and bilateral cases of infective tibia or femur non union and bilateral tibia or femur compound injuries, were excluded.

Study Procedure

Cases of compound tibia or femur shaft fractures were further classified according to the Gustilo-Anderson Classification [5]. This classification consists of three major types, with Type 3 being subdivided into A, B and C. Most cases included in the present study fall into Type 3A or 3B. These patients were followed throughout their hospital stay and after discharge from the hospital.

In order to understand the impact of Ilizarov fixation on the mental status of patients, the authors used the Hospital Anxiety and Depression Scale (HADS) [6]. The HADS consists of 14 self-report items rated on a 4-point Likert scale (ranging from 0 to 3). This scale is specifically designed to assess levels of anxiety and depression, with seven items dedicated to each subscale. The total score is calculated by summing all the items, with the scores for anxiety and depression calculated separately, each having seven items. A score of 0-7 is considered normal, 8-10 is considered borderline abnormal and 11-21 is considered abnormal. For each patient, the scale was administered during the hospital stay and three months after the patient's discharge.

STATISTICAL ANALYSIS

The statistical analysis was conducted using Statistical Package for Social Sciences (SPSS) software version 27.0. A paired t-test was used to compare the statistical values of the HADS system at the time of hospital stay and at the three-month follow-up following discharge. A p-value ≤ 0.05 was considered significant.

RESULTS

A total of 20 patients were considered for the present study from June 2023 to June 2024, consisting of cases of unilateral complex tibia fractures, tibia non union, femur non union and complex femur fractures, within the age group of 18 to 65 years, including both genders. Among the participants, there were 16 men (80%) and four women (20%). Out of these cases, there were 9 (45%) cases of compound tibia and femur shaft fractures, 6 (30%) cases of infected tibia non union and 5 (25%) cases of femur non union. Among the cases of compound injuries, it was found that five cases were classified as Type 3A and four cases as Type 3B according to the Gustilo-Anderson classification [5].

The results indicated a notable difference in anxiety and depression, with significantly lower p-values. Specifically, the p-value for anxiety was 0.008 when comparing the hospital stay to three months post-discharge, whereas the p-value for depression was 0.005. The same results are shown in [Table/Fig-1].

Parameters		Mean	Std. Deviation	Std. error mean	p-value
Anxiety	Pre	9.47	1.39	0.32	0.008
	Post 3 months	10.42	1.84	0.42	
Depression	Pre	9.11	1.52	0.35	0.005
	Post 3 months	10.11	1.85	0.43	

[Table/Fig-1]: Table comparing mean and standard deviation of HADS Scores during hospital stay and 3 months following discharge.

The demographic summary of the cases involved in the present study, which is subdivided into age, sex, diagnosis and sub-classification of compound injuries wherever relevant is depicted in [Table/Fig-2] [5].

S. No.	Age (in years)	Sex	Diagnosis	Gustilo-Anderson Classification for compound injuries [5]
1	22	M	Left infected tibia-fibula shaft non union	
2	42	M	Right infected femur shaft non union	
3	35	M	Left compound femur shaft fracture	3A
4	46	M	Left infected tibia-fibulashaft non union	

5	37	M	Right infected tibia-fibula shaft non union	
6	30	M	Left compound tibia shaft fracture	3B
7	38	M	Right infected femur shaft non union	
8	52	F	Left infected femur shaft non union	
9	50	M	Left compound tibia shaft Fracture	3A
10	49	F	Right infected tibia shaft non union	
11	59	M	Left infected tibia shaft non union	
12	55	M	Right infected femur shaft non union	
13	60	M	Left compound femur shaft fracture	3A
14	47	M	Right compound tibia shaft fracture	3A
15	44	F	Left compound femur shaft fracture	3B
16	62	F	Left infected tibia-fibula shaft non union	
17	42	M	Right compound femur shaft fracture	3B
18	19	M	Right compound tibia shaft fracture	3B
19	27	M	Left compound tibia shaft fracture	3A
20	61	M	Right infected femur shaft non union	

[Table/Fig-2]: Demographic summary of cases involved in the study [5].  
M: Male; F: Female

DISCUSSION

The present study demonstrated remarkable results, with the p-value indicating a high level of significance for both anxiety and depression by the end of three months following patient discharge, proving the presence of active signs of anxiety and depression post-Ilizarov surgery.

The impact of infected non union of the tibia and femur is significantly negative, primarily due to the chronic and debilitating nature of this condition, which affects patients both physically and mentally [7,8]. In the present study, there were 11 cases of infected non unions of the tibia and femur shafts that were managed by Ilizarov fixation. However, other viable techniques exist to manage these challenging cases with promising results, as explained in the study by [9], which discussed options such as Ilizarov fixation, bone transport and local debridement, among others. Ilizarov fixation is an effective treatment for chronic infected non unions of the tibia or femur [10] and consists of three to four rings interconnected by rods [11]. The rings are then connected to the bone by means of Ilizarov wires, which pass through the bone and are attached to the frame using bolts and screws. The fixation can be further enhanced by using larger-diameter Schanz pins or screws. To carry out the principle of distraction osteogenesis, the construct itself needs to be stable.

On average, the frame is applied for six months [12]; however, this duration varies from case to case and is usually longer, depending on the complexity of the condition. While the application has been effective in managing cases of complex fractures and infected non unions, it is crucial to consider the duration of appliance application. Considering these factors, the present study has demonstrated that while the application of the Ilizarov frame has improved the functionality of patients postoperatively [13,14], it has also insidiously contributed to the development of anxiety and depression among the patients included in the present study. External fixation can

sometimes lead to discomfort and a negative psychological impact [15,16] due to its invasive nature and the visible hardware required. In a study by Yildiz C et al., where they used the SCL-90-R questionnaire (Symptom Checklist), they found a p-value of 0.0025 for anxiety and 0.003 for depression among 40 patients, which was significant and similar to the results achieved in the present study [17]. In a study conducted by Jia Q et al., researchers observed a notable increase in anxiety and depression levels within the first month following surgery, according to the HADS [18]. This trend suggests that the immediate postoperative period can be particularly challenging for patients in terms of mental health. This finding indicates that while patients may initially experience heightened psychological distress postoperatively, these symptoms may stabilise and return to baseline after the initial recovery period. This contrasts with the results of the present study, where anxiety and depression levels remained elevated beyond the first month postoperatively. This sustained psychological distress may be attributed to factors such as delayed return to work and the socioeconomic profile of the study population, which primarily included individuals from middle or lower-income backgrounds [19]. For these individuals, financial constraints can significantly complicate and prolong the rehabilitation process, adding additional stress to their recovery.

The signs of anxiety and depression are often subtle but can be effectively identified using simple questionnaires, such as the HADS. This tool can be administered preoperatively and compared postoperatively to detect these symptoms. Appropriate counselling by qualified psychologists can then be provided to support postoperative recovery, which relies not only on achieving a functional outcome but also on addressing mental wellbeing.

The future prospects of the present study include the use of effective patient education and counselling during the preoperative period to make patients aware of the potential challenges they may face postoperatively, the use of standardised questionnaires such as HADS to detect and compare signs of anxiety or depression if they arise and the management of such cases through effective integration with the psychiatry or psychology department to tailor an effective psychotherapy plan for successful postoperative recovery.

### Limitation(s)

Although the study provided useful insights and results, it faced a significant limitation due to its relatively small sample size and the limited duration over which it was conducted. A small sample size can restrict the generalisability of the findings, making it difficult to apply the results to a broader population. Additionally, a short study duration may not capture the long-term outcomes and complications associated with the condition or treatment.

### CONCLUSION(S)

The study concluded that while the Ilizarov procedure is a valuable and effective solution for addressing complex orthopaedic conditions, its focus on physical recovery often overshadows the psychological challenges patients face. Postoperatively, many individuals experience anxiety, depression and emotional distress to varying degrees due to factors such as prolonged recovery periods, pain, restricted mobility and lifestyle adjustments. Despite this, the psychological aspect of care is frequently neglected, leaving patients

without adequate emotional support during their rehabilitation journey. The findings emphasise the importance of integrating mental healthcare into the treatment process, particularly through preoperative counselling to prepare patients for the emotional and physical challenges ahead. Additionally, ongoing psychological support postsurgery can play a crucial role in improving overall recovery outcomes and enhancing patients' quality of life.

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