

# Evaluation of the Quality of Life of Patients Using Circular External Fixator in a Trauma Hospital\*

## *Avaliação da qualidade de vida dos pacientes em uso de fixador externo circular em um hospital de trauma*

Paulo Henrique Vogt<sup>1</sup> Renê Hobi<sup>1</sup> Heloisa Zimmermann Faggion<sup>1</sup> Giro Alberto Yoshiysu<sup>2</sup>   
Lucas Antônio Ferraz Marcon<sup>1</sup> Cássio Kenji Hiraga<sup>1</sup>

<sup>1</sup>Department of Orthopedic and Traumatology, Hospital do Trabalhador, Universidade Federal do Paraná, Curitiba, PR, Brazil

<sup>2</sup>Department of Medical Residency, Hospital do Trabalhador, Universidade Federal do Paraná, Curitiba, PR, Brazil, Curitiba, PR, Brazil

Address for correspondence Paulo Henrique Vogt, MD, Av. Rep. Argentina, 4406 - Novo Mundo, Curitiba, PR, CEP: 81050-000, Brazil (e-mail: paulovogt90@gmail.com).

Rev Bras Ortop 2022;57(2):214–217.

### Abstract

**Objective** To evaluate the quality of life of patients using an Ilizarov type external fixator for the treatment of complicated fractures and their sequelae.

**Method** This is an observational and cross-sectional study, in which the 36-item short form survey (SF-36) questionnaire (translated into Portuguese) was applied during outpatient consultations in 2 periods, in the months of July 2018 and January 2019. The patients who participated in the study underwent their surgical procedures between January and June 2018.

**Results** We evaluated 36 patients using an external Ilizarov fixator. We observed a predominance of male patients, with a mean age of 37.9 years. Fractures of leg bones and their complications represented half of the sample. Improvement in functional capacity and emotional aspects of the patients was observed throughout the treatment.

**Conclusion** The use of the circular external fixator is an important and effective method for the surgical treatment of complex fractures and their sequelae. This study allowed us to conclude that, after treatment, patients achieved functional return to daily activities with adequate quality of life.

### Keywords

- ▶ quality of life
- ▶ Ilizarov technique
- ▶ external fixators
- ▶ bone lengthening
- ▶ fractures, bones
- ▶ pseudoarthrosis

\* Study developed at the Orthopedics and Traumatology Service of Hospital do Trabalhador, Curitiba, PR, Brazil.

received  
August 10, 2020  
accepted  
March 8, 2021  
published online  
October 13, 2021

DOI <https://doi.org/10.1055/s-0041-1732383>.  
ISSN 0102-3616.

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Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

**Resumo**

**Objetivo** Avaliar a qualidade de vida dos pacientes em uso do fixador externo do tipo Ilizarov para tratamento de fraturas complexas e de suas sequelas

**Método** Trata-se de um estudo observacional e transversal, em que foi aplicado o questionário *36-item short form survey* (SF-36) (traduzido para a língua portuguesa) durante as consultas ambulatoriais em 2 períodos, nos meses de julho de 2018 e janeiro de 2019. Os pacientes que participaram do estudo realizaram seus procedimentos cirúrgicos no período de janeiro a junho de 2018.

**Resultados** Foram avaliados 36 pacientes em uso de fixador externo do tipo Ilizarov. Foi observado predomínio do sexo masculino e idade média de 37,9 anos. As fraturas de ossos da perna e suas complicações representaram metade da amostra. Foi observada melhora na capacidade funcional e nos aspectos emocionais dos pacientes ao longo do tratamento.

**Conclusão** O uso do fixador externo circular constitui um método importante e eficaz para o tratamento cirúrgico de fraturas complexas e de suas sequelas. Este trabalho permitiu concluir que, após o tratamento, os pacientes alcançaram retorno funcional às atividades diárias com adequada qualidade de vida.

**Palavras-chave**

- ▶ qualidade de vida
- ▶ técnica de Ilizarov
- ▶ fixadores externos
- ▶ alongamento ósseo
- ▶ fraturas ósseas
- ▶ pseudoartrose

**Introduction**

The use of an external fixator as a therapeutic option in the treatment of fractures or bone stretching was incorporated into the practices of orthopedics in the mid-nineteenth century.<sup>1</sup> In the 1950s, Gavril Abramovich Ilizarov developed the circular external fixator that took his name, as well as the Ilizarov method, based on the concept of osteogenesis by distraction.<sup>2,3</sup> Osteogenic distraction allows the surgeon to perform limb stretching in patients with posttraumatic length discrepancy caused by bone trauma itself or secondary to osteomyelitis debridement.<sup>4</sup> Ilizarov employed, in his studies, the safe distraction rate to facilitate bone formation of 1 mm per day.<sup>4,5</sup> Due to this, it is important to highlight that the period of treatment with the fixator is usually long, about 15 months in cases of bone stretching,<sup>4</sup> resulting in alterations, even if transient, in daily life, quality of life and functionality of patients. According to Baschera et al.,<sup>6</sup> treatment with the circular external fixator is effective and fulfills its biological function for the proposed goal. However, it was noted that the return to previous work activities did not occur in the same time interval for all patients involved. For Elsoe et al.,<sup>7</sup> after treatment with the circular external fixator, moderate to severe depression rates increased. The authors associate this data with the complex degree of the fractures presented, the length of treatment, and the socioeconomic consequences and limitations that the long therapeutic follow-up imposes. According to the care required during therapy, the present study aims to evaluate, in a level 1 in trauma center, the repercussions generated by the Ilizarov method on the quality of life (functional and psychosocial) of patients undergoing treatment with the circular external fixator.

**Material and Method**

This study has a cross-sectional observational design and evaluates the quality of life (physical and psychosocial) of

patients undergoing treatment with circular external fixator (Ilizarov method) for complications resulting from fractures and complex lesions in the lower limbs. Data were collected in two periods, in July 2018 and January 2019. The inclusion criteria used were patients who used the circular external fixator in the lower limbs during the questionnaire application and who agreed to participate in the study by signing the informed consent form. Patients submitted to external fixators with non-standard assemblies and patients with cognitive impairment or severe psychiatric disorders that compromised the application of the questionnaire were excluded. For data collection, the 36-item short form survey (SF-36) questionnaire was used, translated, adapted and validated for Portuguese.<sup>8</sup> This is a generic instrument for assessing the quality of life, easy to apply and understand, consisting of 36 items in 8 groups: functional capacity, physical aspects, pain, general health status, vitality, social aspects, emotional and mental health aspects.<sup>8</sup>

Thirty-six patients were evaluated in the present study, who answered the questionnaire at two distinct periods, maintaining a 6-month difference between the first application and the second. The period of treatment in which the questionnaire was conducted varied widely among patients, with an average of 11 months. Of the total evaluated, 75% of the patients were male and 25% were female. The age ranged from 19 to 63 years of age, with a mean of 37.9 years, and the median being 38 years. In about 80% of the patients evaluated in the study, the use of the external circular fixator was indicated for the treatment of complications of leg bone fractures, including pseudoarthrosis (PSA), osteomyelitis, bone failure and/or vicious consolidation. In the period evaluated, since the initial trauma, patients were submitted to multiple surgical procedures before the assembly of the Ilizarov system, on average each patient was submitted for 4 procedures involving surgical stabilization, soft-tissue debridement and/or bone resection, and the average

permanence of the method for the end of the proposed treatment was around 15.6 months.

The statistical program R Version 3.5.1 (R Core Team) was used for data analysis. Descriptive analysis was performed by verifying the quantities and percentages for categorical variables and descriptive measures (minimum, maximum, quartiles, mean and standard deviation) for continuous variables.

## Results

Among the items evaluated (functional capacity, limitation by physical aspects, pain, general health status, vitality, and social aspects) through the SF-36 questionnaire, only functional capacity and emotional aspects of the patient revealed statistically significant changes.

It was found through the application of the questionnaire and using the paired t-test, that the functional capacity of the patients increased on average 3.71 points ( $p < 0.05$ ) when compared to the previous traumatic or infectious functional state, with a  $p < 0.001$  between the parameters evaluated, (►Table 1)(initial values  $30.32 \pm 24.66$  and final values  $34.03 \pm 23.47$ ) demonstrating significant difference for this dimension and, nevertheless, improvement of the patient with treatment. In the same way, by qualitative analysis of this subitem, it is possible to affirm that patients can, even in use of the external fixator, return to perform their usual and basic activities of daily life, such as bathing without assistance, walking on the streets, using public transport, and shopping in markets.

The emotional aspect was another subitem of the questionnaire that presented significant alterations. At this point, it is also observed that there was an increase of 8.6 points ( $p < 0.05$ ) (►Table 1) between the first application of the questionnaire and the second, with a difference of 6 months between them and a  $p < 0.03$  between the parameters evaluated.

In addition, 70.5% of the patients believe that, comparatively, their perception of health at the time of the questionnaire was improved in relation to that in the beginning of treatment with the method; the perception of their health improved or maintained at acceptable levels. It can be

**Table 1** Paired comparison between before and after for dimensions with  $p < 0.05$  values

Rated items	Average	SD	$P < 0.05$
<b>Functional capacity</b>			<b>0.001</b>
Before	30.32	24.66	
After	34.03	23.47	
Difference	3.71	4.28	
<b>Emotional aspects</b>			<b>0.03</b>
Before	25.81	33.01	
After	34.41	42.59	
Difference	8.6	21.03	

Abbreviation: SD, standard deviation.

evaluated that, during the treatment and its progression, patients reported being more stimulated and, consequently, more involved with the treatment and recovery.

## Discussion

In this heterogeneous group of patients submitted to the circular external fixator method for traumatic complications, such as pseudoarthrosis or bone infection, 70.5% believe that their health improved when compared to the period prior to the beginning of treatment. The improvement in functional capacity and emotional aspects demonstrated by the SF-36 questionnaire may be related to the stabilization of the initial clinical picture, the patient's understanding of the complexity of his injury, or by the use and results obtained by the Ilizarov method, as demonstrated by Wang et al.<sup>9</sup>

However, the improvement of the functional condition may be related to the objective of the circular external fixator, which is the treatment of pseudoarthrosis, osteomyelitis, and complex fractures; thus, the evolution of the patient's condition and the gradual return to their activities demonstrate functional improvement of the previous condition. The return to activities, and the positive evolution of the condition, with good results of the Ilizarov method, may be related to the improvement of the emotional aspect of the patient.

The satisfaction with the use of the circular external fixator obtained in our study, shown by the emotional improvement of patients, is in accordance with the literature, as shown by Baschera et al.<sup>6</sup> in a paper published in 2014. Through the SF-12 questionnaire, it was found that the satisfaction index of the sample studied with the treatment with circular external fixator (Ilizarov method) was 96.8%. In the same study, 91.7% of the patients said that they would undergo the same treatment again under similar circumstances if necessary.

Wang et al.,<sup>9</sup> in 2017, also evaluated the mental component by SF-36 in their patient series. They noticed improvement in psychological status according to the progression of treatment (the values found were  $37.5 \pm 4.5$  and, at the end of treatment, they reached  $72.5 \pm 5.5$ , with  $p = 0.00$ ). Regarding the psychological and emotional factor, it was possible to affirm with this study that patients using a circular external fixator had an improvement in signs of anxiety or depression.

In a 1997 publication, McKee et al.<sup>10</sup> evaluated 25 patients using the SF-36, with application of the questionnaire pre and postoperatively. In the overall score, similar to the present study, values that represent improvement of functional activity were revealed. However, as observed in this study, issues such as vitality ( $37 \pm 4$  to  $46 \pm 7$ ) and physical function ( $38 \pm 6$  to  $46 \pm 7$ ) did not show significant improvement, with indexes outside the reliability intervals.

As these are patients with orthopedic complications and patients resulting from fractures, the preoperative functional and emotional evaluation becomes complicated, but the literature and our work are in line regarding the good results of the Ilizarov method and the adequacy/adaptation of the patient to the method.

## Conclusion

Despite the great complexity of the fractures presented, complications, treatment time and the socioeconomic consequences and limitations that therapeutic follow-up imposes, patients listed for the use of the Ilizarov circular external fixator method obtained improvement in functional and emotional aspects in relation to the beginning of treatment.

### Financial Support

There was no financial support from public, commercial, or non-profit sources.

### Conflict of Interests

The authors declare that there is no conflict of interests.

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