



The Quality of Life of Trauma Patients with Splint Immobilization

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Abstract

Background: Different countries have used different methods to reduce trauma-related mortality and its complications.

Objectives: Splint is a temporary and conventional method of fixing an injured organ. Therefore, evaluating the quality of life in trauma patients with splint immobilization is important.

Methods: This prospective study was performed on 287 trauma patients with splint immobilization in two baseline periods and one month later in Haft-e-Tir and Rasoul-e-Akram hospitals. The Data collection tool was the SF-36 quality of life questionnaire. Paired *t*-test was used to assess the changes in the quality of life. SPSS version 21 was used for statistical analysis.

Results: The mean quality of life in the study's first phase was 76.31 ± 9.42 , and one month after splint immobilization was 76.13 ± 8.98 , and there was no significant difference between the two phases. The Splint immobilization of the patients significantly affected the quality of life in 5 out of 8 dimensions. Still, the intervention increased the scores in 3 dimensions and decreased scores in 2 dimensions. The results showed that social performance ($P = 0.01$), energy and vitality ($P < 0.001$), and emotional health ($P < 0.001$) increased, and physical performance ($P = 0.01$) and general health ($P = 0.001$) decreased, and they were significantly different in the two phases. There were no significant differences between emotional limitation, physical limitation, and pain in the two phases of the study.

Conclusions: Splint immobilization of patients improved the quality of life in 5 out of 8 dimensions. After a month, the trauma-related mental and physical shock did not disappear, and even the patients were more sensitive to quality-of-life questions due to time spent with splint immobilization and familiarity with its limitations. The patients tried to reflect on their dissatisfaction with splint immobilization.

Keywords: Trauma, Splint, Quality of life, Immobilization

1. Background

According to the World Health Organization, approximately 4.4 million people die yearly from injuries and trauma. Also, 10% of the total years lived with disability (YLD) is due to them (1). Usually, after trauma and injury, the injured limb is immobilized with techniques such as splints (2, 3). Splints are used to immobilize an injured limb to prevent further injury, heal the injured area, and complete the healing process (4). It is demonstrated that immobility caused by splints can reduce the quality of life (5). Quality of life refers to an individual's personal perception of their position in life, considering their personal values and goals (6). In other words, quality of life in a population or individual at a specific time means well-being according to the positive and negative criteria

in that population or individual at that time (7). Quality of life is an important therapeutic goal, and research on quality of life is conducted to evaluate treatment and make policies to improve it (6). Fatal and non-fatal injuries and trauma rates are significantly higher in low-income countries and individuals (1). Immobility is associated with complications that generally reduce the quality of life (8).

2. Objectives

Due to many traumatic patients and their treatment with splints, this study aimed to measure the quality of life in traumatic patients with splint immobilization.

3. Methods

This study was a prospective study performed on 287 patients with trauma from May to September 2022 who used splints for immobilization treatment in Haft-e-Tir and Rasoul-e-Akram hospitals. People over 15 years old were included in the study. Exclusion criteria were being unable to cooperate, such as mentally disabled individuals, people with cerebral palsy, and people needing surgery or physiotherapy. Patients' score was assessed at two-time intervals at the beginning of treatment and one month after splinting. Splinting meant all types of splinting methods on patients, and there was no limit to the splinting method in the study. In this study, we used the SF-36 quality of life questionnaire, which has 8 dimensions: physical performance (10 questions range 0 - 30), physical limitation (4 questions range 0 - 8), emotional limitation (3 questions range 0 - 6), energy and vitality (4 questions range 0 - 14), emotional health (5 questions range 0 - 20), social performance (2 questions range 0 - 6), pain (2 questions range 0 - 6), and general health (5 questions range 0 - 13), and higher scores are better. The reliability and validity of the SF 36 questionnaire were measured and approved by Montazeri et al. (9). In this study, the reliability was 0.77, and validity was above 0.40, ranging from 0.58 to 0.95. A paired *t*-test was used to evaluate changes in quality-of-life scores. Statistical analysis was conducted using SPSS version 20, with a significance level of less than 0.05.

4. Results

Regarding gender, 189 participants (65.9%) were male, and 98 (34.1%) were female. As shown in Table 1, the mean age of men was higher than women (40.45 years in men vs. 36.62 years in women). In addition, the mean age of 287 participants in the study was 39.15 years.

By measuring and comparing 8 dimensions of quality of life in the SF36 questionnaire in two phases of the study, the changes were significant in five dimensions. The results are shown in Table 1. According to the results, physical health significantly decreased from 20.84 ± 7.19 to 18.89 ± 7.33 ($P = 0.003$). However, energy and vitality, emotional health, social performance, and general health were significantly increased from 11.74 ± 2.15 to 12.25 ± 2.24 ($P < 0.01$), 16.82 ± 2.21 to 17.34 ± 2.43 ($P < 0.01$), and 4.82 ± 0.95 to 5.01 ± 1.02 ($P = 0.01$), 10.74 ± 2.31 to 10.29 ± 2.33 ($P = 0.001$) respectively.

Table 2 shows the mean of the overall dimensions. The physical dimension consists of dimensions of physical performance, physical limitation, pain, and general health, and the mental dimension consists of dimensions

of emotional limitation, energy and vitality, emotional health, and social performance. Therefore, according to the results, the physical dimension decreased one month after the study, which reached 38.47 from 40.84 at the beginning of the study, but its mean mental score increased from 35.94 to 37.23. The mean changes in the overall score dimensions differed significantly, but this significance was not shown in their total score.

5. Discussion

Quality of life is considered one of the treatment outcomes (6), but some interventions may decrease the patient's quality of life until complete recovery. One of these treatments is splints, which are used in some injuries and traumas. Since a splint restricts the movement of a limb, evidence indicates that splints and immobility can reduce patients' quality of life (8, 10). This study investigated the quality of life of patients with immobility caused by splints. The results demonstrated that the quality of life of the patients, in general, did not significantly change during the splint treatment period. On the other hand, although the difference in the physical and mental dimensions was significant, it was small. However, studies on hospitalized patients show that complications such as pressure ulcers and pneumonia caused by immobility reduce patients' quality of life (8). The results obtained from WHOQOL-BREF, which is a quality-of-life assessment developed by the WHOQOL Group, demonstrated that immobility caused by stress and anxiety in PTSD patients significantly decreased their quality-of-life score (11). The immobility caused by splints differs slightly from immobility in hospitalized or PTSD patients. Therefore, the difference in the effect of immobility on the quality of life may be due to the nature of the immobility and the amount of immobility. Similarly, a systematic review demonstrated that splints had no significant effect on pain and function (12).

Although there was a difference in the quality of life of patients treated with splints in dimensions such as general health, physical performance, energy and vitality, and emotional health and social performance, there was no difference in the dimension of pain among hospitalized patients with immobility (8). Physical limitation, emotional limitation, and pain are items in which no difference has been observed a month after splint treatment. However, in a group with early-stage thumb carpometacarpal joint osteoarthritis, it was found that pain, stiffness, and physical limitation significantly decreased in the splint group compared to the non-splint group (13). Overall physical dimension was decreased one month after the start of splint treatment. This is

Table 1. Comparison of Mean Scores of Quality-of-Life Dimensions

Dimension	Mean ± SD	t	P-Value
Physical performance		3.05	0.003
Baseline	20.84 ± 7.19		
One month	18.89 ± 7.33		
Physical limitation		0.28	0.78
Baseline	5.27 ± 2.11		
One month	5.23 ± 1.52		
Emotional limitation		-0.07	0.94
Baseline	2.83 ± 1.27		
One month	2.84 ± 1.13		
Energy and vitality		-4.45	< 0.01
Baseline	11.74 ± 2.15		
One month	12.25 ± 2.24		
Emotional health		-3.18	< 0.01
Baseline	16.82 ± 2.21		
One month	17.34 ± 2.43		
Social performance		-2.6	0.01
Baseline	4.82 ± 0.95		
One month	5.01 ± 1.02		
Pain		-1.72	0.087
Baseline	3.66 ± 2.99		
One month	4.09 ± 2.29		
General health		3.32	0.001
Baseline	10.74 ± 2.31		
One month	10.29 ± 2.33		

Table 2. Comparison of Mean Quality of Life in Dimensions

Variables	Baseline	One Month	t	P-Value
Quality of life				
Physical	40.84 ± 7.24	38.47 ± 8.03	3.25	0.001
Mental	35.94 ± 4.16	37.23 ± 4.15	-4.53	< 0.001
Total	76.31 ± 9.42	76.13 ± 8.98	0.22	0.84

consistent with the results of a six-month follow-up that showed patients' physical performance was significantly worse compared to the time of injury (14). Although there is controversy in this field (15, 16), it seems that treatment with a splint and the resulting immobility reduces the physical dimension score, at least in the short term (17). This can be due to the individuals' unfamiliarity with the limitations that a splint can create, and after a month and familiarity with the effects of a splint on the quality of life, the patient's responses to the questionnaire

might have been affected. Unlike the physical dimension, we found that the mental status of patients improved one month after treatment with a splint. A 24-month study of an injured population group after treatment demonstrated improvement in the quality of life in the mental dimension (18). It seems that a month after injury and splint treatment, the psychological effects of trauma decrease. On the other hand, expecting improvement in physical condition due to treatment also makes the person feel mentally better one month after a trauma.

5.1. Conclusions

Based on the splint therapy intervention in the study, it can be concluded that this treatment method could improve the quality of life in patients with trauma as it improved the quality of life in 5 out of 8 dimensions. Splinting is a well-known treatment for trauma patients, and if there is an alternative to splinting, these methods can be compared to investigate their effectiveness and their effects on the quality of life. We propose that this study should be conducted with larger sample sizes in more than 2 hospitals. Also, this study could be conducted using other quality-of-life questionnaires.

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Footnotes

Authors' Contribution: Hoseini conceived and designed the evaluation, performed parts of the statistical analysis, and assisted in drafting the manuscript. Mousavi re-evaluated the clinical data, revised the manuscript, performed the statistical analysis, and revised the manuscript. Veisi collected the data and interpreted them. Tahmasebi re-analyzed the statistical data and revised the manuscript. All authors read and approved the final manuscript.

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References

- World Health Organization. *Injuries and violence*. 2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/injuries-and-violence>.
- Feller R, Furin M, Alloush A, Reynolds C. EMS Immobilization techniques. *StatPearls*. Treasure Island (FL); 2023.
- DeYulis M, Hinson JW. Joint immobilization. *StatPearls*. Treasure Island (FL); 2023.
- Althoff AD, Reeves RA. Splinting. *StatPearls*. Treasure Island (FL); 2023.
- Gabriel C, Barbier O, David M, Manon J, Detrembleur C, Libouton X. Effect of splint on pain, function and quality of life in trapeziometacarpal osteoarthritis patients? *Acta Orthop Belg*. 2022;**88**(1):179–85. [PubMed ID: [35512169](https://pubmed.ncbi.nlm.nih.gov/35512169/)]. <https://doi.org/10.52628/88.1.22>.
- Fixsen D, Blase K, Metz A, Van Dyke M. Implementation Science. *International Encyclopedia of the Social & Behavioral Sciences*. 2015. p. 695–702. <https://doi.org/10.1016/b978-0-08-097086-8.10548-3>.
- Teoli D, Bhardwaj A. Quality Of Life. *StatPearls*. Treasure Island (FL); 2023.
- Wu X, Li Z, Cao J, Jiao J, Wang Y, Liu G, et al. The association between major complications of immobility during hospitalization and quality of life among bedridden patients: A 3 month prospective multi-center study. *PLoS One*. 2018;**13**(10). e0205729. [PubMed ID: [30312330](https://pubmed.ncbi.nlm.nih.gov/30312330/)]. [PubMed Central ID: [PMC6185860](https://pubmed.ncbi.nlm.nih.gov/PMC6185860/)]. <https://doi.org/10.1371/journal.pone.0205729>.
- Montazeri A, Gashtasbi A, Vahdaninya M. [Translation, reliability and validity of SF-36 questionnaire]. *Payesh J*. 2005;**5**(1):49–56. Persian.
- Sadeghi E, Jamebozorgi AA, Qoreishy M, Kangarani Farahani M. Comparison of quality of life following single- event multilevel surgery (SEMLS) using bandaging and casting immobilization methods in cerebral palsy children. *Iran J Child Neurol*. 2021;**15**(3):55–64. [PubMed ID: [34282363](https://pubmed.ncbi.nlm.nih.gov/34282363/)]. [PubMed Central ID: [PMC8272545](https://pubmed.ncbi.nlm.nih.gov/PMC8272545/)]. <https://doi.org/10.22037/ijcn.v15i2.17361>.
- Kalaf J, Coutinho ESF, Mendlowicz M, Portella CM, Berger W, Luz MP, et al. Stuck in a moment: Tonic immobility predicts poor quality of life in treated PTSD patients. *Psychiatr Danub*. 2022;**34**(3):447–54. [PubMed ID: [36256982](https://pubmed.ncbi.nlm.nih.gov/36256982/)]. <https://doi.org/10.24869/psyd.2022.447>.
- Buhler M, Chapple CM, Stebbings S, Sangelaji B, Baxter GD. Effectiveness of splinting for pain and function in people with thumb carpometacarpal osteoarthritis: A systematic review with meta-analysis. *Osteoarthritis Cartilage*. 2019;**27**(4):547–59. [PubMed ID: [30317000](https://pubmed.ncbi.nlm.nih.gov/30317000/)]. <https://doi.org/10.1016/j.joca.2018.09.012>.
- Can A, Tezel N. The effects of hand splinting in patients with early-stage thumb carpometacarpal joint osteoarthritis: a randomized, controlled study. *Turk J Med Sci*. 2020;**50**(8):1857–64. [PubMed ID: [32536106](https://pubmed.ncbi.nlm.nih.gov/32536106/)]. [PubMed Central ID: [PMC775706](https://pubmed.ncbi.nlm.nih.gov/PMC775706/)]. <https://doi.org/10.3906/sag-1807-157>.
- Van Son MA, De Vries J, Roukema JA, Gosens T, Verhofstad MH, Den Ouden BL. The course of health status and (health-related) quality of life following fracture of the lower extremity: A 6-month follow-up study. *Qual Life Res*. 2016;**25**(5):1285–94. [PubMed ID: [26537977](https://pubmed.ncbi.nlm.nih.gov/26537977/)]. [PubMed Central ID: [PMC4840217](https://pubmed.ncbi.nlm.nih.gov/PMC4840217/)]. <https://doi.org/10.1007/s11136-015-1167-4>.
- Shamsi A, Ziya SS, Shahabinejad R. Trend of quality of life in patients with traumatic hand injury. *Military Caring Sciences*. 2019;**5**(3):165–72. <https://doi.org/10.29252/mcs.5.3.165>.
- Cuesta-Vargas AI, Gonzalez-Sanchez M, Casuso-Holgado MJ. Effect on health-related quality of life of a multimodal physiotherapy program in patients with chronic musculoskeletal disorders. *Health Qual Life Outcomes*. 2013;**11**:19. [PubMed ID: [23414183](https://pubmed.ncbi.nlm.nih.gov/23414183/)]. [PubMed Central ID: [PMC3577634](https://pubmed.ncbi.nlm.nih.gov/PMC3577634/)]. <https://doi.org/10.1186/1477-7525-11-19>.
- Kasnavieh MH, Sattarian SF, Ghafouri HB, Zadeh MY. [Study on Short-term and long-term Quality of life in patients with acute musculoskeletal injuries undergone treatment]. *Trop Med Public Health*. 2018;**2**(Issue Special Issue):7–8. Persian.
- Gopinath B, Jagnoor J, Harris IA, Nicholas M, Casey P, Blyth F, et al. Health-related quality of life 24 months after sustaining a minor musculoskeletal injury in a road traffic crash: A prospective cohort study. *Traffic Inj Prev*. 2017;**18**(3):251–6. [PubMed ID: [27736156](https://pubmed.ncbi.nlm.nih.gov/27736156/)]. <https://doi.org/10.1080/15389588.2016.1244335>.