International Journal of Medical Sciences And Clinical Research

VOLUME Vol.05 Issue11 2025
PAGE NO. 201-204
DOI 10.37547/ijmscr/Volume05Issue11-38

Assessment Of Periodontal Microcirculation In Patients With Jaw Alveolar Process Fractures Using Different Immobilization Techniques

Yusufov N.I.

PhD Senior Lecturer of the Department of Clinical Sciences, Faculty of Medicine, Gulistan State University, Uzbekistan

Shomurodov K.E.

PhD Senior Lecturer of the Department of Clinical Sciences, Faculty of Medicine, Gulistan State University, Uzbekistan

Musaev Sh.Sh.

Department of Maxillofacial Surgery of the Tashkent State Medical University, Uzbekistan

Received: 29 September 2025; **Accepted:** 21 October 2025; **Published:** 26 November 2025

Abstract: This article presents the findings of an evaluation of periodontal microcirculation during the immobilization period in patients with fractures of the jaw alveolar process. The study demonstrates that, alongside standard fracture management, it is essential to implement measures aimed at improving microcirculatory parameters and preventing the progression of inflammatory-destructive changes in periodontal tissues. The use of such supportive approaches contributes to maintaining periodontal tissue viability and reducing the risk of complications.

Keywords: Alveolar process fractures, maxillofacial trauma, jaw immobilization, periodontium, microcirculation.

Introduction: Fractures of the facial skeleton constitute 3.2%–5.8% of all injuries [5,6,8]. Most facial bone traumas involve the jaws, with 77.0%–90.0% of patients requiring treatment in specialized healthcare facilities [1,4,8,11,13]. As the incidence of maxillofacial trauma continues to rise, the need for comprehensive and specialized management of jaw alveolar process fractures (JAPF) remains an important clinical concern. Treatment typically involves both conservative (orthopedic) and surgical approaches, and in many cases, a combination of these two modalities is used. Despite advances in mandibular fracture management, infectious and inflammatory complications are still frequently observed in the post-traumatic period. Their development is influenced by several factors, including the presence of teeth with existing periodontal pathology. Additional contributors include reduced systemic resistance, impaired local blood circulation, and altered innervation in the fracture area [1,3,9].

At present, the most commonly used method for managing JAPF is fragment immobilization with smooth dental splints. However, the application of splints creates difficulties in performing both professional and personal oral hygiene. As immobilization time increases, oral hygiene inevitably deteriorates. Dental plaque microorganisms directly initiate inflammatory reactions in periodontal tissues. Under normal conditions, host defense mechanisms suppress microbial activity, but once this balance is disrupted, infection and subsequent tissue damage occur. Prolonged placement of bronze–aluminum ligatures in the cervical region of the teeth also provokes periodontal inflammation, ultimately causing periodontitis. Indeed, one of the standard experimental models of induced periodontitis involves the placement of ligatures around the cervical tooth area. In patients with existing periodontal disease, splint application can exacerbate periodontitis, complicating disease progression and, in some cases, making splint placement impossible [2,4,6–10].

Currently, no studies have examined how dental splints affect periodontal tissues in patients with mandibular alveolar process fractures. Although several authors recommend abandoning splints in favor of alternative immobilization techniques for alveolar bone fragments [5,11–13], these methods have not gained widespread acceptance. As a result, dental splints remain the primary immobilization technique for mandibular alveolar process fractures, despite the lack of data on their impact on the condition of periodontal tissues.

Purpose of the Study.

The aim of this research was to evaluate the impact of dental splints used for managing mandibular alveolar process fractures on periodontal tissue microcirculation.

METHODS

The study was based on clinical observations from 65 patients diagnosed with alveolar process fractures of the jaws. Depending on the immobilization technique employed, the patients were divided into three groups:

- **Group 1**: 20 patients treated with smooth dental arch bars for immobilization;
- **Group 2**: 22 patients treated with smooth dental arch bars in combination with the "Medical Herbs" (Splat) mouthwash and CALCIY TRIACTIVE® D3;
- **Group 3**: 23 patients treated with dental splints fixed using composite restorative materials.

Patients with jaw alveolar process fractures (JAPF), as well as individuals in the control group, were evaluated at three time points: prior to immobilization (upon hospital admission), on the 14th day of immobilization, and on the day the immobilization devices were removed.

Because periodontal microcirculation indices measured by laser Doppler flowmetry (LDF) are known to vary by functional state and age (Davidyan O.M., Davreshyan G.K., Kodzhakova F.R. et al., 2020), microcirculation parameters were also recorded in a control group of 16 healthy individuals matched by age. These results served as reference data for comparison.

The assessment of microcirculation relied on laser probing of periodontal surface tissues, with data analysis based on detecting the Doppler shift in the reflected light. The frequency spectrum of the reflected signal corresponds to erythrocyte velocity, enabling evaluation of blood flow dynamics.

The parameters analyzed included the microcirculation index (MI), characterizing overall LDF effectiveness, as well as additional indicators of basal surface perfusion such as standard deviation and coefficient of variation.

Results. Analysis of LDF recordings in healthy individuals with intact periodontal tissues showed an average perfusion value (PM) of 11.84 ± 1.26 units, as presented in Table 1.

In patients with JAPF, the microcirculation index of periodontal tissues was reduced during treatment, reaching 7.62 ± 1.11 units. The obtained PM values further demonstrated that individuals aged 18–22 exhibited more active microcirculation compared to other age groups, both in the control population and among patients ($p < 0.05$).

The standard deviation in healthy subjects averaged 1.04 ± 0.06 units. Among JAPF patients, this parameter showed a decreasing trend prior to immobilization, with values of 0.89 ± 0.06 units. These reduced values were statistically significant ($p < 0.05$). The standard deviation reflects fluctuations in microvascular perfusion and indicates reduced average modulation across different frequency ranges of capillary blood flow in patients with JAPF.

Table 1

Periodontal microcirculation indicators according to LDF data in healthy individuals and patients with JAPF before immobilization (M±m) (n=81)

Groups	Microcirculation index, units	Standard deviation, units	Coefficient of variation, relative units	Microcirculation efficiency, units
Control group	11.84±1.26	1.04±0.06	6.95±0.41	1.39±0.02

Patients with JAPF	7.62±1.11	0.89±0.06	8.75±0.38	1.13±0.04

The coefficient of variation (Kv) in LDF studies of periodontal complex tissues in the examined groups reflects the general dependence of tissue perfusion on blood flow modulation, and according to our observations, the values of this indicator were highest in patients with JAPF. Vasomotor activity of microvessels in the healthy group showed the following values: 6.95%±0.41 relative units, while in the group of patients with JAPF - 8.75%±0.38 relative units, respectively, by age groups ($p<0.05$).

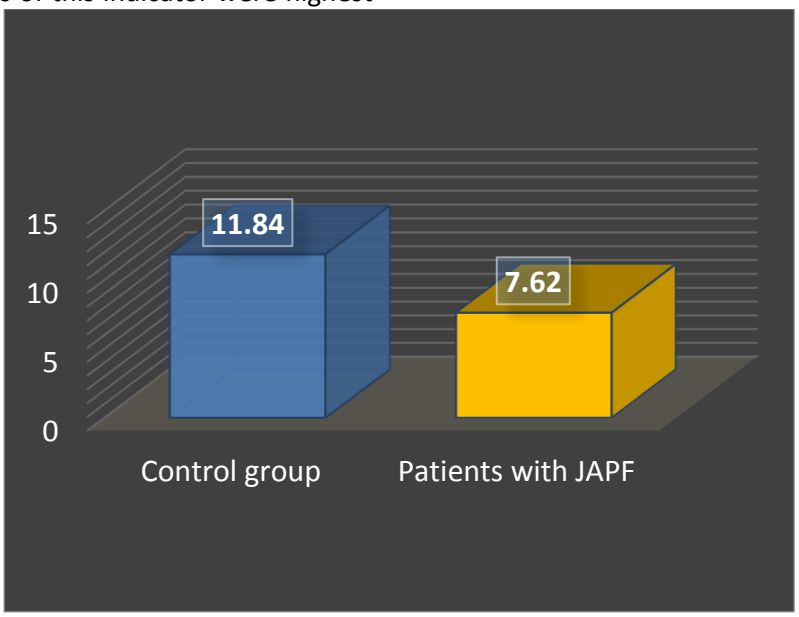

Diagram 1. Periodontal microcirculation indicator according to LDF data in the control group and patients with JAPF before immobilization (M±m) (n=81)

The dynamics of changes in periodontal complex tissue microcirculation indicators according to LDF data during various immobilization methods on the 14th and last day of JAPF treatment in patients of different groups are presented in Diagram 2.

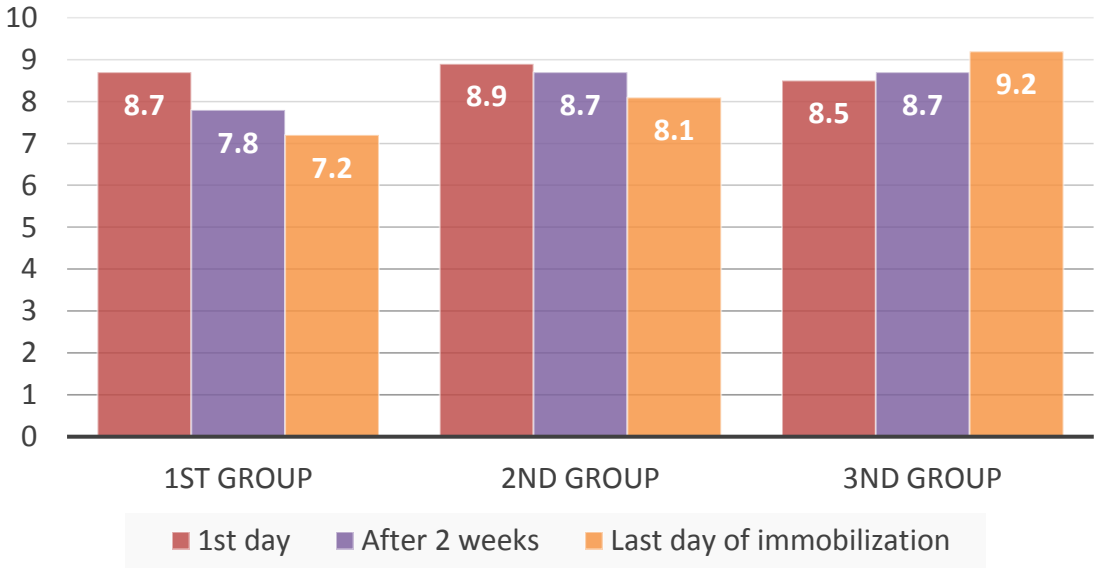

Diagram 2. Dynamics of periodontal microcirculation indicators according to LDF data in patients with JAPF during treatment with various immobilization methods

Analysis of the data obtained using LDF studies in the control group showed the following: PM - 11.84±1.26 arbitrary units. When comparing the PM of periodontal tissues in patients with JAPF, obtained before immobilization, with the parameters obtained from the control group, significant changes were revealed, indicating that in patients with JAPF, the state of microcirculation in periodontal tissues in the fracture area is disrupted, and in patients with JAPF it was 7.62±1.11 arbitrary units. The values obtained during LDF studies indicate more active microcirculation in the periodontal tissues of patients aged 18-22 compared to other age groups of healthy individuals and patients ($p<0.05$). During the study, cases were recorded where microcirculation efficiency indicators in patients with JAPF deteriorated by 1.2 times compared to the control group.

CONCLUSION

Analysis of the obtained data supports recommending an oral hygiene protocol that includes the use of “Medical Herbs” (Splat) mouthwash and CALCIY TRIACTIVE® D3 for patients with JAPF. Implementation of this regimen contributes to improved microcirculation parameters during the immobilization period with smooth dental splints.

Overall, the findings indicate that immobilization techniques that maintain the anatomical and functional integrity of periodontal tissues promote better microcirculatory function. Enhanced microcirculation, in turn, positively influences the quality and rate of fragment consolidation in the management of alveolar process fractures of the upper jaw.

REFERENCES

1. Abdullin I.Sh. et al. A splint for treating fractures of the maxillary alveolar process. - 2006.
2. Afanasyev V.V. Traumatology of the Maxillofacial Region. M.: "GEOTAR-Media" Publishing House, 2010. 256 p.
3. Bernadsky Yu. I. Traumatology and restorative surgery of the craniofacial region / Yu. I. Bernadsky. M.: Medical Literature, 1999. 456 p.
4. Boimuradov Sh.A., Bobamuratova D.T. The state of oral hygiene in patients with jaw fractures and ways to improve it. Annals of the Tashkent Medical Academy, 2016; 1:69-74.
5. Boimuradov Sh.A., Bobamuratova D.T. Condition of the periodontium in patients with jaw fractures. Journal of Dentistry, 2016; 2:75-79.
6. Bomuradov Sh.A. Application of Collapse L material in injuries of the alveolar process of the upper jaw //Stomatology (Moscow). - 2009. - Vol. 6. - P. 5.
7. Kazantseva I.A., Dmitrienko S.V., Rukavishnikova L.I., Fursik T.I., Fursik D.I. Permanent and Milk Tooth Trauma. Teaching-methodical manual. Volgograd, 2001. 24 p.
8. Shomurodov K. E., Musaev S. S., Olimjonov K. J. Influence of immobilization methods on periodontal tissues during treatment of mandibular fractures in children //Journal of Oral Medicine and Craniofacial Research. - 2020. - Vol. 1. - No. 1. - P. 8-11.
9. Zoirov T.E., Bobamuratova D.T., Elnazarov A.T. The state of hygiene and periodontism in the treatment of patients with jaw fractures using the splinting method // Issues of Science and Education. 2019. No. 23 (71). P. 147-154.
10. Rybalko A. S., Orlov A. A., Grigoryan A. S. New approaches in the aesthetic and functional rehabilitation of patients with injuries of the alveolar processes and jaws with complete and incomplete dislocation of teeth //Bulletin of New Medical Technologies. Electronic edition. - 2016. - Vol. 10. - No. 1. - P. 158-163.
11. Timofeev A. A. Fundamentals of maxillofacial surgery: textbook / Timofeev A.A. M.: Med. inform. agency, 2007. 696 p.
12. Andreasen J. O., Lauridsen E. Alveolar process fractures in permanent dentition. Part 1. Etiology and clinical characteristics. A retrospective analysis of 299 cases involving 815 teeth //Dental Traumatology. - 2015. - Vol. 31. - No. 6. - P. 442-447.
13. Lauridsen E., Gerds T., Ove Andreasen J. Alveolar process fractures in the permanent dentition. Part 2. The risk of healing complications in teeth involved in a fracture of the alveolar process //Dental Traumatology. - 2016. - Vol. 32. - No. 2. - P. 128-139.