Treatment outcome of patients with mandibular symphyseal fractures treated with titanium plate and screw fixation

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ABSTRACT

Objective: To describe the clinical and radiographic characteristics of patients with mandibular symphyseal fractures treated with titanium plate and screw fixation at Viet Tiep Hospital in 2023. **Subjects and Methods:** A cross-sectional descriptive study was conducted on patients diagnosed with mandibular symphyseal fractures who visited and underwent surgical treatment with titanium plate and screw fixation at the Department of Oral and Maxillofacial Surgery, Viet Tiep Hospital, from January 2023 to October 2023 due to trauma. Patient records and CT scan films were fully collected. Mandibular fractures were classified based on anatomical location. **Results:** The study found that 90% of patients with mandibular fractures underwent surgery within a week of trauma, with most requiring two titanium plates for fixation (63.3%). Post-operative recovery was rapid, with 93.3% discharged within a week, and complications such as drain use (20%) and tooth extraction (6.7%) were minimal. Maxillomandibular fixation was required for 2-3 weeks in 56.7% of cases, while 10% of patients did not need fixation due to non-displaced fractures. Radiographic evaluations showed excellent outcomes in 83.3% of cases before discharge, with no poor results. At six months post-surgery, anatomical recovery was excellent in 96.7% of patients, with 93.3% achieving optimal functional and aesthetic outcomes. These findings highlight the efficacy and reliability of titanium plate fixation for mandibular fractures. **Conclusion:** Most patients were hospitalized for treatment within one week after surgery (93.3%), with none requiring more than two weeks. The majority underwent surgical fixation using two titanium plates (63.3%). Maxillomandibular Fixation was predominant, with most patients requiring fixation for 2-3 weeks. One week after surgery, 83.3% of patients had good outcomes, with no poor results reported. At six months post-surgery, the proportion of patients with excellent outcomes increased to 93.3%, with no recorded poor results in terms of anatomical alignment, functionality, or aesthetics.

Keywords: *mandibular fracture, titanium plate and screws, Viet Tiep Hospital*.

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INTRODUCTION

Maxillofacial trauma in general, and mandibular fractures (MF) in particular, are becoming increasingly common. Mandibular fractures account for a significant proportion of facial fractures worldwide, approximately 47–50%, with the

rate in Vietnam being around 43% [1]. Among mandibular fractures, symphysis region accounts for the highest proportion. The primary cause of these injuries is traffic accidents, followed by other causes such as occupational accidents, violence, and domestic accidents [1], [2], [3].

Mandibular fractures are becoming increasingly diverse and complex. If not diagnosed and treated promptly and appropriately, they often result in functional disorders and leave severe sequelae, affecting both aesthetics and mastication [2], [3]. Studies on mandibular fractures consistently report fracture rates in different regions, with symphyseal fractures being the most common (Huynh Kim Khang: 39.8% [4]; Nguyen Quoc Duc: 31.8% [5]; Pham Van Lieu: 46.38% [6]; Ly Han Thanh: 41.11% [7]). In Vietnam, titanium plates and screws have been widely applied in the treatment of mandibular fractures. However, there has been limited research summarizing, analyzing, and evaluating the effectiveness of titanium plate and screw fixation for mandibular symphyseal fractures. At Viet Tiep Hospital, no prior studies have been conducted on this topic. Thus, we carried out the study: Treatment outcome of patients with mandibular symphyseal fractures with titanium plate and screw fixation.

MATERIALS AND METHODS

Materials

The study included patients diagnosed with mandibular symphyseal fractures who underwent surgical treatment with titanium plate and screw fixation at the Department of Oral and Maxillofacial Surgery, Viet Tiep Hospital, due to trauma from January 2023 to October 2023.

Inclusion Criteria: Patients aged 18 years and older, with an indication for surgical fixation and who underwent titanium plate and screw fixation.

Exclusion Criteria:

- Patients with mandibular symphyseal fractures caused by pathological conditions.
- Patients with severe internal diseases that could delay surgery (e.g., cardiovascular disease, diabetes, asthma, tuberculosis).
- Patients with psychiatric disorders.
- Patients with incomplete or missing medical records.

Study Methods

Study Design: A cross-sectional descriptive study.

Sampling Method: Convenience sampling was applied. A total of 30 patients were included in the study.

Data Processing: Data were cleaned and entered into Excel based on the study variables. Statistical analysis was performed using SPSS software. Statistical results were presented in frequency and percentage tables.

Ethical Considerations: All information collected from medical records was solely used for research purposes.

RESULTS

Short-term postoperative

Table 3.1. *Distribution of Subjects by Time from Injury to Surgery*

Time	Count (n)	Ratio (%)	P
< 7 days	27	90,0	
≥ 7 days	3	10,0	0,001
Total	**30**	**100**	

Observation: Of the 30 patients, 90% underwent surgery within 7 days of trauma, while only 10% delayed surgery beyond a week. Timely intervention correlated significantly with better recovery outcomes ($p < 0.05$).

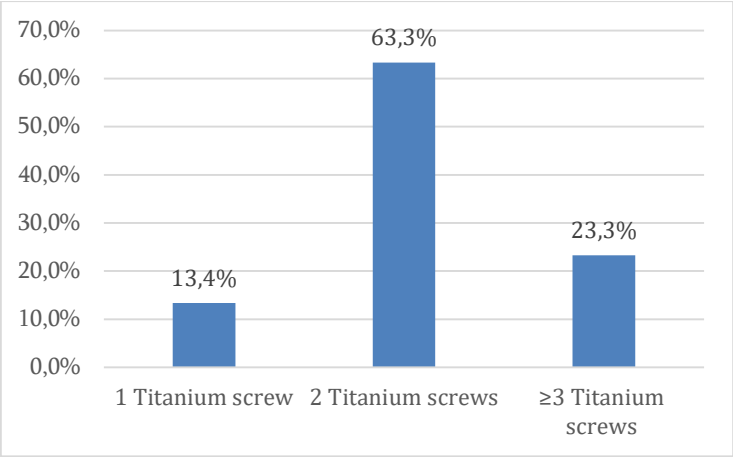

Chart 3.1. *Distribution by the Number of Titanium Screws Used in Bone Fixation*

Observation: Titanium plates were predominantly used for fixation. A total of 63.3% of patients required two plates, 23.3% needed three plates, and 13.4% utilized one plate. The choice depended on fracture complexity and anatomical considerations.

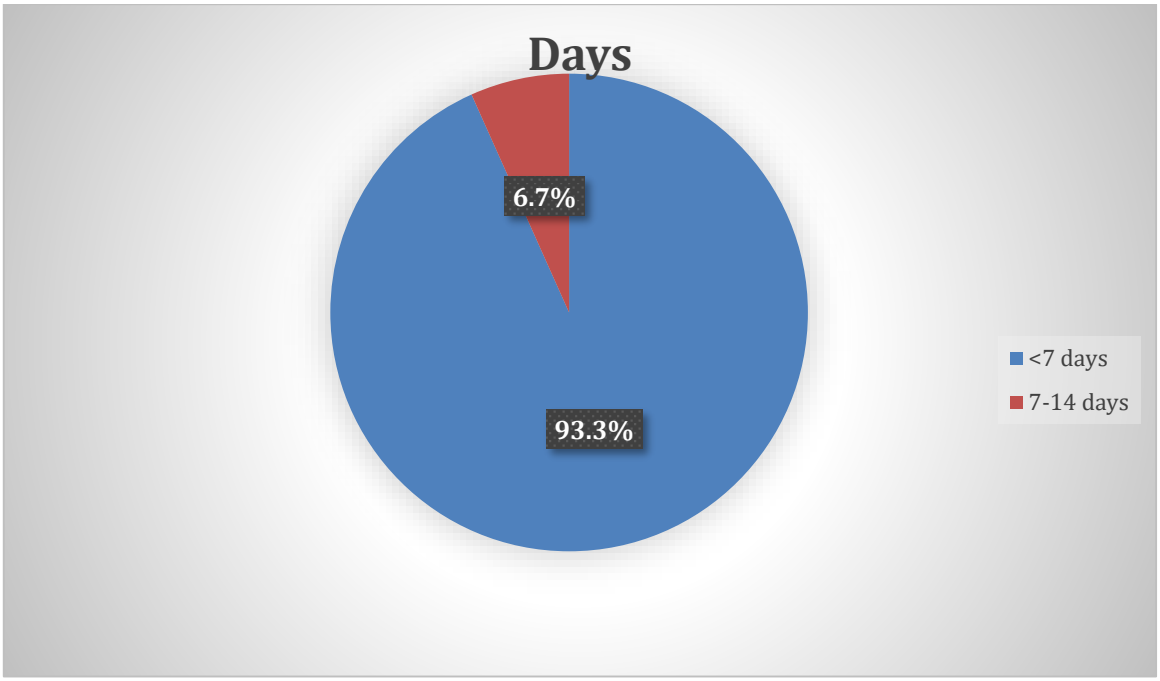

Chart 3.2. *Distribution of Patients by Length of Hospital Stay After Surgery*

Observation: Post-operative hospitalization data revealed that 93.3% of patients were discharged within one week. Only 6.7% remained hospitalized for 1-2 weeks, with no cases exceeding two weeks. This outcome underscores the efficiency of titanium plate fixation in facilitating swift recovery.

Table 3.2. *Distribution of Patients by Characteristics of Drain Use and Tooth Extraction After Surgery, Categorized by Gender*

	Male		**Female**		**Total**	
Count	**n**	**%**	**n**	**%**	**n**	**%**
Drains	4	16,7	2	33,3	6	20,0
No surgical drains	20	83,3	4	66,7	24	80,0
Teeth extraction	1	4,2	1	16,7	2	6,7
No teeth extraction	23	95,8	5	83,3	28	93,3
Total	**24**	**100**	**6**	**100**	**30**	**100**

Observation:

- Surgical drain was required in 20% of patients, with a higher incidence among females (33.3%) compared to males (16.7%).
- Tooth extraction was necessary in 6.7% of cases due to trauma-related dental issues.

Table 3.3 *Distribution of Patients by Duration of Maxillomandibular Fixation After Surgery*

Maxillomandibular Fixation	**Count (n)**	**Ratio (%)**
No fixation	3	10,0
2 - 3 weeks	16	56,7
4 weeks	9	30,0
6 weeks	1	3,3
Total	30	100

Observation: The most common maxillomandibular fixation period was 2-3 weeks (56.7%). Longer fixation durations of four weeks and six weeks were required in 30% and 3.3% of patients, respectively. A minority (10%) did not require fixation due to simple, non-displaced fractures.

Table 3.4. *Evaluation of X-Ray Results Before Patient Discharge*

X-ray result	**Count (n)**	**Ratio (%)**	**p**
Excellent	25	83,3	0,013
Satisfactory	5	16,7	
Total	**30**	**100**	

Observation: Pre-discharge radiographic evaluations demonstrated excellent results in 83.3% of patients, satisfactory results in 16.7%, and no poor outcomes. This highlights the precision and effectiveness of titanium fixation in restoring mandibular alignment.

Six-Month Follow-Up

Table 3.5. *Evaluation of Anatomical Outcomes After 6-Month Follow-Up*

Anatomical outcome	Count (n)	Ratio (%)	p
Excellent	29	96,7	
Satisfactory	1	3,3	0,001
Total	30	100	

Observation: Excellent in 96.7% of cases, with no poor outcomes recorded ($p < 0.05$).

Table 3.6. *Evaluation of Function Outcomes After 6-Month Follow-Up*

Function	Count (n)	Ratio (%)	p
Excellent	28	93,3	
Satisfactory	2	6,7	0,001
Total	30	100	

Observation: Rated excellent in 93.3% of patients, satisfactory in 6.7%, and no cases of poor functionality.

Table 3.7. *Evaluation of Aesthetic Outcomes After 6-Month Follow-Up*

Aesthetic Outcomes	Count (n)	Ratio (%)	p
Excellent	28	93,3	
Satisfactory	2	6,7	0,001
Total	30	100	

Observation: Similarly, 93.3% achieved excellent cosmetic recovery, with 6.7% rated satisfactory.

DISCUSSIONS

Short term postoperative Outcomes

In the 19th and early 20th centuries, bone fixation surgery was not widely supported due to complications such as osteomyelitis, ankylosis, and malocclusion. However, by the mid-20th century, advancements in antibiotics reduced infection risks, reviving the role of surgery in fracture treatment. Research into the biocompatibility of fixation materials further improved surgical outcomes. Alongside steel wires, titanium plates were developed and implemented in surgeries. By the 1970s, the use of plates and screws became more refined. Innovations such as miniplates, microplates, compression plates, lag screws, locking screws, and absorbable plates contributed to optimizing surgical results. With these systems, intraoral incisions became a standard approach, avoiding external scars,

minimizing the risk of facial nerve damage, and reducing maxillomandibular fixation times. However, the high cost of titanium plates remains a drawback, particularly for patients with limited financial resources. Improper use of plates and screws may also lead to severe consequences.

The time between trauma and surgery, known as the preoperative period, is critical. In the initial days following trauma, facial swelling often prevents immediate surgical intervention. Swelling can obscure fracture assessment and complicated surgical procedures, increasing unnecessary bleeding and infection risks. In our study, 90% of patients underwent surgery within a week of trauma, compared to 10% with preoperative times exceeding one week—a statistically significant difference ($p < 0.05$). The ideal surgical window is within one week, as swelling subsides, brain injuries stabilize, and patients have time to recover physically for surgery.

Only 3.3% of patients underwent surgery more than 14 days after trauma, primarily due to associated conditions such as head injuries, femoral fractures, or systemic issues requiring prioritized care. In some cases, delayed referrals from remote areas resulted in healed fractures requiring re-breakage during surgery. Patients with preoperative periods exceeding three weeks were excluded from our study.

Early intervention generally yields better outcomes, as delayed treatment can lead to fibrous tissue formation between fracture ends, resulting in pseudoarthrosis, complicated realignment and reducing bone healing stability. Bones heal robustly after 3-4 weeks of treatment. Previous studies by authors like Truong Manh Dung and Nguyen Quoc Trung found the highest surgical rates within two weeks post-trauma, like our findings, though our rates were slightly higher, likely due to advancements in technology and healthcare accessibility.

Titanium Plate Fixation Method

Titanium plate fixation offers several advantages over older steel wire methods, including stronger three-dimensional stabilization, shorter maxillomandibular fixation periods (2-4 weeks), reduced risk of vascular or nerve damage, and the ability to use intraoral incisions, which avoid external scarring and preserve aesthetics. Our study focused on treating mandibular symphyseal fractures using titanium plates. The optimal approach is placing plates at every fracture site. Using three plates yields better outcomes for complex fractures involving the symphysis and related areas. However, due to cost constraints, most patients in our study (primarily laborers and students) could only afford two plates, used in 63.3% of cases. Three plates were used in 23.3%, and one plate in 13.4%, aligning with other studies like Nguyen Thi Hong Minh's research in Vietnam.

The postoperative period, defined as the time from surgery to discharge, was within one week for 93.3% of patients, with no cases exceeding two weeks. These results align with those of Nguyen Xuan Thuc (2013), reflecting advancements in surgical techniques and modern equipment, which reduce complications and promote faster recovery.

Surgical drain was required in 20% of cases, while 6.7% underwent tooth extraction. maxillomandibular fixation was needed for 90% of patients, with durations of 2-3 weeks (56.7%) being most common, followed by 4 weeks (30%) and 6 weeks (3.3%). Only 10% of patients required no fixation due to simple, non-displaced fractures. These findings highlight the

advantages of titanium plate fixation in reducing jaw immobilization times.

Before discharge, 83.3% of patients had excellent radiographic outcomes, 16.7% had satisfactory results, and none had poor results ($p < 0.05$). Surgical wound evaluations showed 90% with excellent healing and 10% with satisfactory outcomes. Overall, 83.3% of patients achieved excellent outcomes at discharge, 16.7% satisfactory, and nonpoor, consistent with other studies by Tran Quoc Khanh and Nguyen Xuan Thuc.

Six-Month Follow-Up Results

Anatomical Outcomes: Radiographic assessments showed 96.7% excellent and 3.3% satisfactory results, with no poor outcomes. These results align with studies by Tran Quoc Khanh (2013) and Huynh Kim Khang (2021), confirming the high efficacy of titanium plate fixation.

Functional Outcomes: At six months, 93.3% of patients had excellent function, and 6.7% were satisfactory. Poor outcomes were absent, though non-compliance with postoperative instructions contributed to reduced functionality in some cases.

Aesthetic Outcomes: Cosmetic evaluations based on facial harmony and scar quality found 93.3% excellent and 6.7% satisfactory outcomes. Factors like keloid scarring contributed to lower scores in a small number of cases.

CONCLUSIONS

Most patients were hospitalized for post-operative treatment within one week (93.3%), and no patients required treatment beyond two weeks. Most patients (63.3%) underwent bone fixation using two titanium plates during surgery. Maxillomandibular fixation after surgery was predominant, with most patients having a fixation period of 2-3 weeks. Most patients (83.3%) achieved good treatment outcomes, with no poor results recorded at one-week post-surgery and excellent outcomes were observed in 93.3% of patients, with no poor results reported in terms of anatomy, functionality, or aesthetics at 6-month follow-up.

Conflicts of interest statement

The authors report no conflicts of interest in this case report.

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