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Original Research Article

Evaluation of Clinical Efficacy of Lag Screw Osteosynthesis in Anterior Mandibular Fracture Management

Karuna Jindwani[1], Vilas Nevaskar[2], Deepak Agrawal[3]

[1]Professor, Department of Dentistry, SSMC, Rewa, MP.
[2]Professor and Head, Department of Oral and Maxillofacial Surgery, Government College of Dentistry, Indore, M.P.
[3]Professor, Department of Oral and Maxillofacial Surgery, Government College of Dentistry, Indore, M.P.

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Corresponding Author: Dr. Karuna Jindwani
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Abstract:

Aim: To assess the clinical efficacy and complication profile of lag screw osteosynthesis in anterior mandibular fracture management.

Materials and Methods: A total of 65 skeletally mature patients with anterior mandibular fractures were treated using titanium lag screw osteosynthesis. Patients older than 13 years with isolated or associated fractures were included, while those with extensively comminuted fractures were excluded. Preoperative clinical and radiographic evaluations were performed. Manual reduction was achieved, followed by maxillomandibular fixation (MMF) using Ehrich-type arch bars under local anesthesia. All patients received a seven-day course of antibiotics. Most surgeries (94%) were performed via an intraoral anterior degloving approach under conscious sedation (96%), while a few required extraoral access or general anesthesia. Bone reduction was achieved using clamps and Kocher's forceps, and lag screws were inserted with careful drilling to avoid lingual cortex perforation. Countersinking ensured optimal interfragmentary compression and stable fixation. In isolated anterior fractures, MMF was released immediately, while additional management was applied for multiple fractures. Postoperative follow-up up to six months included clinical and radiographic assessments to monitor fracture stability, occlusion, bone healing, and complications.

Results: Most patients were male (70.8%), aged 21–30 years (33.8%). Isolated anterior fractures accounted for 73.8% of cases. Road traffic accidents were the leading cause (56.9%), followed by falls (27.7%) and assaults (15.4%). Two lag screws were most commonly used (81.5%) with an average length of 20.8 mm and a mean operating time of 62 minutes. Intraoperative complications were minimal, including lingual cortex perforation (3.1%) and screw loosening (4.6%). Postoperative complications included minor infection (7.7%), transient mental nerve paresthesia (6.2%), wound dehiscence (3.1%), and malocclusion (3.1%), yielding a total complication rate of 18.5%. Functional outcomes were favorable: pain subsided within a week, mouth opening improved significantly from 12.5 mm preoperatively to 33.2 mm at one month, occlusion was satisfactory in 95.4% of patients, radiographic bone healing was complete by three months, and patients returned to normal function within an average of 18 days.

Conclusion: Lag screw osteosynthesis is a reliable and effective method for stabilizing anterior mandibular fractures with predictable functional and radiographic outcomes.

Keywords: Mandibular, Screw, Fixation.

Introduction

Lag screw osteosynthesis has become a significant technique for managing anterior mandibular fractures, offering an alternative to traditional plate fixation. Its minimally invasive nature ensures rapid recovery, minimal complications, and reliable functional outcomes, placing it at the forefront of contemporary maxillofacial surgery practices. This technique utilizes the mechanical principle of interfragmentary compression, bringing fracture segments tightly together to optimize conditions for bone healing.[1–3]

Clinical and radiographic evidence supports the efficacy of lag screw fixation for anterior mandibular fractures. Studies have shown high rates of primary stability, rapid bone healing, and satisfactory occlusal restoration. Compared to miniplate fixation, lag screws are associated with shorter operative times and improved biting

efficiency, allowing earlier functional rehabilitation and reduced reliance on postoperative intermaxillary fixation. Radiographic evaluations consistently demonstrate effective bone union and low rates of postoperative infection, highlighting the safety and reliability of this technique.[4,5]

The complication profile of lag screw osteosynthesis is generally favorable, with low incidences of infection, malunion, or hardware-related issues. Reported adverse events are usually attributed to technical errors rather than intrinsic limitations of the method. Large case series report isolated instances of hardware failure and drill breakage, which are uncommon and manageable without long-term consequences. Nerve injuries and postoperative edema are rare and resolve rapidly with standard care.[6,7]

Lag screw fixation is cost-effective, simple, and efficient, making it particularly beneficial in resource-limited settings. The procedure requires minimal specialized equipment, reduces hospital stay, and consistently achieves excellent functional and aesthetic outcomes. (Fig 1a and Fig 1b) Increasing evidence supports its reliability in anterior mandibular fracture management, and it is increasingly advocated as a standard of care in appropriately selected patients.[8,9]

Materials and Methods

A total of 65 skeletally mature patients with anterior mandibular fractures were treated using titanium lag screw osteosynthesis. Inclusion criteria were patients older than 13 years with isolated or associated mandibular fractures; patients with extensively comminuted fractures were excluded.

All patients underwent thorough clinical and radiographic evaluation before surgery. (Fig 2a and Fig 2b) Manual reduction was performed, followed by maxillomandibular fixation (MMF) using Erich-type arch bars under local anesthesia. All patients received a seven-day course of antibiotics. Pre- and postoperative parameters—including mouth opening, occlusion, fracture mobility, infection, and sensory disturbances—were recorded to assess healing and complications.

Most cases (93.8%) were managed via an intraoral anterior degloving approach, (Fig 3) while four patients (6.2%) required a minor extraoral incision. Conscious sedation was used in 96.9% of patients, and general anesthesia in the remaining 3.1%. Bone reduction was achieved with clamps and Kocher's forceps, and lag screws were inserted following careful drilling to avoid lingual cortex perforation. (Fig 4) Countersinking ensured optimal interfragmentary compression and stable fixation before wound closure. In isolated anterior fractures, MMF was released immediately after fixation; patients with multiple fractures received additional treatment as required.

Postoperative follow-up was conducted at regular intervals up to six months, with clinical and radiographic evaluations to monitor screw stability and bone healing. (Fig 5) Outcomes assessed included fracture stabilization, occlusion, mouth opening, pain, functional recovery, and complications.

Results

Table 1: Patient Demographics and Fracture Characteristics

Parameter	Category	Number of Patients (n=65)	Percentage (%)
Age group (years)	13–20	10	15.4
	21–30	22	33.8
	31–40	18	27.7
	>40	15	23.1
Gender	Male	46	70.8
	Female	19	29.2
Type of fracture	Isolated anterior	48	73.8
	Associated with other mandibular fractures	17	26.2
Etiology	Road traffic accident	37	56.9
	Fall	18	27.7
	Assault	10	15.4

Table 2: Surgical Approach, Anesthesia, and Fixation

Parameter	Category	Number of Patients	Percentage (%)
Surgical approach	Intraoral (anterior degloving)	61	93.8
	Extraoral	4	6.2
Type of anesthesia	Conscious sedation	63	96.9
	General anesthesia	2	3.1
Number of lag screws used	Single	8	12.3
	Two	53	81.5
	Three	4	6.2
Average screw length (mm)	—	20.8 ± 3.1	—
Average operating time (minutes)	—	62 ± 14	—

Table 3: Intraoperative and Postoperative Complications

Complication Type	Number of Patients (n=65)	Number of Patients (n=65)	Number of Patients (n=65)
Intraoperative			
Lingual cortex perforation (Fig 6)	2	3.1	Managed intraoperatively
Screw loosening during placement	3	4.6	Re-tightened successfully
Postoperative			
Minor infection at incision site	5	7.7	Resolved with antibiotics
Wound dehiscence	2	3.1	Healed secondarily
Transient paresthesia (mental nerve)	4	6.2	Recovered within 4–6 weeks
Malocclusion	2	3.1	Corrected during follow-up
Total complication rate	—	**18.5%**	—

Table 4: Postoperative Evaluation and Functional Outcomes

Parameter	Evaluation Period	Mean Value / Finding	Outcome Summary
Pain (VAS score)	24 hours	6.8 ± 1.2	
Mouth opening (mm)	Preoperative	12.5 ± 3.4	—
	1 month	33.2 ± 4.8	Significant improvement
Occlusion	Immediate postoperative	62/65 patients	62/65 patients
Fracture mobility	1 week	None in 63 patients	Stable fixation
Infection incidence	1–2 weeks	5 cases	Mild, controlled with antibiotics
Bone healing (radiographic)	3 months	100% cases	Complete union by 12 weeks
Return to normal function	Mean duration	18 ± 3 days	Early rehabilitation achieved

Figure 1a: Various Lengths of 2.5mm Titanium Lag Screws

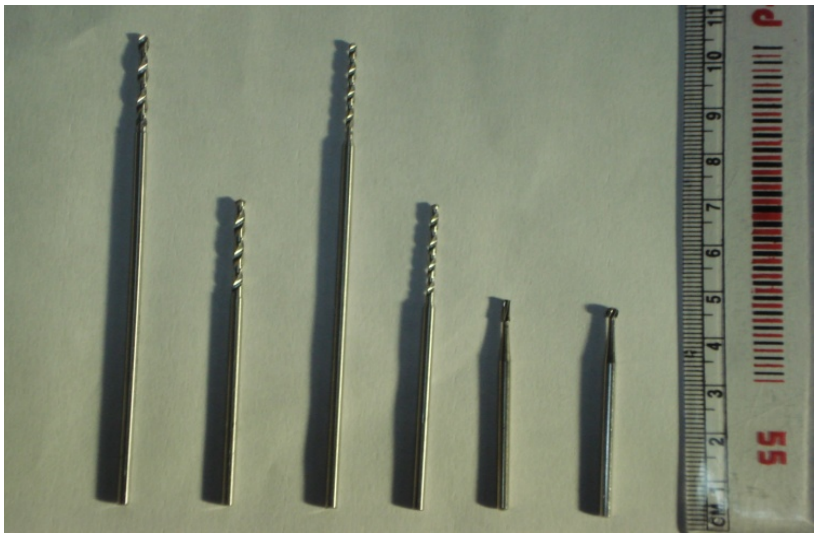

Figure 1b: Drill Bits and Burs

Figure 2a: Preoperative Clinical View

Figure 2b: Preoperative Panoramic View

Figure 3: Degloving and Reduction

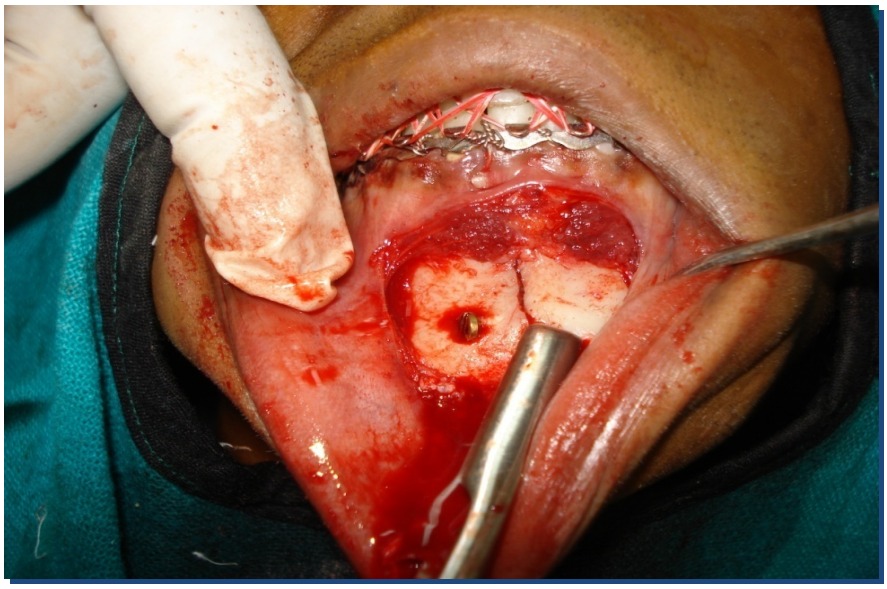

Figure 4: Placement of Lag Screw

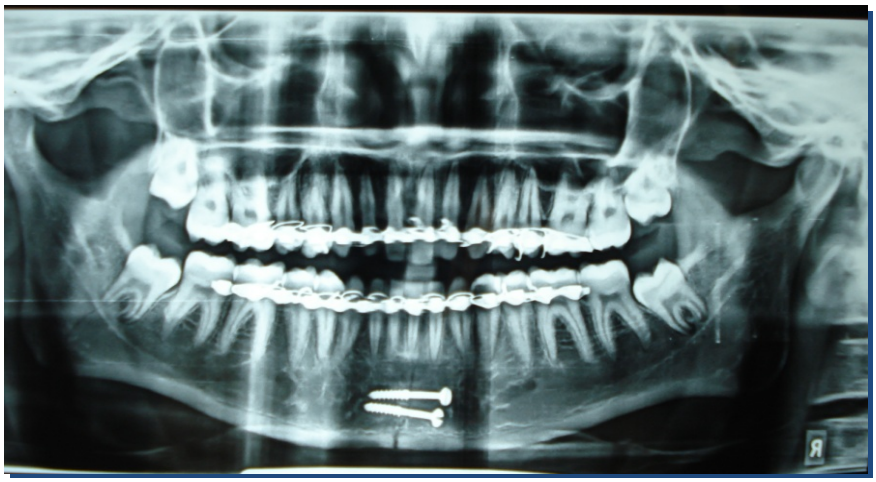

Figure 5: Post Operative Panoramic View

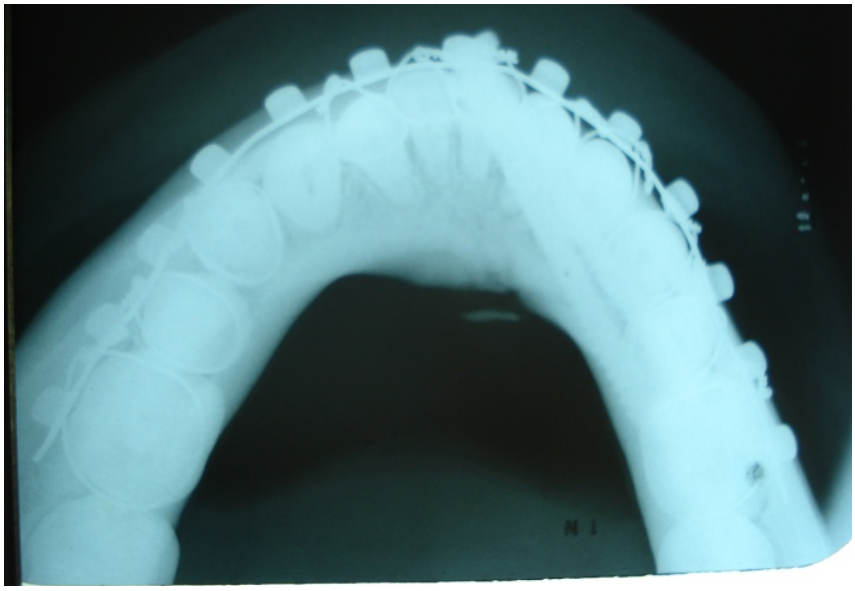

Figure 6: Post Operative Mandibular Anterior Occlusal View

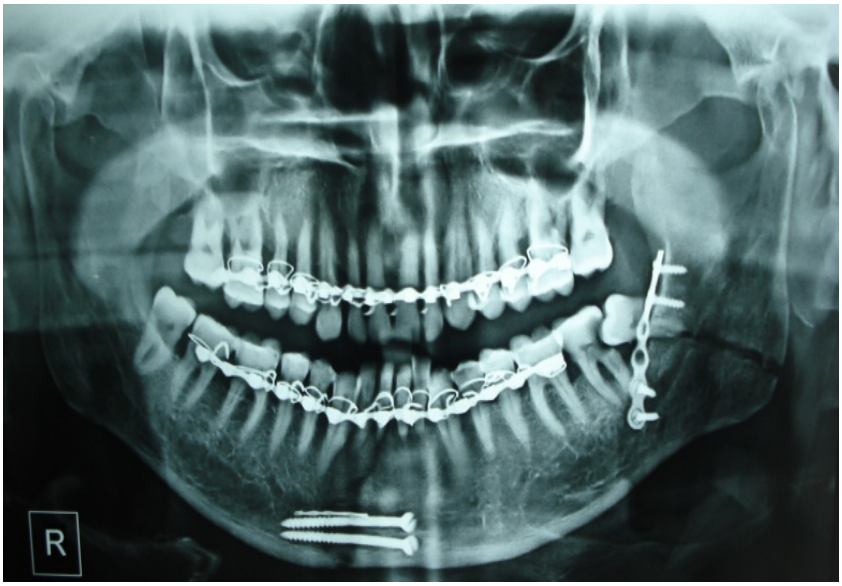

Figure 7: Surgical Misadventure

Discussion

Anterior mandibular fractures are common and pose challenges due to complex anatomy, muscular attachments, and functional demands. Achieving stable fixation with early restoration of form and function is critical. Lag screw osteosynthesis provides rigid internal fixation through interfragmentary compression and has become a reliable, minimally invasive technique. Compared to conventional miniplate fixation, it offers reduced hardware bulk, superior biomechanical stability, and facilitates early functional rehabilitation.[10-12]

In this study, most patients were males (70.8%) aged 21–30 years (33.8%), with isolated anterior fractures in 73.8%. Road traffic accidents were the leading cause (56.9%). Surgeries were predominantly performed via an intraoral anterior degloving approach (93.8%) (Fig 3) under conscious sedation (96.9%). Two lag screws (Fig 5) were most commonly used (81.5%), with an average screw length of 20.8 mm and mean operating time of 62 minutes. Intraoperative complications were minimal: lingual cortex perforation (3.1%) (Fig 6) and screw loosening (4.6%). Postoperative complications included minor infection (7.7%), transient mental nerve paresthesia (6.2%), wound dehiscence (3.1%), and malocclusion (3.1%), resulting in a total complication rate of 18.5%. Surgical misadventure with a retained broken drill bit was encountered in a case. (Fig 7)

Functional outcomes were favorable: pain subsided within a week, mouth opening improved significantly, occlusion was satisfactory in 95.4% of patients, radiographic bone healing was complete by three months, and normal function resumed within an average of 18 days.

These findings align with prior studies. Tiwana et al. reported only one fixation failure and one nonunion in 102 patients, highlighting reliability and cost-effectiveness. Chowdhury et al. and Betharia et al. similarly observed rapid recovery, early return to function, and excellent bone healing in their patient cohorts.[13–15]

Overall, lag screw osteosynthesis provides stable fixation, promotes early functional recovery, and minimizes complications when proper surgical technique and patient selection are applied. Its advantages—rigidity, reduced hardware bulk, cost-effectiveness, and facilitation of early rehabilitation—make it a valuable technique in modern maxillofacial trauma care. Careful surgical planning, precise technique, and diligent postoperative monitoring remain essential to maximize safety and efficacy.

Conclusion

Lag screw osteosynthesis is a reliable and effective method for stabilizing anterior mandibular fractures with predictable functional and radiographic outcomes.

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