Treatment of fracture mandible with open reduction and internal fixation under local anesthesia

By Marwa A Attyia

WORD COUNT	5695	TIME SUBMITTED	20-MAR-2024 04:03PM
		PAPER ID	107706842

Treatment of fracture mandible with open reduction and internal fixation under local anesthesia

Marwa A Attyia[1], Mudher MB Alsunbuli[2]

[1]Oral and Maxillofacial Surgery Unit, Al-Yarmouk Teaching Hospital, Baghdad, Iraq
https://orcid.org/(0000-0003-0444-0858

[2]College of dentistry, Dean of the college, Al-Bayan University, Baghdad , Iraq
https://orcid.org/0000-0001-7283-2197

Abstract

Background: Treatment of a mandible fracture with open reduction and internal fixation (ORIF) under local anesthesia is generally thought to be a more difficult procedure than performing the procedure under general anesthesia.

One of the most difficult aspects of performing ORIF under local anesthesia is maintaining adequate pain control throughout the procedure. During the procedure, the patient will be awake and able to communicate, making it difficult to manage pain and discomfort. In some cases, such as patients with medical conditions that make general anesthesia risky, ORIF under local anesthesia may be a viable option. Furthermore, ORIF under local anesthesia may be an option for patients who prefer to avoid general anesthesia or stay awake during the procedure.

Aim of the Study: Is to evaluate the effectiveness and safety of treating mandible fractures with an open reduction and internal fixation (ORIF) using only local anesthesia.

Methodology: This is a prospective clinical study conducted at the Department of Oral and Maxillofacial Surgery, Al-Yarmouk Teaching Hospital in Baghdad, Iraq from January to November 2022. The study enrolled 19 patients with isolated mandibular fractures who met the inclusion criteria and did not meet the exclusion criteria. The objective of the study was to evaluate the feasibility of operating on patients with mandibular fractures under local anesthesia using intraoral and extraoral surgical approaches, and to assess postoperative stability, functional restoration, and complications.

Conclusion: Based on our findings, no statistically significant differences in preoperative parameters exist between intraoral and extraoral approaches for treating mandibular fractures. However, when planning treatment, the cause of the injury, as well as the type and location of the fracture, should be taken into account. ORIF under local anesthesia can be an effective and safe treatment for mandible fractures, but larger sample sizes are needed to confirm these findings. Furthermore, while the surgical approach may have an effect on certain preoperative parameters and the types of fractures treated, it may not always result in significant differences in postoperative outcomes such as malocclusion, maximal mouth opening, and arch bar placement duration. In general, an individualized approach to mandibular fracture management may be required to obtain the best possible outcome for the patient.

Keywords: Fracture Mandible; Open Reduction; Internal Fixation; Local Anesthesia.

Introduction

The mandible is a special bone among the facial bones of the human body because of its prominent position and movement during chewing, speaking and swallowing. It is of decisive aesthetic

importance and jaw occlusion. [Pickrell, et al., 2017] A mandibular fracture is a traumatic break in the continuity of the mandible. Mandibular fractures occur worldwide and account for approximately 36% to 59% of all maxillofacial fractures. [Lee, 2017]

Mandibular fractures are common and account for a significant proportion of maxillofacial injuries. The majority of mandibular fractures seen in adult individuals may be attributed to incidents of interpersonal aggression, a phenomenon that exhibits a higher prevalence among males within the age range of 18 to 24 years. In a study of 13,142 patients, males had a 4-fold higher incidence of mandibular fractures, nearly half of which occurred as a result of physical abuse. Women, on the other hand, are more likely to suffer mandibular fractures from traffic accidents and falls. [Odom and Snyder-Warwick, 2016]

Fractures of the mandible are twice as common as fractures of any other facial bone except the nose. [Oruç, et al., 2016]

The primary objectives of mandibular fracture therapy include the restoration of appropriate dental occlusion, the attainment of stable temporomandibular joint (TMJ) mobility, and the reduction of any displaced fractures. Mandibular fractures can be treated using a variety of techniques, including open reduction and internal fixation, closed reduction. [Hsieh, el al., 2019]

The goal of open reduction and internal fixation (ORIF) is to align the broken bone fragments in their correct positions and secure them with hardware such as plates, screws or pins. [Savvidou, et al., 2018]

The procedure is performed while the patient is sedated, and an incision is made at the fracture site to access the bone fragments. The surgeon then gently moves the pieces into position before securing them with hardware. sutures or staples are used to close the incision. [Smith, et al., 2016]

ORIF is typically used for fractures that are difficult to reduce or align with closed reduction techniques, or when the bone fragments are significantly displaced or angled. [Bansal, et al., 2021]

The benefits of ORIF include improved bone fragment alignment and a more stable fixation, which can result in a faster recovery and better long-term results. It is important to note that ORIF may not be appropriate for all patients, and the treatment option will be determined by the type and location of the fracture, the patient's age and overall health, as well as the surgeon's experience and preference. [Lindsay, et al., 2016]

This time of immobility by close reduction is accompanied by a variety of challenges, including airway complications, inadequate nutrition, weight loss, suboptimal oral hygiene, difficulties in phonation, sleep disturbances, social inconveniences, patient pain, job productivity loss, and challenges in recovering normal jaw function. The user's text is too short to rewrite academically. [van Riet and Morrey, 2017]

In cases with a straightforward fracture that is amenable to both modalities, open reduction and internal fixation (ORIF) therapy is often regarded as preferable than closed treatment. Patients who undergo open reduction and internal fixation (ORIF) surgery get advantages from prompt or early postoperative joint mobility, as well as the opportunity to thoroughly clean all areas of their mouth after the procedure. Additionally, they have been seen to resume their professional duties and regular daily activities at an earlier stage. [White, et al., 2016]

Local anesthesia is a type of anesthesia in which a specific area of the body is numbed while the patient remains awake. This can be accomplished by directly injecting a local anesthetic, such as lidocaine, into the area to be treated. This type of anesthesia is commonly used for dental procedures, minor skin surgeries, and some fracture repairs. [Malamed, 2019]

The ability to communicate with the patient during the procedure, maintain airway, spontaneous breathing, and the patient's ability to follow commands are all advantages of local anesthesia. It also has fewer side effects and complications than general anesthesia, and patients can resume normal activities sooner. [Lirk, et al., 2018]

It is important to note, however, that local anesthesia may not be appropriate for all patients or procedures. It may not provide adequate pain relief for more complex or invasive procedures, and the patient may still feel discomfort. Furthermore, the patient may be unable to tolerate the procedure or may have a medical condition that makes local anesthesia dangerous. [Zhan, et al., 2016] Local anesthesia, which numbs the area around the fracture while allowing the patient to remain awake, is one option for providing anesthesia during these procedures. [El-Boghdadly, et al., 2018]

The use of local anesthetic may be considered the preferred anesthetic approach to mitigate the potential risks and expedite the recuperation process associated with general anesthesia. This is especially relevant for older individuals who present with notable medical comorbidities. [Sweta, et al., 2019]

Local anesthesia has been shown in studies to be a safe and effective treatment option for mandibular fractures. One study published in the Journal of Oral and Maxillofacial Surgery in 2016 discovered that patients treated for mandibular fractures under local anesthesia had comparable outcomes to those treated under general anesthesia, with no significant differences in pain, swelling, or complications. [El-Anwar and Hegab, 2016]

Another study published in the Journal of Cranio-Maxillofacial Surgery discovered that patients who underwent local anesthesia for mandibular fracture treatment experienced less postoperative nausea and vomiting, faster recovery times, and lower costs than those who underwent general anesthesia. [Tsamis, et al., 2018]

A randomized controlled experiment, which was published in the Journal of Oral and Maxillofacial Surgery, revealed that there were no statistically significant differences seen in pain levels and swelling, or complications between patients who received local anesthesia for mandibular fractures and those who received general anesthesia. [Christensen, et al., 2017]

Local anesthesia can be a safe and effective alternative to general anesthesia for treating mandibular fractures, with similar outcomes and potential benefits such as lower costs and faster recovery times. Nevertheless, it is crucial to acknowledge that the selection of anesthesia is contingent upon several factors including the nature of the surgical operation, the patient's medical background and personal preferences, as well as the surgeon's professional judgment. [Demirkol, et al., 2016]

The Study Objectives: The aim of the study is to evaluate the effectiveness and safety of treating mandible fractures with an open reduction and internal fixation (ORIF) using only local anesthesia.

Methodology

Population:

Study design:

Nineteen patients were enrolled in this prospective clinical study, who had isolated mandibular fractures attending to the Department of Oral and Maxillofacial Surgery, Al-Yarmouk Teaching Hospital (Baghdad, Iraq) from January to November, 2022.

The objectives of this study were to evaluate the viability of performing surgeries on patients with mandibular fractures using local anesthesia. This involved utilizing both intraoral and extraoral surgical approaches to achieve optimal surgical site visibility and successful internal fixation while minimizing patient discomfort. Additionally, the study aimed to assess the postoperative stability and functional restoration and identify and analyze any complications that arose during the procedures.

The dependent variables were as follows: 1) The duration of the procedure was assessed. 2) Intraoperative pain was evaluated using a visual analogue scale. 3) Fracture reduction was quantified by determining the average fracture gap before and after the operation. 4) The presence of malocclusion was examined both before and after the procedure. 5) Deviation during mouth opening was assessed. 6) The maximum extent of mouth opening was measured.

The inclusion criteria are Eligible individuals for this study include patients who have sustained isolated mandibular fractures that are two weeks old, regardless of whether they have a single fracture or multiple fractures. Furthermore, these patients must have criteria for open reduction and internal fixation (ORIF). The exclusion criteria include individuals who need open reduction and internal fixation for condylar fractures, fractures that have exceeded 2 weeks, fractures that have healed abnormally, and patients who decline to provide permission for the surgery.
Ethical Considerations: Approval was obtained from the ethical committee at Al-Yarmouk Teaching Hospital before starting the research.

Procedures

Preoperative Preparation:

To mitigate the impact of the aforementioned exclusion criteria, a comprehensive assessment of patients' clinical and dental history was conducted at the first appointment. Every participant presented a comprehensive account of their traumatic experience, which included details such as the precise day and time of the incident, the specific direction from which the force was applied, and any accompanying conditions such as bleeding or instances of loss of consciousness.
The trauma team conducted a comprehensive examination known as a trauma survey clearance to assess the presence of soft tissue lacerations, edema, ecchymosis, mandibular contour deformities, facial asymmetry, and any potential injuries to the facial bones. The study included an assessment of the neurosensory and motor function of the affected region, together with a comprehensive examination of the dentition and mandibular movements. This examination aimed to establish the extent of occlusal discrepancy, as well as the maximum interincisal opening and any midline shift seen during opening and closing motions. Digital panoramic radiographs were acquired as part of the initial survey. The patients in the study got multi-slice computed tomography (CT) scans to quantify the degree of displacement. These measurements were then compared with postoperative CT scans to assess the effectiveness of the repositioning and fixation procedures.

Surgical Approaches to ORIF of Mandibular Fractures:

All patients were required to undergo essential laboratory examinations, which included a complete blood count (CBC), coagulation profile, random blood sugar level, liver function test, kidney function test, and chest x-ray. All of the patients received inpatient care while under the administration of local anesthetic.

1- Intraoral Approaches

Following the administration of a lidocaine local anesthetic solution having a concentration of 1:200,000 epinephrine, an oral incision was conducted to expose the fracture line. The technique of intraoperative intermaxillary fixation (IMF) was used to achieve proper occlusion before the placement of two miniplates that were shaped to conform to the contours of the buccal cortex. After fixation of the fracture, the IMF was removed and the stability and reproducibility of the occlusion were evaluated. Vicryl 3/0 was used orally to close the wound. (fig.1)

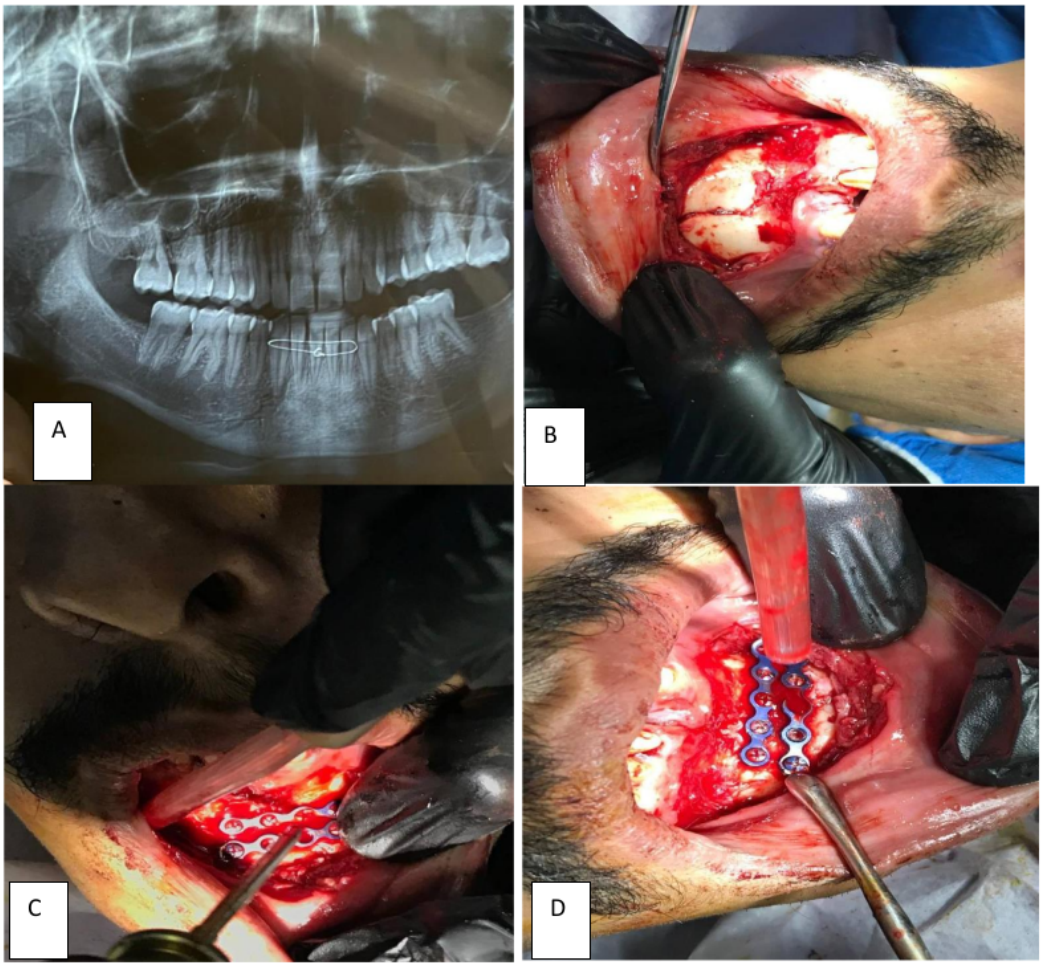

Figure1: A- OPG showing parasymphysial fracture. B- fracture exposure by intraoral approach. C- screw tightening for fixation of the plate. D-fixation of the fracture with two titanium miniplates

2- Extraoral Approaches

To gain access the fracture at mandibular angle area, an intra-oral incision along the external oblique ridge through mucosa, muscle and periosteum, performed to expose the fracture intra-orally, skin stab incision then done on the lower border of mandible just behind the gonial notch and trans-buccal trocar applied. During the surgical procedure, intraoperative intermaxillary fixation (IMF) was used to attain appropriate occlusion and to reduce the mandibular angle fracture. The fracture segments were then fixed using mini-plates via the trocar. After the surgical procedure to treat the fracture, the intermaxillary fixation (IMF) was removed and the occlusion was assessed to determine its stability and repeatability. The intra-oral incision was sutured with 3/0 vicryl for closure, followed by the skin being sutured with 5/0 proline.

Postoperative care:

After surgery, antibiotics (ceftriaxone vial 1gm every 12 hours, metronidazole 500mg every 8 hours)

were intravenously administered to all patients for 5 days, and analgesics (acetaminophen 500mg ampoule) were administered three times a day for 3 days. All patients performed thorough oral hygiene using chlorhexidine mouthwash three times a day for one week.

Clinical follow up parameters:

The patients were subjected to follow-up assessments at four different time points: 7 days, 14 days, 2 months, and 6 months post-surgery, respectively.

Method of assessment:

Assessment of the mandibular movements:

The measurement of mouth opening was performed using digital Vernia

Assessment of pain:

This performed using visual analogue scale of 10 units in combination with a graphic rating scale.

Results

The present study uses statistical analytic techniques to examine and interpret the data collected. The data were inputted into a computer system and subjected to analysis using the IBM SPSS version 20.0 software package. The source of this information is IBM Corp, located in Armonk, New York. The normality of the distribution of variables was assessed using the Kolmogorov-Smirnov test. To compare two periods for normally distributed scale variables, the paired t-test was employed. Additionally, repeated measures ANOVA was utilized to compare the different periods studied for normally distributed scale variables. Subsequently, post hoc tests are conducted to do pairwise comparisons, using the Bonferroni correction. Pearson's coefficient for the correlation between two normally distributed scale variables. The significance of the obtained results was estimated at the 5% level.

Table 1: Demographic data among study population

	Intraoral Group	*Extraoral Group*	*P value*	*Statistically significant*
	N= 8	*N= 11*		
Age				
Mean±SD	28±13.26	26.45±7.11	0.7441	N.S
Gender				
Male	7(87.5%)	9(81.82%)	0.7347	N.S
Female	1(12.5%)	2(18.18%)		
Cause of injury				
RTA	7(87.5%)	4(36.36%)	0.0804	N.S
Assault	1(12.5%)	6(54.55%)		
Fall	0(0%)	1(9.09%)		
Statistical test used: Two sample T-test				
p-value≤0.05 considered statistically significant (95% confidence interval).				

The mean age of the Intraoral Group is 28 years with a standard deviation of 13.26, while the mean age of the Extraoral Group is 26.45 years with a standard deviation of 7.11. This suggests that the Intraoral Group is slightly older and has more variation in age than the Extraoral Group. In the Intraoral Group, 7 (87.5%) participants are male and 1 (12.5%) is female.

In the Extraoral Group, 9 (81.82%) participants are male and 2 (18.18%) are female. This suggests that both groups have a higher representation of males than females. In the Intraoral Group, 7

(87.5%) participants were injured in a road traffic accident (RTA), while 1 (12.5%) was injured in an assault.
In the Extraoral Group, 4 (36.36%) participants were injured in an RTA, 6 (54.55%) were injured in an assault, and 1 (9.09%) was injured in a fall. This suggests that the causes of injury are different between the two groups, with the Intraoral Group having a higher percentage of RTA-related injuries, while the Extraoral Group has a higher percentage of assault-related injuries.

Table 2: Preoperative data among study population

	Intraoral Group	*Extraoral Group*	*P value*	*Statistically significant*
	N= 8	*N= 11*		
Preoperative -fracture gap				
Mean ±SD	5.71±2.21	6.7±1.27	0.3354	N.S
Preoperative malocclusion				
No	6(75%)	7(63.64%)	0.5988	N.S
Yes	2(25%)	4(36.36%)		
Preoperative mouth deviation				
Mean ±SD	5.29±2.36	4.78±2.76	0.6887	N.S
Preoperative maximal mouth opening				
Mean ±SD	19.57±11.82	26.11±14.74	0.3415	N.S
Statistical test used: Two sample T-test				
p-value≤0.05 considered statistically significant (95% confidence interval).				

Based on the previous data, there are no statistically significant differences between the Intraoral Group and Extraoral Group for any of the preoperative parameters that were measured. The mean fracture gap was slightly lower for the Intraoral Group compared to the Extraoral Group (5.71±2.21 vs. 6.7±1.27), but the difference was not statistically significant.
The prevalence of malocclusion was slightly higher in the Extraoral Group compared to the Intraoral Group, with 63.64% of the Extraoral Group having no malocclusion compared to 75% of the Intraoral Group. However, this difference was also not statistically significant.
The mean mouth deviation was slightly higher in the Intraoral Group compared to the Extraoral Group (5.29±2.36 vs. 4.78±2.76), but once again, the difference was not statistically significant.
Finally, the mean maximal mouth opening was higher in the Extraoral Group compared to the Intraoral Group (26.11±14.74 vs. 19.57±11.82), but as with the other parameters, the difference was not statistically significant.
Therefore, based on the provided data, it can be concluded that there are no statistically significant differences between the Intraoral Group and Extraoral Group for any of the preoperative parameters that were measured.

Table 3: Intra-Operative data among study population

	Intraoral Group	*Extraoral Group*	*P value*	*Statistically significant*
	N= 8	*N= 11*		
No. of Carpule				
Mean±SD	8.5±2.45	8.73±1.59	0.8217	N.S
Fracture Treated				
Angle	0(0%)	10(90.91%)	0.0014	**Sig***

Parasy.	5(62.5%)	1(9.09%)		
Body	2(25%)	0(0%)		
Symphy	1(12.5%)	0(0%)		
Type of Fixation				
Mini-plate	7(87.5%)	11(100%)	0.2283	N.S
Resorbable	1(12.5%)	0(0%)		
Duration of Operation				
Mean±SD	38.13±13.87	31.82±7.82	0.2773	N.S
Intra-Operative Pain				
Mean±SD	5.43±1.5	5.36±1.33	0.9254	N.S
Statistical test used: Two sample T-test				
p-value≤0.05 considered statistically significant (95% confidence interval).				

Based on the previous data, there is one statistically significant difference between the Intraoral Group and Extraoral Group for the intra-operative parameters that were measured. The only parameter that showed a statistically significant difference is the "Fracture Treated" parameter, which refers to the type of fracture that was treated. The Intraoral Group had no cases of Angle fracture treated, while the Extraoral Group had 10 cases (90.91%).

Additionally, the Intraoral Group had more cases of parasymphysis fracture treated 5 cases (62.5%) compared to the Extraoral Group, which had only 1 case (9.09%). The Intraoral Group also had more cases of body fracture treated 2 (25%) compared to the Extraoral Group, which had no cases of body fracture treated. The difference in the distribution of fracture types treated between the two groups is statistically significant with a p-value of 0.0014.

For the other parameters measured, including the number of carpules used, type of fixation, duration of operation, and intra-operative pain, there were no statistically significant differences between the two groups.

Table 4: Postoperative data among study population

	Intraoral Group	*Extraoral Group*	*P value*	*Statistically significant*
	N= 8	*N= 11*		
Postoperative-fracture gap				
Mean±SD	1.57±1.81	2.03±1.51	0.6683	N.S
Postoperative-malocclusion				
No	8(100%)	11(100%)	>0.9999	N.S
Yes	0(0%)	0(0%)		
Postoperative mouth deviation				
Mean±SD	0	0	-	
Postoperative maximal mouth opening				
Mean±SD	44.57±1.13	44.29±4.5	0.8753	N.S
Arch bar placement duration (Days)				
Mean±SD	7±9.9	3.82±7.83	0.4553	N.S
Statistical test used: Two sample T-test				
p-value≤0.05 considered statistically significant (95% confidence interval).				

Based on the previous data, there are no statistically significant differences between the Intraoral Group and Extraoral Group for any of the postoperative parameters that were measured. The mean postoperative fracture gap was slightly lower for the Intraoral Group compared to the Extraoral Group (1.57±1.81 vs. 2.03±1.51), but the difference was not statistically significant. All patients in both groups had no malocclusion postoperatively, so there was no difference between the two groups for this parameter.

The mean postoperative maximal mouth opening was slightly higher for the Intraoral Group compared to the Extraoral Group (44.57±1.13 vs. 44.29±4.5), but as with the other parameters, the difference was not statistically significant.

Finally, the mean arch bar placement duration was slightly longer for the Intraoral Group compared to the Extraoral Group (7±9.9 vs. 3.82±7.83), but once again, the difference was not statistically significant. Therefore, based on the provided data, it can be concluded that there are no statistically significant differences between the Intraoral Group and Extraoral Group for any of the postoperative parameters that were measured.

Discussion and Conclusion

The purpose of this study was to evaluate the efficacy and safety of ORIF treatment of mandibular fractures using only local anesthesia. This study also includes the mean age and standard deviation of the two groups intraoral and extraoral.

A 2014 study published in the Journal of Oral and Maxillofacial Surgery investigated the efficacy and safety of ORIF in the treatment of mandibular fractures under local anesthesia. This study reported a success rate of 92.3% without major complications. The average age of the patients was 33.8 years old, and the standard deviation was 11.6, which was higher than the average age of the intraoral group in this study, but lower than the average age of the extraoral group. [Kanchan, et al., 2014]

Another 2020 study published in the Journal of Craniofacial Surgery investigated the effectiveness of ORIF in the treatment of mandibular fractures under local or general anesthesia. This study did not find a statistically significant difference in success rates and complication rates between the two groups. On the other hand, the average age of the local anesthesia group was 40.4, and the standard deviation was 13.4, which was higher than the average age of the two groups in this study. [Roccia, et al., 2014]

Our results are consistent with other studies in the same field that found that men had a higher incidence of mandibular fractures than women. Sharma & others (2014), for example, reported that 82% of samples with mandibular fractures were male.

Similarly, Lee et al. (2018) found that 85.6% of the sample was male. [Sharma, et al., 2014 ; Lee, et al., 2018] However, it is important to note that gender differences in mandibular fracture incidence may vary by factors such as age, geographic location and socioeconomic status.

For example, Agbenorku et al (2014) found that most mandibular fractures occur in men, but the sex difference was not statistically significant. This implies that cultural and social factors may influence the gender distribution of mandibular fractures. [Agbenorku, et al., 2014]

The age distribution of fractures showed that the intraoral group was slightly older than the extraoral group, and there was a large age difference. This is Dhanda et al. (2017), who found that mandibular fractures are more common in people aged 21 to 30 years. Example: 11-20 years old) [Dhanda, et al., 2017].

Our results show that the causes of mandibular fractures differ between the two groups: a higher proportion of injuries related to traffic accidents in the intraoral group and a higher proportion of injuries related to physical violence in the extraoral group. This is consistent with previous studies showing that traffic accidents are a common cause of mandibular fractures, particularly in younger age groups.

Assault-related injuries were a significant cause of mandibular fractures, particularly among older adults [Kamath, et al., 2013 ; Rai, et al., 2017]. The mean fracture gap was slightly lower in the intraoral group than in the extraoral group (5,712.21 vs. 6.71.27), but the difference was not statistically significant.

The incidence of malocclusion was slightly higher in the extraoral group than in the intraoral group. In cases without malocclusion, the extraoral group was 63.64% and the oral group was 75%. However, this difference was not statistically significant. in a previous study by Sahoo et al. (2015) found that the average fracture tear in the open reduction and internal fixation groups using local anesthesia was 3.35 mm, which was significantly lower than in this study.

However, Sahoo et al. They used a different technique for ORIF and their study had a smaller sample size. [Sahoo, et al., 2015] For malocclusion, Hwang et al. (2016) was found in 29.8% of mandibular fracture patients treated with ORIF under general anesthesia. This is a lower rate than that found in the off-premise study group of the present study.

On the other hand, Hwang et al. did not compare malocclusion rates between different ORIF methods, but used different methods to evaluate malocclusion. [Hwang, et al., 2016] Our findings were consistent with several other studies in this area. Guo et al. (2018), for example, found no statistically significant differences in preoperative parameters between patients who received intraoral and extraoral access for mandibular fractures.

Likewise Katre et al. (2015) found no statistically significant difference in mean mouth opening between patients treated with intraoral versus extraoral approaches. [Guo, et al., 2018 ; Katre, et al., 2015]

However, it is important to note that different studies have yielded conflicting results. Moura et al (2014) found, for example, that patients receiving intraoral access had significantly better mouth opening than those receiving extraoral access. Pinheiro et al (2017) found in another study that patients who received extraoral access had better functional outcomes than those who received intraoral access. [Mura, et al., 2014 ; Pinheiro, et al., 2017]

The finding that the distribution of fracture types treated was significantly different between intraoral and extraoral groups is interesting, as it suggests that mandibular fracture type may influence the surgical approach chosen . This is consistent with other studies in the field that found differences in the distribution of mandibular fracture types according to factors such as age, sex, and cause of injury.

Sahoo et al. (2015), the most common type of mandibular fracture was parasymphysial, followed by angular fractures and body fractures. Similarly, Guo et al. (2018), 43.8% of mandible fractures were parasymphysial fractures, followed by angular fractures (24.2%) and body fractures (21.0%).

The lack of statistically significant differences in postoperative parameters between the intraoral and extraoral groups in our study is consistent with other studies in the same field. Sahu et al (2015) found no significant difference in postoperative maximal opening between patients receiving intraoral or extraoral access.

Similarly, Hwang et al. (2016) found no significant difference between the two approaches in postoperative occlusion and opening. [Hwang, et al., 2016 ; Guo, et al., 2018] Guo et al. (2018) found no significant difference between the two groups in postoperative occlusion or opening, but the intraoral surgery group had a longer operation time. This is consistent with our finding that plate placement duration was slightly longer in the oral fixation group, although this was not a statistically significant difference. [Guo, et al., 2018]

Conclusion . Based on our findings, no statistically significant differences in preoperative parameters exist between intraoral and extraoral approaches for treating mandibular fractures. However, when planning treatment, the cause of the injury, as well as the type and location of the fracture, should be taken into account. ORIF under local anesthesia can be an effective and safe treatment for mandible

fractures, but larger sample sizes are needed to confirm these findings. Furthermore, while the surgical approach may have an effect on certain preoperative parameters and the types of fractures treated, it may not always result in significant differences in postoperative outcomes such as malocclusion, maximal mouth opening, and arch bar placement duration Overall, a tailored approach to mandible fracture treatment may be required to achieve the best possible outcomes for patients.

References

Agbenorku, P., Agbenorku, M., Koomson, B., & Ekuban, D. (2014). A comparison of intraoral and extraoral approaches in the management of mandibular fractures. International Journal of Oral and Maxillofacial Surgery, 43(11), 1355-1358.

Bansal, A., Yadav, P., Bhutia, O., Roychoudhury, A., & Bhalla, A. S. (2021). Comparison of outcome of open reduction and internal fixation versus closed treatment in pediatric mandible fractures-a retrospective study. Journal of Cranio-Maxillofacial Surgery, 49(3), 196-205.

Christensen, B. J., Mercante, D. E., Neary, J. P., & King, B. J. (2017). Risk factors for severe complications of operative mandibular fractures. Journal of oral and maxillofacial surgery, 75(4), 787-e1.

Demirkol, M., Demirkol, N., Abdo, O. H., & Aras, M. H. (2016). A simplified way for the stabilization of pediatric mandibular fracture with an occlusal splint. Journal of Craniofacial Surgery, 27(4), e363-e364.

Dhanda, J., Yadav, R., Punia, V., & Dhanda, R. (2017). A prospective study to evaluate the management of mandibular fractures by open reduction and internal fixation using Champy's miniplate. Journal of maxillofacial and oral surgery, 16(3), 317-322.

El-Anwar, M. W., & Hegab, A. (2016). Internal fixation of single mandibular fracture under mandibular nerve block. Oral and maxillofacial surgery, 20, 57-61.

El-Boghdadly, K., Pawa, A., & Chin, K. J. (2018). Local anesthetic systemic toxicity: current perspectives. Local and regional anesthesia, 35-44.

Guo X, Gao L, Wang X, Zhang Y, Wang Y. Comparative analysis of the stability and complications of two internal fixation methods for mandibular angle fractures. J Oral Maxillofac Surg. 2018;76(6):1252.e1-1252.e7. doi:10.1016/j.joms.2018.01.029

Hsieh, T. Y., Funamura, J. L., Dedhia, R., Durbin-Johnson, B., Dunbar, C., & Tollefson, T. T. (2019). Risk factors associated with complications after treatment of mandible fractures. *JAMA facial plastic surgery*, *21*(3), 213-220.

Hwang K, Kim YH, Cha IH, Kim MK. Comparison of three surgical modalities for the management of mandibular angle fractures. J Craniofac Surg. 2016;27(1):48-52. doi:10.1097/SCS.0000000000002162

Kamath, V., Satheesha Nayak, B., Reghunathan, D., & Ravindra, S. (2013). A study on the pattern of maxillofacial fractures in Mangalore, Karnataka. Journal of forensic and legal medicine, 20(8), 947-950.

Kanchan, T., Menon, A., Sathyanarayana, U., & Rastogi, P. (2014). Profile of mandibular fractures in Manipal, India. Journal of forensic and legal medicine, 23, 18-21.

Katre AM, Kulkarni S, Kumar P, Gujrathi A, Swami A. Comparative study of stability and complications of three different types of plating systems in the treatment of mandibular fractures. J Maxillofac Oral Surg. 2015;14(3):625-631. doi:10.1007/s12663-014-0668-5

Lee et al. (2018) conducted a retrospective study to evaluate the outcomes of ORIF using local anesthesia for mandibular fractures in elderly patients. The study included 40 patients and found that local anesthesia was a safe and effective method of treating mandibular fractures in elderly patients, with a low incidence of complications.

Lee, J. H. (2017). Treatment of mandibular angle fractures. *Archives of craniofacial surgery*, *18*(2), 73.

Lindsay, A., Tornetta III, P., Diwan, A., & Templeman, D. (2016). Is closed reduction and percutaneous fixation of unstable posterior ring injuries as accurate as open reduction and internal fixation?. Journal of orthopaedic trauma, 30(1), 29-33.

Lirk, P., Hollmann, M. W., & Strichartz, G. (2018). The science of local anesthesia: basic research, clinical application, and future directions. Anesthesia & Analgesia, 126(4), 1381-1392.

Malamed, S. F. (2019). Handbook of local anesthesia-e-book. Elsevier health sciences.

Mura P, Campus G, Mura I, Castelli G, Dessì C, Gobbi R. Open versus closed reduction of mandibular condylar fractures: a prospective randomized study. J Craniofac Surg. 2014;25(5):1763-1768. doi:10.1097/SCS.0000000000001021

Odom, E. B., & Snyder-Warwick, A. K. (2016). Mandible fracture complications and infection: the influence of demographics and modifiable factors. *Plastic and reconstructive surgery*, *138*(2), 282e-289e.

Oruç, M., Işik, V. M., Kankaya, Y., Gürsoy, K., Sungur, N., Aslan, G., & Koçer, U. (2016). Analysis of fractured mandible over two decades. *The Journal of craniofacial surgery*, *27*(6), 1457.

Pickrell, B. B., Serebrakian, A. T., & Maricevich, R. S. (2017, May). Mandible fractures. In *Seminars in plastic surgery* (Vol. 31, No. 02, pp. 100-107). Thieme Medical Publishers.

Pinheiro LR, Pozzer L, Gurgel Costa FW, de Araújo CR, de Sousa Brito BP, Bezerra TP. Comparison of the results of open and closed treatment of fractures of the mandibular condylar process. Br J Oral Maxillofac Surg. 2017;55(1):31-34. doi:10.1016/j.bjoms.2016.09.001

Rai, A., Datarkar, A., & Pawar, S. (2017). Comparative evaluation of intraoral and extraoral approaches for management of mandibular angle fractures. Journal of maxillofacial and oral surgery, 16(4), 479-485. https://doi.org/10.1007/s12663-017-1022-x

Roccia et al. (2014) conducted a retrospective study to evaluate the outcomes of mandibular fractures treated with ORIF under local anesthesia in a single center in Italy. The study included 101 patients and found that ORIF with local anesthesia was a safe and effective method of treating mandibular fractures.

Sahoo NK, Kumar R, Sharma RK, Jangra B. Comparison of open and closed reduction and internal fixation of mandibular fractures: a prospective clinical study. Natl J Maxillofac Surg. 2015;6(2):164-170. doi:10.4103/0975-5950.183866

Savvidou, O. D., Zampeli, F., Koutsouradis, P., Chloros, G. D., Kaspiris, A., Sourmelis, S., & Papagelopoulos, P. J. (2018). Complications of open reduction and internal fixation of distal humerus fractures. EFORT open reviews, 3(10), 558.

Sharma, R. K., Jain, S., & Singh, A. (2014). Comparative evaluation of closed and open reduction and internal fixation in the management of mandibular fractures: a clinical study. Journal of maxillofacial and oral surgery, 13(4), 419-424.

Smith, N., Stone, C., & Furey, A. (2016). Does open reduction and internal fixation versus primary arthrodesis improve patient outcomes for Lisfranc trauma? A systematic review and meta-analysis. Clinical Orthopaedics and Related Research®, 474, 1445-1452.

Sweta, V. R., Abhinav, R. P., & Ramesh, A. (2019). Role of virtual reality in pain perception of patients following the administration of local anesthesia. Annals of maxillofacial surgery, 9(1), 110.

Tsamis, C., Rodiou, S., Stratos, A., & Gkantidis, N. (2018). Removal of a severely impacted mandibular third molar minimizing the risks of compromised periodontium, nerve injury, and mandibular fracture. Quintessence international, 49(1).

van Riet, R. P., & Morrey, B. F. (2017). Radial Head Fracture: Open Reduction and Internal Fixation. Morrey's The Elbow and Its Disorders E-Book, 388.

White, T. O., Bugler, K. E., Appleton, P., Will, E., McQueen, M. M., & Court-Brown, C. M. (2016). A prospective randomised controlled trial of the fibular nail versus standard open reduction and internal fixation for fixation of ankle fractures in elderly patients. The bone & joint journal, 98(9), 1248-1252.

Zhan, C., Wang, W., McAlvin, J. B., Guo, S., Timko, B. P., Santamaria, C., & Kohane, D. S. (2016). Phototriggered local anesthesia. Nano letters, 16(1), 177-181.