Assessment of Facial Nerve Dysfunction in the Retromandibular Approach for Mandibular Condylar Fracture Management

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Abstract

Background: Condylar fractures account for a significant proportion of mandibular fractures. Surgical management of these fractures often involves navigating around the facial nerve, which controls the motor function of the muscles of facial expression along with other specialized functions. Preserving the integrity of this nerve during surgical intervention is crucial to prevent functional impairment.

Objective: To evaluate the incidence of facial nerve dysfunction following the retromandibular approach for the management of mandibular condylar fractures.

Materials & Methods: It was a 'Descriptive Case Series' completed within six months from October 20, 2020 to April 20, 2021 in the department of oral and maxillofacial surgery, Mayo Hospital, Lahore. A total of 60 patients meeting the inclusion criteria were enrolled in the study. All patients underwent surgical reduction and fixation of condylar fractures via the retromandibular approach under general anesthesia. Facial nerve dysfunction involving any of its peripheral branches was assessed three months postoperatively using the House-Brackmann Facial Nerve Grading System (HBFNGS). Nerve involvement was documented if dysfunction was observed in any of the branches, including the zygomatic, temporal, buccal, marginal mandibular, or cervical branches.

Results: The mean age of the patients was 30.50 ± 11.88 years. The study population comprised 55 (91.67%) males and five (8.33%) females. At the three-month follow-up, buccal nerve involvement was noted in two patients (66.67%), while zygomatic nerve involvement was observed in one patient (33.3%). Overall, facial nerve dysfunction was identified in three patients (5%).

Conclusion: The retromandibular approach is effective with minimal facial nerve complications.

Keywords: Facial Paralysis, Mandibular Condyle. Mandibular Fractures. Oral Surgical Procedures, Postoperative Complications, Temporomandibular Joint, Treatment Outcome.

Introduction

Extraoral approaches for maxillofacial trauma, especially in high-velocity injuries with multiple fractures or comminution, often require open reduction and internal fixation and carry a risk of facial nerve injury ranging from 0% to 48%.[1-3] Facial nerve impairment affects facial expression, lacrimation, salivation, and taste, making objective evaluation challenging and usually reliant on subjective methods like the House-Brackmann Facial Nerve Grading System with high inter observer reliability.[4,5] International studies report varying dysfunction rates among different branches—10.7% for the temporal, 16.66% for the marginal mandibular, 5% for the buccal, and 5.3% for the zygomatic—with recovery rates as high as 100% at 6 months in some cases. Specific studies noted recovery rates of 94.7% and 88% following the retromandibular trans-parotid approach in mandibular condylar fractures and maxillofacial trauma, respectively.[6]

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Condylar and subcondylar fractures account for up to 30% of all mandibular fractures. However, statistics from Pakistani trauma centers remain scarce. To date, no comprehensive investigation has been conducted to assess the incidence, diagnostic delays, and treatment outcomes of subcondylar fractures in our region. This lack of data hinders the development of evidence-based guidelines tailored to our patient population.

This study aims to evaluate facial nerve recovery after the retromandibular approach, addressing a gap in local research and supporting its efficacy in managing mandibular condylar fractures.

Diagnostic and Treatment Considerations in Mandibular & Sub-Condylar Fractures:

A mandibular fracture is a break in the jawbone, often occurring in two places. It may cause difficulty opening the mouth, misaligned teeth, or gum bleeding, mostly affecting males in their 30s.[7] Most commonly affecting the condyle (36%), body (21%), angle (20%), and symphysis (14%).[8] While panoramic radiographs and lateral oblique views offer a rapid initial assessment, CT imaging remains the gold standard for accurately delineating fracture lines and guiding treatment—from maxillomandibular fixation to open reduction internal fixation.[9] These injuries present with pain, swelling, malocclusion, ear bleeding, and jaw deviation; bilateral or severe ("flail mandible") cases can obstruct the airway or even risk cranial displacement and vascular injury.[10] Sub-condylar fractures, accounting for 11–16% of facial and 30–40% of mandibular fractures, pose additional challenges due to their proximity to the TMJ, pterygoid muscles, and facial nerve, with displacement severity influencing long-term outcomes such as TMJ dysfunction, chronic pain, and facial asymmetry.[11,12]

Clinically, any chin, preauricular, or contralateral facial trauma especially when accompanied by contusions, hemotympanum, malocclusion, or nerve deficits should prompt a thorough history, occlusal evaluation, and imaging–.[13] Trauma to the chin, preauricular area, or contralateral face should raise suspicion, as mandibular fractures often occur in multiple sites.[14] Evaluating occlusion and mandibular function is crucial, though multiple fractures or nerve injuries may distort perception. Understanding normal occlusal patterns and mandibular motion helps guide diagnosis and treatment, with dental study models aiding complex cases. Accurate diagnosis of sub-condylar fractures relies on radiographic imaging, with panoramic radiography being the most commonly used modality, offering a full view of the mandible, TMJs, and surrounding structures.[15] If unavailable, lateral oblique mandibular views can help assess the condylar region.[16] Ultimately, proper use of panoramic, Towne, and CT projections ensures accurate diagnosis, complete injury mapping, and optimal treatment planning.[17]

Treatment Approaches

Sub-condylar fractures are significant due to their impact on TMJ function and the risk of complications like malocclusion, pain, muscle spasms, and mandibular deviation. Management includes closed reduction with maxillomandibular fixation, open reduction with internal fixation, or endoscopic-assisted fixation. Closed reduction, though traditionally preferred, carries risks like TMJ dysfunction and inadequate ramus height restoration (Figure 1).

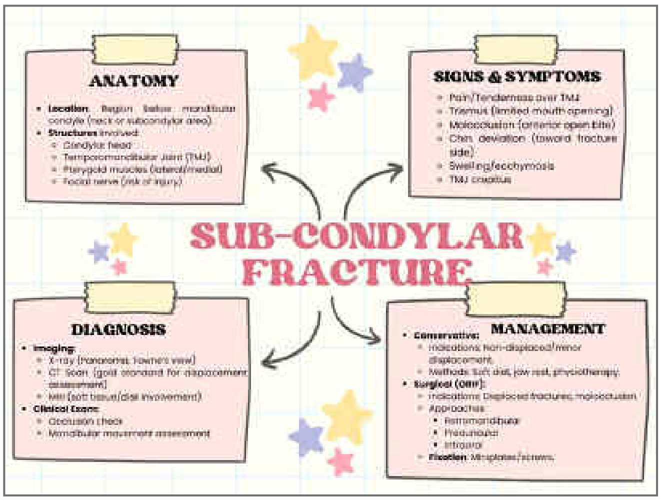

Figure1: Sub-condylar Fractures: Anatomy, Diagnosis, Clinical Presentation, and Management Strategies

A comprehensive overview of sub-condylar fractures, highlighting anatomical considerations, diagnostic methods, clinical signs, and treatment approaches, including both conservative and surgical management. Advances in osteosynthesis techniques have shifted the preference toward surgical intervention, prioritizing anatomic reduction and early mobilization to restore function and prevent long-term complications —[12,18] (Table 1).

Table 1: The Various Treatment Approaches for Sub-Condylar Fractures their advantages and disadvantages

Treatment Approach	Advantages	Disadvantages
Closed Reduction with Maxillomandibular Fixation (MMF)	- Non-invasive, avoids surgical complications - Suitable for minimally displaced fractures - Lower risk of facial nerve injury	- Prolonged immobilization may lead to joint stiffness - Potential for malocclusion and TMJ dysfunction - Higher risk of long-term complications like ankylosis [19]
Open Reduction with Internal Fixation (ORIF)	- Precise anatomical reduction & stable fixation - Allows early jaw mobilization - Reduced risk of long-term TMJ dysfunction	- Risk of facial nerve injury - Surgical risks such as infection and scarring - Requires specialized surgical skills [20]
Endoscopic-Assisted Reduction with Internal Fixation	- Minimally invasive approach - Lower risk of visible scarring - Reduced surgical trauma and faster recovery	- Technically demanding and requires specialized equipment - Limited access in severely displaced fractures - Higher cost and learning curve[21]

Clinical Significance and Research Considerations

One major concern in sub-condylar fractures is facial nerve involvement, whether due to trauma or surgical intervention.[22] Given the functional implications of facial nerve injury and TMJ dysfunction, an important research question emerges: What patient and injury-related factors are associated with the development of facial nerve dysfunction following the retromandibular approach for mandibular condylar fracture management? Addressing this could guide treatment protocols and improve patient outcomes in maxillofacial trauma management.

Materials and Methods

This was a descriptive case series conducted at the Department of Oral and Maxillofacial Surgery, Mayo Hospital, Lahore, over six months from October 20, 2020 to April 20, 2021. This prospective descriptive study was approved by the Institutional Review Board of King Edward Medical University and Dissertation was approved by college of Physicians and Surgeons (REU No. 41889; approved on 17 September 2021). All participants provided written informed consent. A total of 60 patients were included based on predefined inclusion and exclusion criteria. The sample size was calculated using an expected incidence of facial nerve dysfunction of 48% with a 95% confidence level.[23]

Inclusion Criteria:

- Patients aged 16 to 70 years
- Both male and female patients
- Patients with confirmed mandibular condylar fractures requiring surgical intervention

Exclusion Criteria:

- Patients with pre-existing facial nerve dysfunction
- Patients with comminuted fractures requiring different surgical approaches
- Patients with penetrating injuries or tumors

Surgical Procedure:

All patients underwent open reduction and internal fixation (ORIF) using the retromandibular approach under general anesthesia.

Operative and Peri-operative Procedures are given as:

Pre-operative Protocol

All patients fasted for 8 hours prior to surgery and gave written informed consent. Baseline laboratory tests and panoramic radiographs/CT scans were reviewed. Thirty minutes before incision, each patient received IV cefazolin 2 g as antibiotic prophylaxis. Anaesthesia was induced with propofol (2 mg/kg) and fentanyl (2 µg/kg) and maintained with isoflurane (1 MAC) via nasotracheal intubation. A single dose of dexamethasone 8 mg IV was given on induction to reduce postoperative edema.

Operative Technique

Under sterile conditions, a standard retromandibular transparotid approach was used.

A 2–2.5 cm vertical skin incision was placed 1.5 cm below the earlobe, just posterior to the mandibular ramus.

The platysma and parotid capsule were incised in line with the skin, and blunt dissection proceeded through the deep lobe of the parotid, carefully identifying and protecting the buccal and marginal mandibular branches of the facial nerve.

Once the fracture site was exposed, reduction was achieved with bone-holding forceps, and two 2.0 mm titanium miniplates (Synthes®) with monocortical screws were applied across the fracture line. Occlusion was checked intra-operatively and fine-tuned with light intermaxillary fixation as needed.

Closure was performed in layers: The parotid capsule and subcutaneous tissue with 4-0 absorbable sutures, and the skin with 5-0 nylon in an interrupted fashion.

Post-operative Care

Patients were monitored in the recovery room for 2–4 hours. Intermittent cold compresses were applied over the surgical site for the first 24 hours. Analgesia consisted of IV ketorolac 30 mg every 8 hours for 48 hours, then oral ibuprofen 400 mg TID for five days. The antibiotic course was continued with oral amoxicillin–clavulanate 625 mg TID for five days. Beginning on post-op Day 2, patients performed supervised mouth-opening exercises (10 reps, 3×/day). Soft diet was maintained for two weeks. Skin sutures were removed on Day 5. Facial nerve function was formally graded on postoperative Days 1, 7, and at 3 months using the House–Brackmann scale Postoperatively, patients were assessed at regular intervals, and facial nerve function was evaluated three months postoperatively using the House-Brackmann Facial Nerve Grading System (HBFNGS).

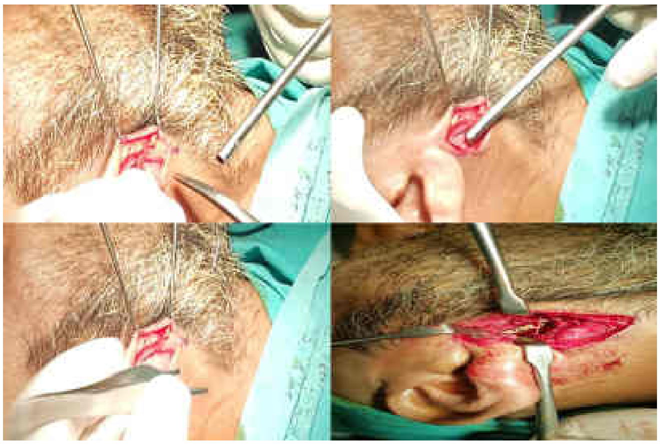

Figure 2: Sequential intraoperative steps of the retromandibular approach for open reduction and internal fixation of a mandibular condylar fracture.

Data Analysis:

Data were entered and analyzed using SPSS version 21. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Chi-square tests were applied to evaluate statistical associations, with a *p*-value ≤ 0.05 considered significant.

Results

In this study, 60 patients (mean age 30.50±11.88 years, range from 16 to 65 years of age were enrolled (Table 2), with 55 males (91.67%) and 5 females (8.33%), resulting in an 11:1 male-to-female ratio (Figure 2).

Table 2: Summary statistics of age (years)

Age (years)	N	60
	Mean	30.50 years
	Standard Deviation	11.88 years
	Minimum	16.00 years
	Maximum	65.00 years

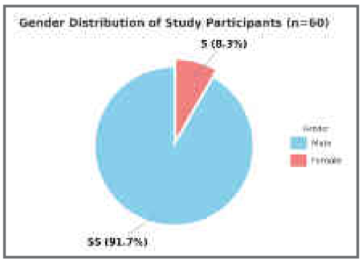

Figure 3. Gender distribution of study participants (n = 60), showing that males predominated at 55 (91.7%) and females comprised 5 (8.3%).

We found that 91.67% of the study participants were male, while only 8.33% were female patients The most common facial fracture pattern was sub-condyle para-symphysis (30.0%), followed by symphysis (13.33%) and Lefort II sub-condyle para-symphysis (11.67%), with other types making up the remainder (Table 3, Figure 3).

Table 3: Frequency distribution of HBFN grade

		Frequency	Percent (%)
HB FN Grade	Grade 2	2	66.7
	Grade 3	1	33.3
	Total	3	100.0

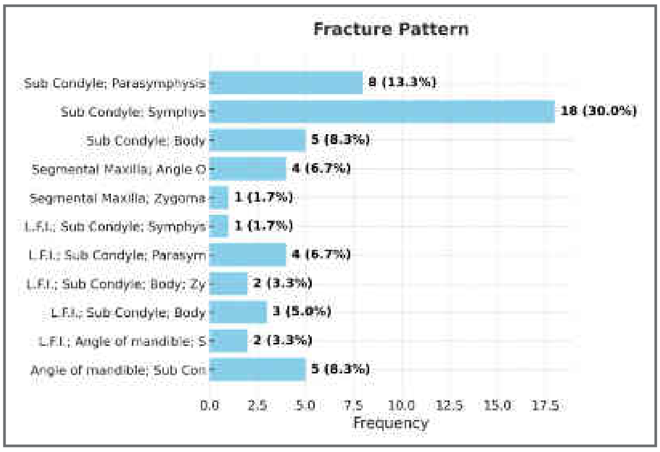

Figure 4: Patterns of Mandibular Fractures in Study Cohort

Distribution of mandibular fracture patterns (n = 60), with sub-condylar body fractures most common (18; 30.0%), followed by sub-condylar parasymphysis (8; 13.3%) and angle of mandible (5; 8.3%).

At the 3-month follow-up, facial nerve assessment showed buccal nerve involvement in 2 patients (66.67%) and zygomatic nerve involvement in 1 patient (33.3%), corresponding to HBFN grades 2 and 3 in 66.7% and 33.3% of affected patients, respectively, suggesting to an overall dysfunction rate of 5% (Figure 4, Table 4).

Table 4: Comparison of facial nerve dysfunction between age groups

		Facial Nerve Dysfunction		Total	P-Value
		Yes	No		
Age (years)	≤30	3	33	36	0.268
		8.3%	91.7%	100.0%	
	>30	0	24	24	
		0.0%	100.0%	100.0%	
Total		3	57	60	
		5.0%	95.0%	100.0%	

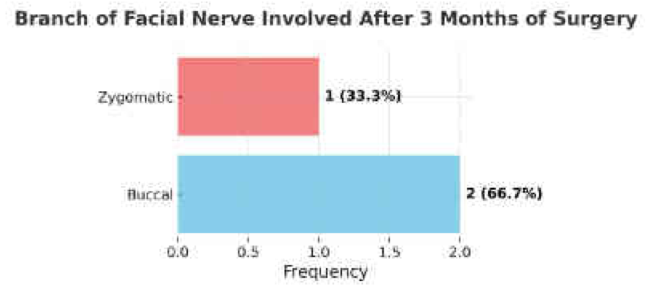

Figure 5: Distribution of Facial Nerve Branch Involvement at 3 Months Post-Surgery

In facial nerve dysfunction it was found that 66% percent of buccal nerve was involved Notably, dysfunction was observed only in patients aged ≤ 30 years (8.3%) and in males (5.5%), while no cases were found in patients >30 years or in females; however, these differences were statistically insignificant (p=0.268 and p=0.999, respectively) (Figure 6. Table 5). Additionally, there was no significant difference in dysfunction across fracture patterns (p=0.340).

Table 5: Incidence of Facial Nerve Dysfunction at Three-Month Follow-Up

		Facial Nerve Dysfunction		Total	P-Value
		Yes	No		
Gender	Male	3	52	55	>0.999
		5.5%	94.5%	100.0%	
	Female	0	5	5	
		0.0%	100.0%	100.0%	
Total		3	57	60	
		5.0%	95.0%	100.0%	

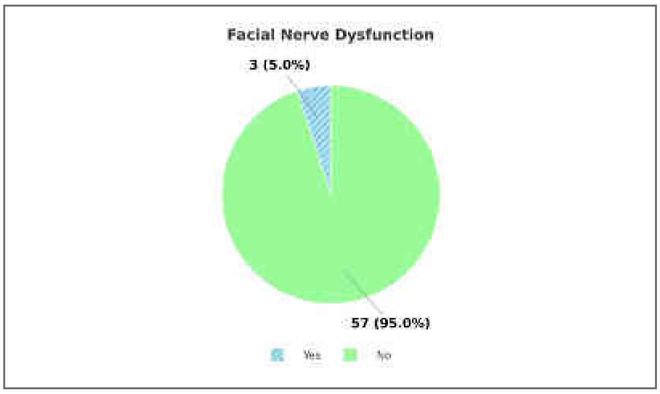

Figure 6: Incidence of Facial Nerve Dysfunction at Three-Month Follow-Up 5 % study population had facial nerve dysfunction

Discussion

In this descriptive series of 60 patients (mean age 30.5 ± 11.9 years; 91.7% male), we observed a 5% incidence of transient facial nerve dysfunction at three months following ORIF via the retromandibular approach. This incidence closely mirrors Prabhu et al.'s report of 5% buccal or zygomatic branch involvement in 100 cases, all recovering by six months.[25] By contrast, dysfunction rates in the literature span from 0% to 48%, likely reflecting variability in surgical technique, branch-specific vulnerability, and follow-up duration. All three dysfunctions in our cohort involved the buccal (66.7%) and zygomatic (33.3%) branches, suggesting these are most susceptible when dissecting near the parotid capsule. An international study on 100 patients found that 10.7% had temporal branch issues, 16.66% had marginal mandibular involvement, and 5% had buccal or zygomatic branch involvement. All recovered fully within six months.[26]

Comparison with previous literature shows that nerve dysfunction rates vary widely depending on sample size, surgical technique, and follow-up duration. Some studies have reported dysfunction rates as high as 48%, while others have documented much lower incidences.[27-29] This variation highlights the importance of standardized surgical protocols and experienced surgical teams in minimizing complications.

In this study the low incidence of facial nerve dysfunction (5%) following the retromandibular approach suggests this technique is both effective and relatively safe when executed with precision. However, these findings also highlight the vulnerability of the buccal and zygomatic branches which suggests the importance of meticulous dissection in the region of the parotid gland. For surgical training programs, these results emphasize the need for hands-on anatomical orientation, cadaveric simulation, and supervised surgical exposure to minimize iatrogenic injury. Additionally, even a small risk of facial weakness may have psychosocial implications, particularly in younger patients, necessitating a clear preoperative discussion regarding potential nerve-related outcomes. Counseling should include the expected recovery timeline and reassure patients that most dysfunctions are temporary. This can help manage anxiety and set realistic expectations, which is crucial for both informed consent and postoperative satisfaction.

Although operative steps were standardized across all cases, this study did not record individual intraoperative variables such as dissection depth, operative time, or surgeon experience level. These factors are known to influence facial nerve outcomes, particularly in retromandibular transparotid approaches where an extended dissection or prolonged retraction within the parotid region can increase the risk of neurapraxia. Notably, all three cases of nerve dysfunction involved fractures requiring deeper exposure due to displacement, potentially increasing manipulation around the buccal and zygomatic branches. While this trend was observed retrospectively, future studies should quantify intraoperative parameters, as this could refine risk stratification and lead to technical refinements that further reduce complications.

Conclusion

The retromandibular approach provides excellent access to mandibular condylar fractures while maintaining a low risk of postoperative facial nerve dysfunction. This study supports the continued use of this approach in clinical practice, with proper surgical techniques ensuring minimal complications. Future research should focus on larger-scale studies to reinforce these findings.

Limitations

The absence of blinded, inter-rater reliability assessment for House-Brackmann grading may limit reproducibility. Moreover, the male-predominant sample (91.7%) restricts applicability to female patients, who may exhibit different nerve resilience or recovery kinetics.

Our three-month follow-up, while practical, risks underestimating late-onset synkinesis or incomplete axonal regeneration. We therefore recommend future multicenter, prospective studies with:

- Standardized, blinded nerve assessments (including EMG confirmation and inter-rater reliability metrics),
- Extended follow-up of 6–12 months to capture delayed recovery or residual weakness,
- Subgroup analyses by fracture pattern, patient age, and sex to refine risk stratification.

Such rigorous designs will consolidate evidence for the retromandibular approach's safety and guide best practices in mandibular condylar fracture management. This study also did not measure intraoperative variables such as dissection extent, operative time, or resident involvement, which may influence the likelihood of facial nerve dysfunction.

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1. Mujtaba Nadeem: Conception and study design, analysis and interpretation of data, drafting the manuscript, critical review
2. Ehsan Ul Haq: Conception and study design, critical review.
3. Mahrukh Nisar: Acquisition of data, drafting the manuscript.
4. Talal Ahmed : Analysis amd interpretation of data, critical review.
5. Safi Ullah Khan: Acquisition, Analysis and interpretation of data.
6. Hassan Irfan: Drafting the manuscript, crtical review, approval of the final version to be published.
7. Ali Masood: Conception and study design, critical review.