

Complications in the Surgical Treatment of Mandibular Condyle Fractures – A Prospective Study

Complicações no tratamento cirúrgico das fraturas de côndilo mandibular – Um estudo prospectivo

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Abstract

Introduction Mandibular fractures are among the most common injuries in the craniofacial region, with involvement of the condylar region reported in 19 to 52% of the cases. Although non-surgical management remains widely used, long-term follow-up has demonstrated suboptimal control of temporomandibular joint dysfunction and related complications, including chronic pain, ankylosis, condylar arthritis, malocclusion, hypomobility, and facial asymmetry. Although the adoption of the surgical treatment has been increasing in recent years, few contemporary studies have evaluated its complications in condylar fractures.

Materials and Methods The current prospective study was conducted between July 2022 and December 2024, and it included adult patients (≥ 18 years) with mandibular condyle fractures who underwent computed tomography (CT) scans, agreed to the treatment proposed by the clinical team, and were followed up throughout the study period.

Results The study included 33 patients, 23 (69.70%) of whom underwent surgical treatment, and 10 (30.30%), non-surgical management. The overall incidence of complications was of 25.92%, with peripheral facial paralysis and sialocele being the most frequent (11.11% each), followed by temporomandibular joint dysfunction (3.70%).

Conclusion Although the indication for surgical treatment of condylar fractures has been increasing, awareness and careful evaluation of its complications remain essential.

Keywords

- mandibular condyle
- maxillomandibular fractures
- postoperative complications

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Resumo

Palavras-chave

- côndilo mandibular
- fraturas maxilomandibulares
- complicações pós-operatórias

Introdução Fraturas mandibulares estão entre as lesões mais comuns na região craniofacial, com relato de acometimento da região condilar em 19 a 52% dos casos. Embora o tratamento não cirúrgico ainda seja amplamente utilizado, o acompanhamento no longo prazo tem demonstrado controle subótimo da disfunção da articulação temporomandibular e das complicações relacionadas, incluindo dor crônica, anquilose, artrite condilar, má oclusão, hipomobilidade e assimetria facial. Apesar da crescente adoção do tratamento cirúrgico nos últimos anos, poucos estudos contemporâneos avaliaram suas complicações em fraturas condilares.

Materiais e Métodos Este estudo prospectivo foi conduzido entre julho de 2022 e dezembro de 2024 e incluiu pacientes adultos (≥ 18 anos) com fraturas do côndilo mandibular que foram submetidos à tomografia computadorizada (TC), concordaram com o tratamento proposto pela equipe clínica e foram acompanhados durante todo o período.

Resultados O estudo incluiu 33 pacientes, 23 (69,70%) dos quais foram submetidos ao tratamento cirúrgico, e 10 (30,30%), ao tratamento não cirúrgico. A incidência geral de complicações foi de 25,92%, sendo a paralisia facial periférica e a sialocele as mais frequentes (11,11% cada), seguidas por disfunção da articulação temporomandibular (3,70%).

Conclusão Embora a indicação para o tratamento cirúrgico de fraturas condilares tenha aumentado, a conscientização e a avaliação cuidadosa de suas complicações continuam sendo essenciais.

Introduction

Mandibular fractures are among the most common fractures in the craniofacial region. Involvement of the condylar region occurs in 19% to 52% of these fractures, which are associated with functional abnormalities, such as malocclusion, trismus, chronic pain, temporomandibular joint dysfunction (TMD, which reduces mouth opening), and facial asymmetry.^{1,2}

The therapeutic options include non-surgical management (involving maxillomandibular fixation, a restricted liquid diet, early physiotherapy, and orthodontic control with elastics) and surgery, which involves open reduction with internal fixation using miniplates and screws.^{3,4}

Historically, the conservative treatment has been widely adopted because of concerns regarding surgical complications, such as unesthetic scarring, peripheral facial paralysis, infection, salivary fistula, and sialocele. However, the long-term follow-up of conservatively managed patients has demonstrated suboptimal control of TMD, chronic pain, temporomandibular joint ankylosis, condylar arthritis, malocclusion, hypomobility, and facial asymmetry. Consequently, the surgical treatment has been increasingly adopted in recent years.^{1,5-9}

Although several studies have evaluated the outcomes of the conservative and surgical managements, few have specifically assessed the complication rates associated with the surgical treatment.^{3,10-14}

Objective

The present study aimed to evaluate the epidemiological profile and incidence of complications in patients with

condylar fractures undergoing surgical treatment at a tertiary general hospital.

Materials and Methods

The current prospective study was conducted from July 2022 to December 2024, and it included patients with mandibular condyle fractures treated by the cranio-maxillofacial surgery team at the Teaching Hospital of Universidade Federal de Uberlândia.

The inclusion criteria were age ≥ 18 years, performance of computed tomography with three-dimensional reconstruction (3D CT), and the patient's agreement with the treatment proposed by the medical team (whether surgical or non-surgical). Patients younger than 18 years or those who did not complete a minimum of 6 months of post-trauma outpatient follow-up by the end of the study were excluded. The institutional Ethics in Research Committee approved the study under protocol number CAAE 57095822.0.0000.5152.

Results

We monitored 33 patients with fractures involving the mandibular condyle who met the inclusion criteria. The age of the patients, most of whom were male individuals, ranged from 18 to 87 (mean: 43.7) years (► **Table 1**). The most common trauma mechanisms were motor vehicle accidents, followed by falls and physical assault (► **Table 1**). Condylar fractures were unilateral in 87.88% of the patients, and bilateral in 12.12% (► **Table 2**).

Table 1 Epidemiological data of the study sample

Data	Number of cases	Percentage
Sex		
Male	25	75.75%
Female	8	24.24%
Total	33	
Trauma mechanism		
Motor vehicle accident	14	42.40%
Fall	10	30.30%
Physical assault	9	27.26%
Total	33	

Table 2 Condylar fracture type

Fracture type	Number of cases	Percentage
Unilateral	29	87.88%
Bilateral	4	12.12%
Total	33	

Surgical treatment was indicated for patients with fragment deviations greater than 45° and loss of mandibular ramus height exceeding 2 mm, as confirmed by thin-slice 3D CT. This approach was selected for 69.70% of the patients (►Table 3). The most frequently used approach was the transparotid retromandibular approach, followed by the preauricular approach for high condylar fractures (►Table 4; ►Figs. 1–2).

We observed 7 complications: 3 cases of peripheral facial paralysis (2 which resolved completely within 3 months, and 1 that resulted in permanent paralysis of the unilateral frontal branch), three cases of sialoceles (1 which improved with drainage and compressive dressing, and 2 that improved after a single session of botulinum toxin), and 1 case of TMD with reduced oral opening (►Figs. 3–4). The overall incidence of complications was of 25.92%, with sialoceles and peripheral facial paralysis each occurring in

Table 3 Treatment type

Treatment type	Number of cases	Percentage
Surgical	23	69.70%
Non-surgical	10	30.30%
Total	33	

Table 4 Approach routes

Approach routes	Number of cases	Percentage
Retromandibular	18	66.67%
Preauricular	9	33.34%
Total	27	

11.11% of the cases. The incidence of TMD was of 3.70% (►Table 5).

Discussion

The current study evaluated the incidence of complications in patients with condylar fractures who underwent surgical treatment. Consistent with our study, other authors^{2,10,12,15} have shown a predominance of condylar fractures in male patients of working age.

Motor vehicle accidents, followed by falls and physical assault, were reported as the main mechanisms of trauma in 3 recent studies^{2,16,17} that corroborate our findings, though the 2023 study by Tatsumi et al.¹⁷ identified falls as the most frequent mechanism. The high prevalence of unilateral fractures observed in our hospital, with a rate of 87.88%, is consistent with previous studies,^{2,10,13,15} which have reported rates of up to 89.7%.

Most of our patients (69.70%) underwent open reduction and internal fixation. Although a 2023 systematic review by Jazayeri et al.¹ reported benefits of the surgical treatment, particularly in patients with significantly-displaced fractures, recent studies^{2,13,18} indicate that the non-surgical management remains the predominant approach, contrasting with our findings. This discrepancy may be explained by

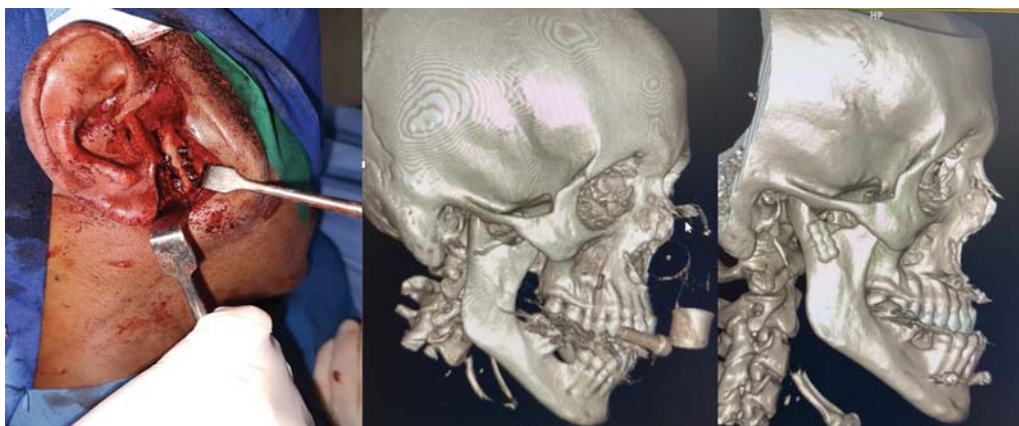
**Fig. 1** Patient with high condylar fracture undergoing open reduction and fixation via the preauricular approach.



Fig. 2 Patient with low condylar fracture undergoing open reduction and fixation via the transparotid retromandibular approach.



Fig. 3 Patient with paralysis of the frontal branch of the facial nerve.



Fig. 4 Patient with sialocele.

Table 5 Complication rates

Complications	Number of cases	Percentage
Peripheral facial paralysis	3	11.11%
Sialocele	3	11.11%
Temporomandibular joint dysfunction	1	3.70%
Total	7	25.92%

the fact that our hospital is a tertiary care center, to which only the most severe trauma cases are referred.

Consistent with our findings, other studies^{12,13,15,16} have also reported a predominance of the retromandibular approach over the preauricular approach. More recently, some

centers have begun to adopt the intraoral approach as an alternative to cutaneous techniques.

Peripheral facial paralysis may occur in transient or permanent forms. Its mechanism can involve compression from surgical retractors or direct nerve injury, and it can occur regardless of the surgical approach used. The literature reports an incidence ranging from 2.43% to 18.3%, consistent with our observed rate of 11.11%. Management strategies vary according to the cause and chronicity of the paralysis, typically involving multidisciplinary follow-up. Treatments range from less invasive options, such as botulinum toxin, to complex microsurgical procedures, which may include regional muscle transfers and cross-face nerve grafts.^{10,12,13,18,19}

Sialocele is associated with the retromandibular surgical route, in which the fracture is approached through the parotid gland. It occurred in 11.11% of our patients, compared with the rate of 15.8% reported by Kulkarni et al.¹² Management options for this complication include repeated aspirations, external compression, antisialagogue medications, botulinum toxin, radiation therapy, and, in rare cases, parotidectomy.¹²

Several studies, including the meta-analysis by Jazayeri et al.,¹ have evaluated TMD following condylar fractures, comparing non-surgical management with open reduction and internal fixation. The surgical treatment often yielded superior outcomes in terms of temporomandibular joint pain, lateral mandibular movements, and malocclusion. To the best of our knowledge, no research has compared different surgical approaches and their impact on TMD incidence. In the current study, TMD with reduced postoperative oral opening only occurred in 3.70% of the patients, whereas other authors^{1,13,18} have reported rates ranging from 10.8% to 17.1%; however, our sample size was smaller than those of previous reports.

The limitations of the present study include the relatively small sample size compared with larger specialized centers on cranio-maxillofacial trauma, as well as the potential for referral bias, since less complex cases may not be directed to our service, resulting in a higher proportion of severe presentations.

Conclusion

Although the indication for surgical treatment of mandibular condyle fractures is increasing, it carries the risk of postoperative complications that require recognition for their prevention or to establish the appropriate management.

Data Availability

Data will be available upon request to the corresponding author.

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Conflict of interests

The authors have no conflict of interests to declare.

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