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Research Article

Open Reduction and Internal Fixation of Subcondylar Fracture by Retromandibular Transmasseteric versus Transparotid Approaches

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Abstract

Background: Fractures of the mandibular condyle result in displacement of the condyle and decrease the ramus height. There are several surgical approaches for open treatment of the fractures. Surgical approaches to the fractured mandibular condyle are broadly classified into intraoral and extraoral approaches. A retromandibular approach is the most commonly used for open reduction and internal fixation of such fractures. ***Objective***: To compare the complications associated with a retromandibular transparotid approach with a retromandibular transmasseteric anterior parotid (TMAP) approach for their management. ***Methods***: Twenty-four patients were included in this study and divided into two groups: Group A included the retromandibular TMAP and Group B retromandibular transparotid approach. The variables evaluated were operating time and facial nerve injury at one week, four weeks, and three months. ***Results***: The mean age in groups A and B was 26.92 and 23.82 years, and there were 20 men and 4 women. The transparotid group showed a shorter incision time (13.8 min) compared to the transmasseteric group (26.3 min). The incidence of facial nerve injury was a single patient in the transparotid group and none in the TMAP group. The results did not show any significant difference in complications between the two approaches. ***Conclusions***: The retromandibular transparotid and transmasseteric approaches are safe and effective methods in the management of subcondylar fractures of the mandible.

Keywords: Fracture mandible, Retromandibular, Transmasseteric, Transparotid.

الاختزال المفتوح والتثبيت الداخلي للكسر تحت اللقمة عن طريق اسلوب عبر الكتلة خلف الفك السفلي مقابل النهبات النكفية

الخلاصة

الخلفية: تؤدي كسور اللقمة الفك السفلي إلى إزاحة اللقمة وتقليل ارتفاع الراموس. هناك العديد من الأساليب الجراحية للعلاج المفتوح للكسور. تصنف الأساليب الجراحية لقمة الفك السفلي المكسورة على نطاق واسع إلى مناهج داخل الفم وخارج الفم. النهج خلف الفك السفلي هو الأكثر استخداما للاختزال المفتوح والتثبيت الداخلي لمثل هذه الكسور. **الهدف**: لمقارنة المضاعفات المرتبطة بنهج النكف خلف الفك السفلي مع نهج الغدة النكفية الأمامية عبر الكتلة السفلية خلف الفك السفلي (TMAP) لإدارتها. **الطرائق**: تم تضمين أربعة وعشرين مريضا في هذه الدراسة وتم تقسيمه إلى مجموعتين: تضمنت المجموعة أ نهج TMAP خلف الفك السفلي والمجموعة ب نهج النكدة خلف الفك السفلي. كانت المتغيرات التي تم تقييمها هي وقت العملية وإصابة العصب الوجهي بعد أسبوع واحد وأربعة أسابيع وثلاثة أشهر. **النتائج**: كان متوسط العمر في المجموعتين A و 26.92 B و 23.82 سنة ، وكان هناك 20 رجلا و 4 نساء. أظهرت المجموعة الباروتية وقتا أقصر للشق (13.8 دقيقة) مقارنة بالمجموعة عبر الكتلة (26.3 دقيقة). كان حدوث إصابة العصب الوجهي في مريضا واحدا في المجموعة النكفية ولم يكن هناك أي مريض في مجموعة TMAP. لم تظهر النتائج أي فرق يعتد به في المضاعفات بين النهجين. **الاستنتاجات**: تعتبر الأساليب اللامعة خلف الفك السفلي وعبر الكتلة طرقا آمنة وفعالة في علاج الكسور تحت اللقمة في الفك السفلي.

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INTRODUCTION

In adults, condylar fractures account for 17.5% to 50% of all mandibular fractures [1]. Although there has been extensive research on condylar fractures, the management is still controversial, including whether open or closed treatment is more effective and which approach is better for open reduction and internal fixation [2]. There are several surgical approaches available for open treatment of the fractures, each with its own advantages and disadvantages. Surgical approaches to the fractured mandibular condyle are broadly classified into intraoral and extraoral approaches. Intraoral approaches can be performed with or without endoscopic assistance. Extraoral approaches are commonly used because they produce better visualization of the fracture site and therefore facilitate fracture reduction and fixation. However, extraoral approaches are complicated by the risk of injury to the facial, great auricular, and auriculotemporal nerves; visible scars; sialocele; Frey syndrome; and salivary fistulas. The most common extraoral approaches are submandibular, Risdon, preauricular, retroauricular, and retromandibular transparotid or transmasseteric approaches [3]. Traditionally, the retromandibular approach has been the most popular since it offers excellent visualization of the neck and base of the condyle and minimizes the

amount of space between the incision and the fracture. Through the retro-mandibular incision, fractures can be approached either through the parotid gland, as in the retromandibular transparotid approach, or via the retromandibular trans-masseteric anterior parotid approach (TMAP) [4]. A transparotid route involves dissecting the parotid capsule and parenchyma of the parotid to reach the fracture site. To reduce the risks of facial nerve injury and parotid-related complications resulting from transparotid surgery, the TMAP approach uses retromandibular incisions with a preauricular extension as the method of dissection (above the SMAS, anterior to the parotid, dissecting through the masseter muscle to bone). To prevent nerve damage, the TMAP approach uses the window between the buccal and marginal mandibular branches [5]. This study was designed to evaluate the operating time in minutes, which was measured from the first skin incision until the exposure of the fracture, total time of surgery, and complications of facial nerve injury between the retromandibular transparotid and the retromandibular TMAP approaches for the management of fractures of the mandibular condyles.

METHODS

Study design and setting

This retrospective study enrolled patients who underwent open reduction and internal fixation (ORIF) of subcondylar fractures through the retromandibular transparotid and transmasseteric anterior parotid TMAP approach from May 2021 to September 2023 in the department of Oral and Maxillofacial Surgery at Al-Yarmouk teaching hospital in Baghdad, Iraq. An analysis of the patients' records was conducted to report their age, gender, the mechanism of injury, the fracture patterns, operative time, and the complications of facial nerve injury.

Inclusion criteria

This study included individuals who were undergoing retromandibular transparotid or TMAP treatment for displaced or deviated mandibular subcondylar fractures.

Exclusion criteria

We excluded patients with closed treatment of mandibular subcondylar fractures, condylar head fractures, bilateral condylar fractures, and preoperative facial nerve palsies or weakness. Additionally, those who have previous operations in the retromandibular region, traumatic open lacerations in the condylar region, or missed follow-up visits were also excluded. Patients maintained on long-term immunosuppressive therapy had radiotherapy to the head and neck region, and those without a complete medical record and documentation were also excluded.

Interventions and outcome measurement

Using the TMAP method (group A) and the transparotid method (group B), we calculated a sample size of 24 fractures. We evaluated patients preoperatively using orthopantomogram (OPG) and computed tomography (CT) to assess fracture severity, as well as the dislocation and displacement of condyles. In accordance with Loukota et al.'s sub-classification [6], fractures were classified as condylar neck or condylar base. From the lowest point of the sigmoid notch on OPG, a line was drawn that was perpendicular to the back edge of the ramus. More than half the fractures that started above this line were fractures of the condylar neck, but if more than half of the fractures were shown below this line, they were classified as fractures of the condylar base. A preoperative facial nerve assessment was also done in accordance with House and Brackmann's (HB) facial nerve grading system [7]. Operating time in minutes was measured from the time taken from the start of the first skin incision up until the exposure of the fracture, and the total time of surgery was also measured. The standard surgical techniques of retromandibular transparotid and retromandibular TMAP approaches were followed. For the transparotid approach, surgery was done while the patient was under general anesthesia. It started with an incision above the ear, which is how common parotid surgery is done (with part of the skin cut in the external auditory canal and the great auricular nerve left alone). The facial nerve and its main branches were localized and separated, which limited the dissection to the fracture site and separated the facial nerve branches above from the parotid tissue around them so that they could be moved along a long tract. The fracture site was then found by cutting through the parotid gland tissue. The fracture was shown, and the facial nerve branches were moved as needed. The bone was then reduced and fixed with the right plates (2.0 mm) and screws, so the facial nerve was not hurt. The wound was closed in layers, particular care being taken with the parotid tissue and closure of the parotid fascia. After surgery, no intermaxillary fixation was performed. Analgesics and a soft diet were given in the post-operative period. An OPT was performed, in all cases, to check the state of the repositioned fragments. Patients were usually discharged 5-6 days post-operatively; they were recommended to eat soft food for 4-6 weeks and encouraged to practice opening and closing the mouth. For the transmasseteric approach, A preauricular incision is made that extends downwards in a curvilinear fashion in the cervicomastoid skin crease. The great auricular nerve is kept, and the flap is raised in the subdermal fat plane, just below the parotid duct and above the superficial musculoaponeurotic layer. This makes it possible to reach the masseter, which is next to the anterior-inferior edge of the parotid gland. Branches of the facial nerve are readily identified and avoided. The buccal branch is usually the only one seen (if any at all) in the area of dissection. The area next to the anterior edge of the parotid gland is usually relatively free of branches of the facial nerve, making the region

an ideal point to dissect down to the fracture. You can easily retract a buccal branch up or down if it crosses the field. The masseter splits in the direction of its fibers, which in the superficial plane run parallel to the anterior edge of the parotid. It is not necessary to sever the fibers to gain adequate access; this may be necessary as the fibers change direction in the deeper parts of the muscle. The periosteum is incised over the lateral aspect of the ramus in the region of the condylar neck, and the fracture site is exposed. If the incision is not immediately deep, you can easily find it by gently retracting the upper edge of the wound. Care should be taken not to include the condylar head in this retraction. The fracture is then reduced and fixed with appropriate plates and screws. The wound is closed in layers. We evaluated patients one week, four weeks, and three months postoperatively. Primary outcome variables were the incidence of facial nerve injury related to the surgical approach. The secondary outcome variable was operating time.

Statistical analysis

The GraphPad Prism program was employed to conduct all statistical analyses. Probabilities that were less than 0.05 were considered to be statistically significant. The chi-square test was employed to assess inter-group differences. Due to its retrospective character, the investigation is not subject to ethical review.

RESULTS

This study was conducted on 24 patients with a mean age of 25.5±5.9. The main cause of the fracture was road traffic accidents, followed by interpersonal violence and falls (62.5%, 16.7%, and 20.8%, respectively). Thirteen patients (11 males and 2 females) underwent the transmasseteric approach, and 11 patients (9 male, 2 female) received the transparotid approach for management of condylar fractures. The mean age was 23.82±5.95 years for the transparotid group and 26.92±6.03 years for the transmasseteric groups (Table 1).

Table 1: Patient characteristics

Characteristics	Group A TMAP	Group B Transparotid	*p*
No. of patients	13	11	
Mean (SD) age (year)	26.92±6.03	23.82±5.95	
Sex			
Males	11	9	1.0
Females	2	2	
Fractured side			
Left	5	2	
Right	8	9	0.04
Other associated fractures	10	8	
Fracture level			
Condylar neck	7	5	1.0
Condylar base	6	6	
Relation of condylar head with glenoid fossa			
Dislocated	8	4	0.4
Not dislocated	5	7	
Relation of fractured condyle with ramus			
Laterally displaced	4	6	0.4
Medially displaced	9	5	

Values were expressed as frequency, percentage, and mean±SD.

The transparotid group showed shorter incision time (13.8±6.6 min) compared to the transmasseteric group (26.3±6.14 min), and there was a statistically significant difference between the 2 groups (p<0.0002). While the total intraoperative time was slightly longer for the transparotid group (83.2±7.2 min) compared to the transmasseteric group (77.7±5.8 min). But there was no statistically significant difference between the 2 groups (p= 0.123). All patients in the transmasseteric group showed normal facial function (HB facial nerve grading system grade I normal). While for the transparotid group, 1 patient (9%) showed mild facial nerve paralysis (HB facial nerve grading system grade II mild dysfunction) immediately postoperative, but the patient was totally recovered at the 1-month follow-up visit. There were no statistically significant differences between the two groups at the initial and 3-month follow-up periods (p= 0.21 and 1.0, respectively). Permanent facial nerve injury was not seen in any patients in both groups (Table 2).

Table 2: correlation in variables between two groups

Variables	Group A (TMAP)	Group B (Transparotid)	*p*-value
Time of incision (min)	26.3±6.14	13.8±6.6 min	<0.0002
Total operative time (min)	77.7±5.8	83.2±7.2 min	0.123
Normal Facial nerve function (postoperative at once)	13(100)	10(90.9)	0.21
Normal Facial nerve function (after 3 months)	13(100)	11(100)	1.0

Values were expressed as mean±SD, frequency, and percentage.

DISCUSSION

A conservative or surgical approach can be used to treat condylar neck and subcondylar fractures, depending on several factors, such as the level of displacement, the position of the condylar head in relation to the glenoid fossa, the position of the fractured bone segments in the subcondylar region (with possible loss of vertical ramus height), the patient's age, dental health, any other facial or body fractures that may be present, the potential for good occlusion, and the patient's general health. Many factors contribute to the debate between open and closed treatment, with the most significant being the complexity of the necessary surgery. This surgery is the same or very similar for treating both condylar neck and subcondylar region fractures [8]. The optimum surgical approach to the mandibular condyle should be comfortable, the least intrusive way possible, provide satisfactory vision, be versatile, be quick to operate, and have the fewest surgical problems [9]. The chance of hurting the facial nerve and its branches, auricular anesthesia (paresthesia caused by damage to the greater auricular nerve), and

problems with the function of the parotid gland (sialocele, fistula, etc.) are all things that can go wrong during surgery [10]. We wanted to find the best way to treat mandibular subcondylar fractures in terms of time and risk of damaging facial nerves. This study looked at the retromandibular transparotid and transmasseteric approaches. There are many studies about the transparotid approach, while the studies of TMAP are relatively rare. The popularity of the transparotid approach may be attributed to its superiority over others, particularly due to its short access route. Orvakonde and Mutum (2020) [11] were the first to introduce the retromandibular transparotid method. When you use the transparotid approach, you cut along the space between the buccal and marginal branches of the facial nerve. Parallel to the branches of the facial nerve, a blunt dissection was performed because the nerve may be visualized and retracted under direct vision. The retromandibular method has fewer complications and more advantages, such as better access to the back edge of the ramus and the area under the condyle, and a shorter distance between the cut and the fracture site [12,13]. Wilson *et al*. [8] discussed the TMAP approach in relation to concerns about facial nerve damage. This approach uses the anatomical window between the buccal and marginal mandibular branches, which lowers the risk of nerve damage. This study indicates that TMAP has a lower chance of nerve injury after surgery. This pattern was also seen in our study. Nine percent of the patients in the transparotid approach group had a temporary, mild facial nerve injury that went away after three months, but none of the patients in the transmasseteric anteroparotid approach group had any facial nerve injury. A recent meta-analysis showed that the transparotid approach caused more temporary facial nerve damage than the transmasseteric approach [14]. These results are similar. However, not all advantages of the TMAP approach are present. Studies have demonstrated that the transparotid approach is significantly faster and requires almost half the exposure time [15,16]. In our study, the transparotid approach significantly reduced the incision time compared to the transmasseteric approach. This difference comes from the preauricular extension and the anterior dissection that is done with the transmasseteric approach to get to the masseter in front of the parotid gland [16]. However, the overall operative time was comparable in both groups, as the transmasseteric approach significantly improved access to the field, facilitating fracture reduction and fixation.

Conclusion

The retromandibular transparotid and transmasseteric approaches are safe and effective methods for treating a mandible fracture that occurs below the condyle. They facilitate the identification of the fracture and its proper repair, and the outcomes are generally satisfactory, with minimal complications. Rare and transient facial nerve injuries were sustained through these methods.

Conflict of interests

No conflict of interest was declared by the authors.

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Data sharing statement

Supplementary data can be shared with the corresponding author based on a reasonable request.

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