

Mini-retromandibular transparotid approach to subcondylar fractures of the mandible

A single Center clinical experience



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AIM: We evaluated the safety and efficacy using a mini-retromandibular transparotid approach to reduce and rigidly fix displaced mandibular condylar neck fractures.

MATERIAL OF STUDY: Retrospective evaluation of patients who underwent surgical reduction of condylar fracture from January 2012 to December 2014 at the Department of Cranio Maxillo-Facial Surgery of the University Hospital of Catanzaro, Italy. All the patients were clinically assessed for signs/symptoms of infection, signs of Frey's syndrome or salivary fistula, facial nerve palsy, postoperative scar, TMJ function, and occlusion with range of mouth opening and deviation.

RESULTS: The sample was composed of 15 patients. Good results were achieved in all patients and with an average follow-up of 20 months. No major intraoperative or postoperative complication remained at 6 months of postoperative follow-up.

DISCUSSION: Management of condylar fractures is still one of the most controversial topics in maxillofacial surgery. Regarding our experience with the mini-retromandibular approach, we evaluate the advantages in comparison with other extra-oral approaches. Advantages include the shorter working distance from the skin incision to the condyle with direct alignment of the fractured segments, less conspicuous facial surgical scarring with good cosmetic result, short operation time, with a low risk of postoperative complications and possible injuries of the facial nerve.

CONCLUSIONS: According to our results, we believe that the mini-retro-mandibular approach is a viable and safe approach for the surgical treatment of condylar fractures, with a relatively low risk of postoperative complications.

KEY WORDS: Condylar fracture, Extraoral approach, Mini-retromandibular access

Introduction

According to currently available epidemiological data mandibular condylar fractures are very common, occurring in 20-52% of all mandibular fractures. With regard to the specific site of condylar fractures, condylar neck

and subcondylar fractures are the most frequent statistically¹. The main causes of condylar fractures in Italy are road traffic accidents (approximately 50%), falls (30%) and personal violence (20%)². The management of these fractures has long been controversial, and for many years condylar fractures have been treated non-surgically using intermaxillary fixation and postoperative rehabilitation³. Over the years new indications and contraindications have slowly evolved on the basis of perceived advantages or disadvantages of one technique over another, and various authors attempt to formulate clear indications for the surgical treatment of mandibular condylar fractures^{4,5}. After open surgical treatment has gained prominence, the method of surgical intervention

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has also become a topic of discussion. Among the techniques for the extra-oral approach, the pre-auricular, sub-mandibular, and retromandibular approaches are used preferentially. Hinds and Girotti first described the retromandibular approach in 1967⁶ and in 1978 Koberg and Momma reported a modification of the technique⁷. Many authors specifically reported their experience with retromandibular approach in mandibular condyle fractures treatment⁸⁻¹⁵. The present study was carried out to evaluate the usefulness of mini retromandibular trans-parotid approach for open reduction and internal fixation of condylar fractures. According to this technique we have collected and retrospectively reviewed our first 15 condylar fractures treated with mini-retromandibular approach. The long-term results and complications are discussed, focusing on the aesthetic and functional outcomes, with regard to occlusion, protrusion and lateralization mandibular movements, maximum mouth opening, signs of Frey's syndrome, salivary fistula formation, and facial nerve palsy.

Material and Methods

The study was designed as a retrospective case-series study. Fifteen patients underwent open reduction and rigid fixation for 15 extracapsular subcondylar fractures at the Department of Cranio Maxillo-Facial Surgery of

the University Hospital of Catanzaro, Italy, between January 2012 and December 2014. Six patients presented with associated fractures (3 in the mandibular symphysis, angle or body, 2 involving the zygoma, orbit or nose, and 1 panfacial fracture). According to the cause of the trauma: in 10 cases (66.6%) the fracture was due to road accidents, in 4 cases (26.6%) to domestic accidents and in 1 case (6.8%) to acts of violence by others (Table I). The inclusion criteria were: age over 18 years; to have undergone a surgical operation with open reduction and internal fixation (ORIF) of condylar fractures by mini-retro-mandibular approach; the availability of exhaustive medical charts, including CT of preoperative and postoperative facial skeleton with a minimum follow-up of 12 months. Exclusion criteria were: age under 18 years; the adoption of any other non-surgical conservative approach; failure to collect exhaustive medical records; preoperative facial palsy. All the patients were clinically assessed for postoperatively local signs/symptoms of infection, signs of Frey's syndrome or salivary fistula formation, facial nerve palsy (evaluated using the House-Brackman Grading System)¹⁶ postoperative scar, postoperative occlusion (Fig. 5 C-D), TMJ function. After surgery, correct reduction of subcondylar fractures were evaluated by standard radiography (Fig 5 A-B) or computed tomography. The average time required to manage each condylar fracture was 40.22 minutes (20-55 minutes).

TABLE I - Description of the mandibular condylar neck fractures in the 15 patients

Case No	Sex	Age (years)	Type of fracture (side)	Associated mandibular fractures	Additional maxillofacial fractures	Cause of trauma	Operation time (min)
1	M	22	L deviation	Mandibular symphysis,		Road accident	
2	F	50	R displacement			Road accident	30
3	M	44	R displacement		zygomatic-orbital complex	acts of violence by others	
4	M	22	R deviation			Road accident	55
5	M	45	L deviation		zygomatic-orbital complex	Road accident	
6	M	35	L deviation			Domestic accident	49
7	M	31	R deviation	Mandibular symphysis,		Road accident	
8	F	28	R deviation		Le Fort I/II	Road accident	
9	M	27	R deviation	Mandibular body		Domestic accident	
10	M	55	L deviation			Road accident	57
11	F	65	L deviation			Road accident	48
12	M	57	R deviation			Road accident	30
13	M	22	L deviation			Road accident	45
14	F	40	R deviation			Domestic accident	28
15	F	71	L dislocation			Domestic accident	20
Mean		40.93					40.22

Results

The surgical approach used was a mini-retro-mandibular skin incision, about 2-3 cm long parallel to the posterior border of the mandible, beginning 0.5 cm below the earlobe (Fig. 2). In cases of other mandibular fractures these were usually first reduced and fixed rigidly (Fig. 2-D). We used bone anchor skeletal self-drilling screws with 0.3-mm steel wire, or dental arch bars to ensure the correct maxillo-mandibular fixation (MMF) for stable occlusion at the time of condylar fractures reduction and rigid fixation. Dissection was carried out in the sub-dermal fat plane. Incising the capsule entered parotid gland with a blunt-dissection towards the posterior border of the mandible. Pterygomasseteric muscle sling was identified and incised. Masseter muscle was stripped along with the periosteum from the angle of the mandible along the posterior border, as high as possible, and the fracture was exposed with the help of suitable retractors, and then reduced under direct vision (Fig. 2-B). Rigid fixation was carried out with two 2.0-mm locking miniplates. The first miniplate was fixed at the posterior border buttress of the mandibular ramus, and then screwed with 6-7 mm screws to the condylar segment.

The second 2.0 mm locking mini-plate was fixed at the anterior buttress of the condyle to the ramus in the same manner. Then in all cases a double-plate technique was used for stabilization (Fig. 2-C). No additional surgical incision was necessary. Occlusion was then confirmed and the wound was irrigated and checked for hemostasis, than we verified that watertight closure of the parotid capsule was achieved. The incisions were closed in layers with resorbable sutures and the skin closure was made with non-resorbable sutures (Fig. 2 E-F). All of the MMF materials were removed before wound closure, except in 1 cases in whom the fracture sites were in both the midface and mandible. No postoperative MMF or training elastic was used in the other 14 patients. An intravenous antibiotic (1.0 g Cefazolin sodium/12 h) was administered on admission to the hospital and continued until the third postoperative day. A liquid diet was initiated on the first postoperative day, followed by instructions for a soft diet for the next 4 weeks. The fractures brought to our attention were, in 60% of cases (9 patients), isolated condylar fractures. The others six patients (40%) presented with associated fractures: 2 patients (13.3%) had associated parasymphysal mandibular fractures, 1 patient (6.7%) had associated

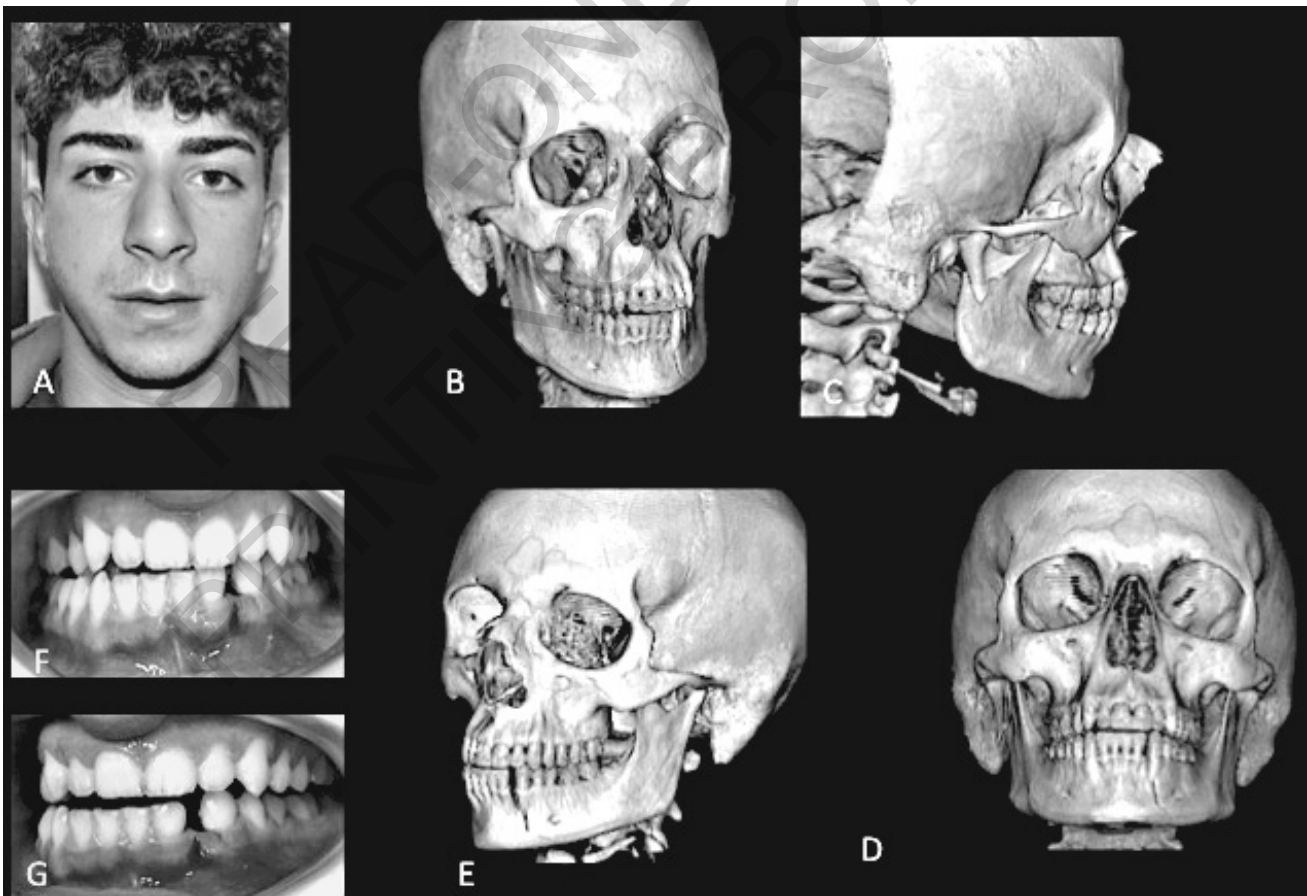


Fig. 1: Pre-operative view: swelling of right temporomandibular region (A); malocclusion with right cross-bite (F-G); TC scans showing right subcondylar fracture and left mandibular symphysis fracture (B-C-D-E).

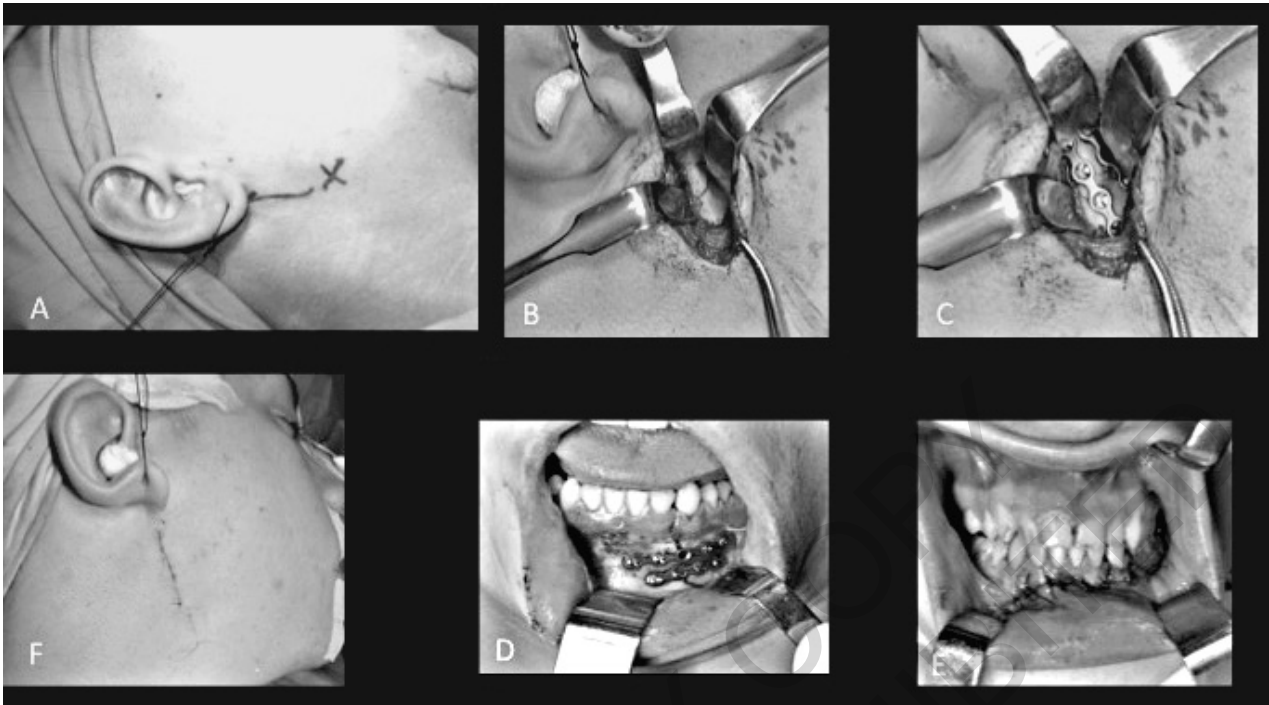


Fig. 2: Intraoperative view: skin incision parallel to the posterior border of the mandible (A); exposure under direct vision of fracture's line (B); subcondylar rigid fixation with two 2.0-mm locking mini-plates (C); mandibular symphysis fracture reduction and rigid fixation (D). Intraoral and extra-oral sutures (E-F).

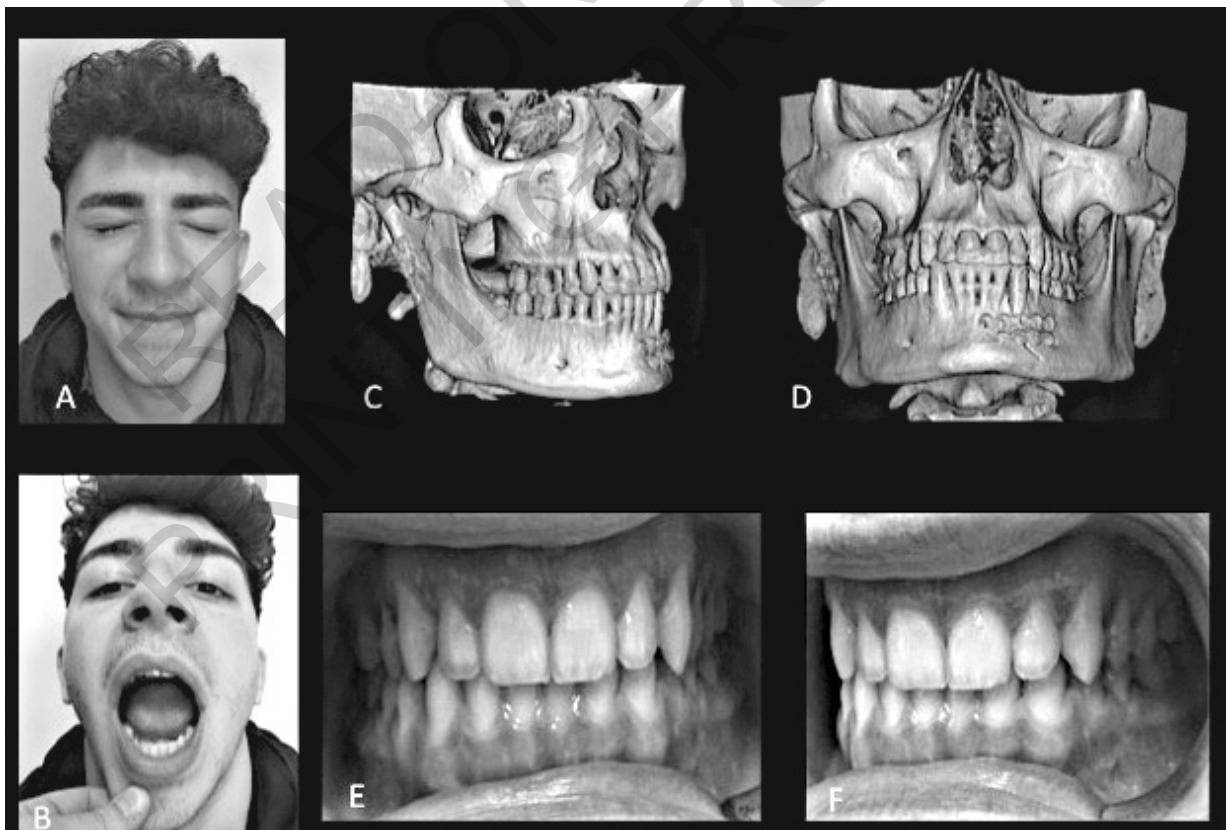


Fig. 3: Postoperative patient photograph shows integrity of facial nerve and mimical movement (A); right maximum opening without pain > 40mm (B); TC scans revealed proper approximation of fracture segments (C-D); occlusal views with normal occlusion and correction of preoperative right cross-bite (E-F).

TABLE II - Post-operative mandibular motion values, according to Okeson physiological values 25

Physiological values of the mandibular motion	Number of patients
Maximal mouth opening (mm)	
> 40 mm	10 patients (67%)
< 40 mm	5 patients (33%)
Lateral movement contralateral to the side of the fracture (mm)	
> 8 mm	8 patients (54%)
< 8 mm	7 patients (46%)
Lateral movement homolateral to the side of the fracture (mm)	
> 8 mm	9 patients (60%)
< 8 mm	6 patients (40%)
Maximal protrusion (mm)	
> 8 mm	1 patients (7%)
< 8 mm	14 patients (93%)

TABLE III - Postoperative complications

Postoperative complications (n= 15)	Time interval after operation		
	1 week	1 month	6 months
Clinical evaluation			
Surgical site infection	0	0	0
Malocclusion	0	0	0
Salivary (parotid) fistula	2	0	0
Facial nerve palsy	1	1	0
Surgical scar perceptibility	0	0	0
Radiological evaluation			
Breakage of plates	0	0	0
Screw loosening	0	0	0

mandibular body fractures, in other 2 patients (13.3) the fracture was associated with zygomatic-orbital complex fracture and in 1 case (6.7%) it was associated with pan-facial trauma. According to the cause of the trauma: in 10 cases (66.7%) the fracture was due to road accidents, in 4 cases (26.6%) to domestic accidents and in 1 case (6.7%) to acts of violence by others. The length of the procedures was evaluated for isolated condylar fractures considering the effective surgical time from incision to suture, amounted to an average of 40.22 minutes (20-55 minutes). Good results were achieved in all patients and with an average follow-up of 20 months (range 12-

24), no major postoperative complication remained at 6 months of postoperative follow-up (Table III). No intra-operative major complication, such as hemorrhage and surgical site infection, occurred in any of the patients. Two salivary fistula was observed postoperatively, and there were managed with direct drainage (Fig. 4) and then conservatively with a compression dressing and antibiotic therapy. Exudation of saliva ceased following 15 days of gauze compression, and in one case it was successfully treated using transdermal scopolamine: as described by Becelli et al.

Proper occlusion and physiological function values of mandibular movement were carefully evaluated before and after surgical treatment (Fig. 3 B-E-F). All the 15 patients had a maximum mouth opening without pain between 20 and 51 mm (average, 36 mm), the maximum opening, between 19 mm and 54 mm (average, 40.8 mm), and the passive opening, between 22 mm and 61 mm (average, 43 mm), (Table II). None of the patients experienced pain in the temporo-mandibular region, in the advanced period. Considering the temporo-mandibular joint movements, twelve patients were found to have good excursive movements, both in lateralization and in protrusion. In 3 cases mandibular movements were somewhat limited and exercises or physiotherapy cycles were recommended. These patients were trained to perform a set of exercises 3 times a day, with 10 minutes spent for each movement, consisting of forced active and passive mouth opening. Transient facial Nerve weakness (Grade II House-Brackman Grading System) was observed in 1 patient, which resolved after 3 months postoperatively. No cases of permanent injury to the facial nerve were reported in any of the patients



Fig. 4: Salivary fistula observed postoperatively. It was managed with direct drainage and then conservatively with a compression dressing and antibiotic therapy.

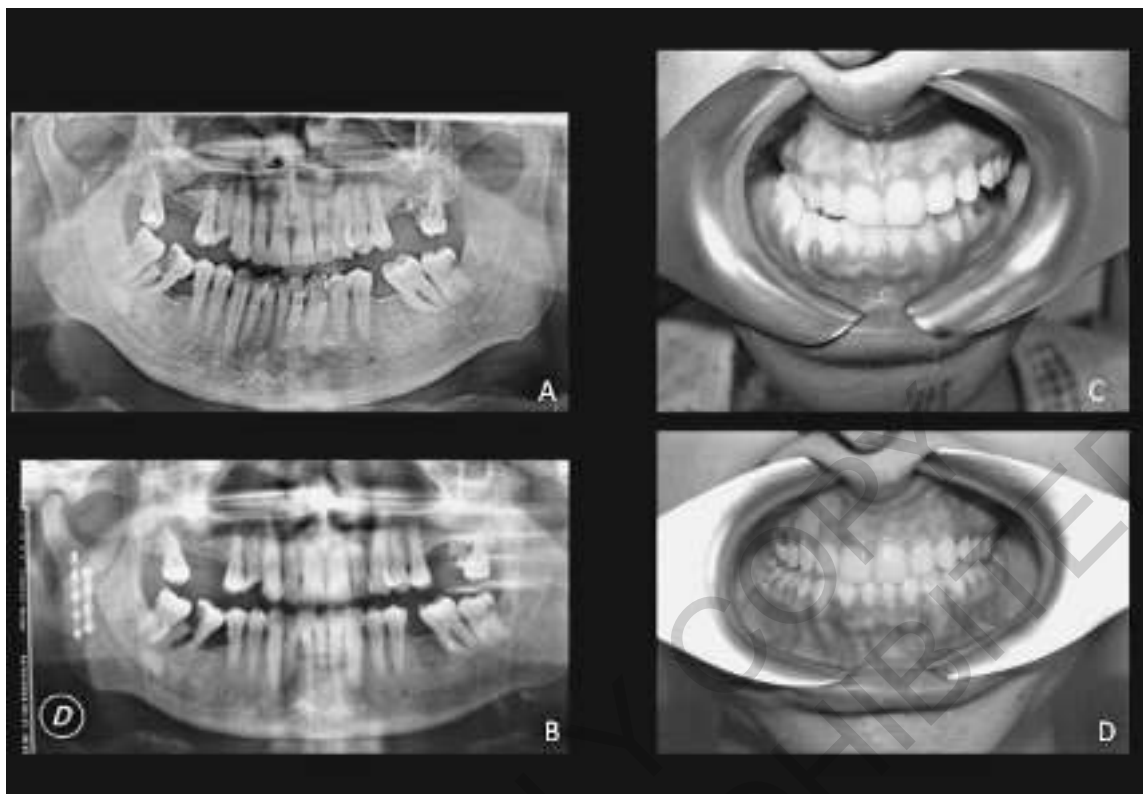


Fig. 5: Preoperative and postoperative dental panoramic radiographs (A-B) show proper approximation of fracture fragments. Preoperative and postoperative occlusions show correction of post-traumatic right cross-bite(C-D).

treated with mini retro-mandibular access. Evaluation of surgical scar was done at 3 and 6 months postoperatively and excellent aesthetic outcomes were found in all cases. On radiographic assessment, (Fig. 3 C-D and Fig. 5 A-B) at intervals of 24 hours, 3 and 6 months postoperatively, were evaluated the approximation of fracture fragments, plate fracture and screw loosening and in all cases, the radiographs revealed proper approximation of fracture fragments with good bone healing. No evidence of plate exposure, and screw loosening at fracture site was observed. Patients were seen at 1, and 2 weeks and 1, 3, 6 12 and 24 months postoperatively for regular check-ups, and as necessary for the possible presence of other surgical complications.

Discussion

Management of condylar fractures is still one of the most controversial topics in maxillofacial surgery given a variety of therapeutic options. For this reason no gold standard treatment method has been yet defined. Conservative treatment of condylar fractures in both young people and adults has long been the method of choice. Several studies have focused on the absolute and relative indications for the open reduction of mandibular condylar fractures and various authors attempt to for-

mulate clear indications for the surgical treatment of mandibular condylar fractures⁴⁻⁵. The current literature contains many indications for, and methods of, mandibular condylar fracture treatment, and also if absolute and relative indications to open reduction and internal fixation (ORIF) of such fractures have been established, the treatment plan is often too dependent on the preferences and personal experience of the surgeon¹⁸⁻²¹. After open surgical treatment has gained prominence, the method of surgical intervention has also become a topic of discussion. Among the techniques for the extra-oral approach, the pre-auricular submandibular, and retro-mandibular approaches are used preferentially²².

The pre-auricular approach is generally suitable for intracapsular condylar fractures, and the fracture line must be extended over the inferior of the ear in sub-condylar fractures. The submandibular approach provides a wide field of vision, but the length of the incision scar (4-5 cm) is an important disadvantage²⁵. Several modifications have been made to the submandibular approach for the sake of facial nerve preservation, by placing skin incisions more posteriorly and vertically adjacent to the mandibular angle (Risdon approach), compared to the traditional submandibular approach. Another variant of submandibular and Risdon approaches is called the modified Risdon approach, in which a curvilinear incision

Riassunto

about 3 to 5 cm in length is placed 1.5 to 2 cm below the edge of the angular region and curved superiorly, extending about 2 cm below the lobe of the ear ²⁶.

G. Gerbino et al., in 2009 observed that transient facial nerve weakness occurred more frequently in fractures that were treated via a submandibular approach, which requires extensive stretching of nerve branches when exposing the condylar region. According to their results they found retro-mandibular approach superior to other surgical approaches for condylar fractures ²⁴. Additional demonstrations that this technique is reliable and enables the safe management of condylar fractures at all levels, come from worldwide experience of Girotto et al. in 2012; Coletti et al. in 2103; Kanno et al in 2014, Dalla Torre et al in 2015 and D'Agostino et al in 2016 ^{13,14, 15,28,29}. Regarding our experience with the mini-retro-mandibular approach, we evaluate the advantages in comparison with other extra-oral approaches for condylar neck fractures. Advantages include the shorter working distance from the skin incision to the condyle and better access to the posterior border of the mandible and to the sigmoid notch, with direct visual alignment of the fractured segments. Other advantages include less conspicuous facial surgical scarring, of about 2-3 cm with good cosmetic result, a minimally invasive procedure, short operation time, short learning curve on the part of the surgeon, with a relatively low risk of post-operative complications and possible injuries of the facial nerve. In our clinical practice, no intraoperative major complication, such as hemorrhage, occurred in any of the patients. Vesnaver et al. have reported salivary fistula formation as complication with this kind of approach in 14% of cases ³⁰. In our study two patients developed a salivary fistula (13,3%). Patients were also followed for Frey's syndrome, and no cases of Frey's syndrome were observed in this series, which is consistent with the literature ³¹⁻³². In our study in only one case (6.7%) transient facial Nerve weakness (Grade II House-Brackman Grading System) was observed, which resolved after 3 months postoperatively. Our results are in line with studies stating the possible onset of transient palsy of the facial nerve of between 13-22% of cases treated with retro-mandibular access ³³⁻³⁵.

Conclusion

In conclusion, our experience with fifteen patients in this retrospective case series study, suggested that displaced subcondylar mandibular fractures could be successfully treated via a mini retro-mandibular trans-parotid surgical approach and rigid internal fixation using two 2.0-mm locking mini-plates. According to our results, by this surgical technique it's possible to obtain a good skeletal reduction and immediate function recovery, with good cosmetic results and low morbidity.

SCOPO: Le fratture condilari mandibolari, rappresentano tra il 20 ed il 52 % di tutte le fratture mandibolari. Abbiamo valutato la sicurezza e l'efficacia dell' 'approccio mini retromandibolare transparotideo nelle fratture scomposte del collo condilare.

MATERIALI E METODI: L'analisi retrospettiva è stata condotta sui pazienti sottoposti a intervento di riduzione e contenzione di fratture condilari da Gennaio 2012 al Dicembre 2014 presso l'Unita Operativa Complessa di Chirurgia Maxillo Facciale del Policlinico Universitario Magna Grecia di Catanzaro. Per ciascun paziente sono stati valutati I seguenti indici: segni di infezione, sindrome di Frey, comparsa di fistole salivari post operatorie, deficit temporanei o permanti a carico del nervo facciale, esiti cicatriziali funzionalità dell'articolazione temporomandibolare pre e post operatoria, e occlusione pre e post operatoria .

RISULTATI: Il campione preso in analisi comprende 15 pazienti. Sono stati ottenuti ottimi risultati in tutti i pazienti, nessuno dei quali presentava a sei mesi dall'intervento chirurgico, alcuna delle complicanze post operatorie prese in analisi.

DISCUSSIONE: La gestione ed il trattamento delle fratture condilari è ancora oggi uno degli argomenti più controversi in traumatologia Maxillo Facciale. Abbiamo preso in considerazione i vantaggi dell'approccio mini retro mandibolare rispetto agli altri accessi extraorali descritti in letteratura. Tali vantaggi consistono, nella riduzione delle dimensioni della ferita chirurgica, così come della distanza operatoria tra l'incisione cutanea e il condilo, con una visione diretta della rima di frattura e una conseguente più agevole riduzione e contenzione della stessa, con tempi operatori minori, ottimi risultati estetici e basso rischio di complicanze post-operatorie, tra cui in particolare il deficit a carico del nervo facciale.

CONCLUSIONI: Alla luce dei risultati ottenuti, crediamo che l'approccio mini retromandibolare sia un approccio sicuro ed agevole per il trattamento delle fratture condilari, con un basso rischio di complicanze post operatorie .

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