Efficacy of the Retroparotid Trans-Masseteric Approach via Retromandibular Incision in ORIF of Subcondylar Fractures: Our Institution Experience

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Abstract

Background Fractures of the mandible subcondyle have always presented a challenge to the maxillofacial surgeon, with a myriad of treatment options existing ranging from conservative management to open reduction and internal fixation (ORIF) to condylotomy. The complex anatomy of the region poses a challenge, with injury to the facial nerve branches being the primary concern.

Objective This study evaluated the efficacy of a modified retromandibular approach, with retroparotid trans-masseteric dissection for ORIF of subcondylar fractures.

Methodology Twenty-five patients with subcondylar fractures at varying levels were treated surgically by ORIF using this approach.

Results All patients managed by this modified retromandibular approach had satisfactory results with restoration of vertical ramal height, satisfactory mouth opening, stable occlusion and no facial nerve damage post-op.

Conclusion In our study, the modified retromandibular approach, with retroparotid trans-masseteric approach was effective in surgical management of subcondylar fractures by ORIF with minimal complications.

Keywords Subcondyle fractures · Retromandibular · Retroparotid approach

Introduction

The management of mandible subcondylar fractures has always been a much debated, discussed and deliberated topic among the maxillofacial surgical fraternity. The decision to operate or manage conservatively has loyal supportists with pros and cons to back them up.

Literature now suggests that, compared with conservative treatment, the management of subcondylar fractures by open reduction and rigid fixation produces superior anatomic results with faster restoration of function and form [1, 2]. Non-operative or conservative treatment is still warranted in cases such as intracapsular or comminuted fractures and pediatric patients with subcondylar fractures [3, 4]. A myriad of approaches to the condyle have been reported and are broadly divided into two main categories, intraoral and extraoral. Some surgeons prefer an intraoral route, stating advantages of less risk to the facial nerve decreased potential for facial scarring [5, 6]. However, the intraoral route demands specific instruments, an endoscope and additional surgical training in endoscopes. Further, the intraoral route can be technically demanding and inadequate when treating high or medially displaced fractures, producing suboptimal reduction of the fractured segments [7, 8].

Surgical management of subcondylar fractures have a myriad of approaches, each associated with certain unresolved issues with facial nerve injury and scarring being of primary concern. High condylar and condylar neck fractures are efficiently approached using the preauricular approach [9]. The retromandibular and mini retromandibular approach allow good access to condylar neck and mid-level fractures with minimal risk to facial nerve while leaving a well concealed scar [10]. However, these approaches would not serve the purpose for lower level and classically subcondylar level fractures, for which the classic submandibular approach is

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best suited. Many of these extra oral approaches are technically demanding, presenting risk of injury to facial nerve branches and limited exposure for access regarding reduction of medially displaced condylar segments.

Newer procedures such as endoscopic surgery or the retromandibular anterior parotid trans-masseteric (APTM) approach provide adequate access while maximizing safety of the facial nerve branches [11].

In our approach, we use a retromandibular incision, with a modified approach to the mandible subcondylar region, minimizing facial nerve injury as well as parotid dissection while providing adequate access to fracture segments.

Materials and Methods

A total of 25 patients were taken up for ORIF of mandible subcondylar fractures from July 2013 to June 2016 of which 20 were males and 5 females. The age group of

patients included was 16–49, with an average age of 31 years. The mechanism of injury was via motor vehicle accidents in 13 patients, six had an accidental fall, three presented with interpersonal violence and three via contact sports. Nineteen patients had unilateral subcondylar fractures, and five patients had bilateral mandibular subcondylar fractures. Five patients were associated with mid-facial fractures, 11 had concomitant mandible parasymphysis and five with concomitant symphysis fractures, whereas four were isolated subcondylar fractures. Thus, a total of 29 mandible subcondylar fractures were operated upon. Of these, nine were of high condylar level, seven at the level of the condylar neck and 13 were low condylar with the fracture line passing below the condylar neck, but not low enough toward the ramus to warrant a Risdon's/Submandibular approach. As per Lindhal's classification [12], 20 were extra capsular and 9 subcondylar. Preoperative assessment consisted of clinical assessment (Fig. 1a, b) orthopantomographs (OPG) (Fig. 2a, b) and computed

Fig. 1 a and b Preoperative frontal view

Fig. 2 a and b Orthopantomograph (OPG) depicting bilateral subcondylar fractures

Fig. 3 **a** and **b** Computed tomography depicting displacement of condyles

Fig. 4 **a** and **b** Retromandibular incision marking

tomography (CT) (Fig. 3a, b) to determine degree of displacement and ramus shortening. Inclusion criteria were: (a) the presence of an extracapsular mandibular condylar fracture; (b) availability of pre- and postoperative panoramic radiographs; (c) mental status level permitting an adequate neuromotor examination; (d) no functional deficit of the facial nerve postinjury/pre-treatment; (e) systemically compromised patients unfit for surgery/general anesthesia. Patients were excluded if they had an intracapsular condylar fracture, lacked the mentioned imaging, presented with signs of facial nerve damage prior to treatment, or were incapable of completing an adequate facial nerve functional examination postoperatively due to intoxication, severe head injury or inability to communicate (sedated or intubated patients). The institutional review board approved the study. Preoperative evaluation for general anesthesia was carried out, and preanesthesia check up was done. Written informed consent was obtained from

patients, and all cases were carried out under general anesthesia.

Surgical Technique

Patients were surgically scrubbed and draped aseptically. A standard 2-cm long vertical retromandibular incision extending from just below the radix of the ear inferiorly toward the mandibular angle was marked, without a preauricular limb (Fig. 4a, b). Vasoconstrictor consisting of 1:100,000 concentration adrenaline in normal saline was infiltrated along the proposed incision line. Skin incision was carried through the subcutaneous tissue and layer wise meticulous dissection done incising SMAS to reveal the glistening parotid fascia. Here, tunneling was done evenly in superior, inferior, anterior and posterior directions, without incising/penetrating the parotid

Fig. 5 a and b Anterior and superior retraction of parotid gland to expose the fracture segments

Fig. 6 a and b Fixation of fracture fragments

capsule. Anterior dissection was not carried out till the anterior border like in the APTM (anteroparotid trans-masseteric approach), but was restricted, whereas dissection inferiorly was carried out till the tail of the parotid. Blunt dissection of the parotid-masseteric fascia was carried out, more so along the posterior and inferior borders of the parotid, in order to clearly identify/delineate the parotid and free the parotid gland off the underlying masseter muscle. Next, the parotid gland was retracted superiorly and anteriorly using two Langenback retractors to give access to the masseter muscle overlying the posterior border of the ramus (After blunt dissection of the parotid-masseteric fascia, especially around the posterior and inferior borders, a cleavage is developed between the parotid capsule and the underlying masseter muscle and the parotid gland is retracted superiorly and anteriorly). On exposure of the masseter muscle, blunt

dissection along the masseter muscle fibers was carried out using artery forceps, without incising the muscle, and also placed below the Langenback retractors. When periosteum was exposed, it was sharply incised and stripped using a sharp Molt's periosteal retractor to expose the fracture site/fragments. Figure 5a, b depicts exposure of the fracture fragments posterior to the parotid gland, along the posterior border of the ramus with anterior and superior retraction of the parotid gland, bluntly dissected masseter and periosteum (yellow arrows indicating direction of retraction) and a reverse Langenback retractor placed along the posterior border to stabilize the fracture segments.

Fixation was carried out using titanium microplates and screws with one plate along the posterior border and one anteriorly at the sigmoid notch region (Fig. 6a, b). Intra-operatively, occlusion was verified and MMF done prior to

Fig. 7 **a** and **b** Post-op OPG depicting fixation

fixation. Concomitant mandibular fractures at other sites were also reduced and fixed, with the anterior/tooth bearing segment fracture site being fixed first, followed by fixation of the condyle. In cases of bilateral condylar fractures, the less displaced side was fixed first. In bilateral condylar fractures, where the condylar head was fractured, with a medial pole fracture and not fit/suitable for fixation, the retrieved fragment was discarded and the distal condylar stump smoothed for articulation and remodeling in the fossa. A closed circuit suction drain was placed and meticulous layer wise closure was done.

Postoperatively, patients were placed on liquid diet for 48 h and soft diet thereafter for a period of 2 weeks, gradually progressing to self-limiting physiotherapy, mouth opening improvement and a normal diet after 3 weeks. All patients were regularly monitored postoperatively clinically and radiographically. Postoperatively, patients were monitored clinically for pain using visual analogue scale, dental occlusion, mouth opening, mandibular movements in lateral and protrusive movement, TMJ dysfunction like clicking, crepitus and pain (pertaining to disk displacement), occurrence of sialoceles, scar quality, hematoma, facial nerve palsy and surgical site infection. The radiologic follow-up examinations consisted of OPGs (Fig. 7a, b) to assess the position of the plate, fracture reduction and additional displacement if any. Subsequently, outpatient follow-up visits were done at 1-month, 3-month and 6-month duration.

Results

Satisfactory results were achieved. Out of 29 condyles operated for 25 cases, posterior ramal height and facial symmetry was restored in all cases. Average mouth opening of 40 mm (Fig. 8) was achieved with full range of mandibular movements. The postoperative functionality of

Fig. 8 Post-op mouth opening

the facial nerve was evaluated using the House-Brackmann Facial Nerve Grading System. Transient facial nerve palsy (marginal mandibular nerve) was seen immediate post-op in four cases which resolved completely in 4 weeks. Stable occlusion was achieved in 21 patients (Fig. 9), four patients with occlusal discrepancy postoperatively were managed by Arch bars and guiding elastics which settled in 3–4 weeks. Two patients developed a sialocele, which was managed conservatively by securing an intracath IV canula minus the stylet in a manner allowing gravitational dependent drainage of saliva and allowing healing of the fistula by secondary healing over a period of 5–7 days (Fig. 10). Two patients developed TMJ dysfunction with pain, clicking and reduced mouth opening, indicating probable disk displacement, plate bending and displacement of the fractured condylar segment medially in one case due to early, over aggressive postoperative

Fig. 9 Stable post-op occlusion **Fig. 10** Conservative management of sialocele **Fig. 11** Scar at 1 week post-op, at the time of suture removal

physiotherapy and mouth opening. There were no cases of surgical site infection. All patients had a minimally visible, esthetic scar (Fig. 11).

Discussion

Management of mandibular subcondylar fractures has been one of the most debated controversies of maxillofacial trauma. Further, the options existing for surgical management of the same can be confusing for the inexperienced

maxillofacial surgeon. The ideal surgical approach for ORIF of subcondylar fractures should provide adequate access, be least invasive, rapidly performed, have minimum morbidity and be associated with minimal potential complications. Surgical approaches can be broadly divided into intraoral and extraoral. The intraoral approach is technically more demanding, requires endoscopes, specific training and longer operating time. The extraoral approaches are basically three, namely, the preauricular, the retromandibular and the submandibular approach.

Hinds and Girotti [13] first described the retromandibular incision for good exposure of the mandibular condyle. As compared to the submandibular approach, this incision allowed direct access to the mandibular ramus and condylar process. The traditional retromandibular approach traverses the parotid gland and requires careful dissection of facial nerve branches. Variations of the retromandibular approach that exist are trans-parotid, transmasseter, high cervical trans-masseteric anteroparotid, mini retromandibular and retroparotid approach [14–16]. The anteroparotid as well as the high cervical trans-masseteric approach causes a temporary facial nerve palsy in 30–50% of cases as a result of intraoperative visualization of facial nerve branches [17, 18]. Our approach to the subcondyle and ramus region via a retroparotid direction, by retracting

the parotid gland in toto in a superior and anterior direction and dissecting bluntly through the masseter muscle, minimizes nerve injury and provides adequate access. The approach is retroparotid and not trans-parotid or anteroparotid. The parotid parenchyma is not dissected to expose the facial nerve branches. The facial nerve branches along with the parotid gland are retracted completely safely superiorly and not by creating a window for access between any two facial nerve branches. This is unlike the APTM or trans-parotid approaches where access to the fracture site is via a window between the nerve branches.

As the dissection is carried out by developing a cleavage between the parotid capsule and the underlying masseter muscle, the parotid gland can be retracted quite easily in toto without worrying about the facial nerve branches. Further, after easily retracting the parotid gland, blunt dissection through the underlying masseter muscle provides wider and quicker access to the fracture site.

We had transient palsy of the marginal mandibular nerve in only four cases postoperatively, which responded well to corticosteroid therapy and resolved in 4 weeks.

The scar produced is esthetic and barely 2 cm long. As the parotid capsule is preserved, occurrence of salivary fistulas is nil. We had two patients with a sialoceles postoperatively, due to inadvertent rupture of the parotid capsule during harder retraction in high condylar fractures. In both cases, the sialoceles were managed conservatively and resolved completely. Another advantage of approaching from a retroparotid direction is shorter operating time, as time-consuming dissection to identify and preserve the facial nerve branches is avoided.

Conclusion

In our experience, the modified retromandibular approach, with retroparotid trans-masseteric approach, provides adequate access, is least invasive, has relatively short operating time and is associated with fewer potential complications. The results achieved with the retroparotid trans-masseteric modification of the retromandibular approach were clinically and radiologically validated, and this approach was thus effective in surgical management of subcondylar fractures by ORIF with minimal complications.

Compliance with Ethical Standards

Conflict of interest None.

References

1. Haug RH, Brandt MT (2007) Closed reduction, open reduction, and endoscopic assistance: current thoughts on the management of mandibular condyle fractures. *Plast Reconstr Surg* 120(Suppl. 2):90S
2. Palmieri C, Ellis E III, Throckmorton GS (1999) Mandibular motion after closed and open treatment of unilateral mandibular condylar process fractures. *J Oral Maxillofac Surg* 57:764
3. Myall R (1994) Condylar injuries in children: What is different about them? In: Whortington P (ed) *Controversies in oral and maxillofacial surgery*. WB Saunders, Philadelphia, pp 191–200
4. Hovinga J, Boering G, Stegenga B (1999) Long term results of nonsurgical management of fractures in children. *Int J Oral Maxillofac Surg* 28:429
5. Silverman SL (1925) A new operation for displaced fractures at the neck of the mandibular condyle. *Dentisto Cosmos* 67:876
6. Jacobovitz J, Lee C, Trabulsy PP (1998) Endoscopic repair of mandibular subcondylar fractures. *Plast Reconstr Surg* 101:437
7. Schneider M, Lauer G, Eckelt U (2007) Surgical treatment of fractures of the mandibular condyle: a comparison of long term results following different approaches—functional, axiographical, and radiological findings. *J Cranio-Maxillofac Surg* 35:151
8. Loukota RA (2006) Endoscopically assisted reduction and fixation of condylar neck/base fractures—the learning curve. *Br J Oral Maxillofac Surg* 44:480
9. Vesnaver A, Gorjanc M, Eberlinc A et al (2005) The periauricular transparotid approach for open reduction and internal fixation of condylar fractures. *J Cranio-Maxillofac Surg* 33:169
10. Biglioli F, Colletti G (2009) Transmasseter approach to condylar fractures by mini-retromandibular access. *J Oral Maxillofac Surg* 67:2418–2424
11. Trost O, Abu El-Naaj I, Trouilloud P et al (2008) High cervical transmasseteric anteroparotid approach for open reduction and internal fixation of condylar fracture. *J Oral Maxillofac Surg* 66:201
12. Lindahl L (1977) Condylar fractures of the mandible. Classification and relation to age, occlusion, and concomitant injuries of teeth and teeth-supporting structures, and fractures of the mandibular body. *Int J Oral Surg* 6:12–21
13. Hinds E, Girotti W (2001) Vertical subcondylar osteotomy: a reappraisal. *J Oral Surg* 24(164):170
14. Ellis E, McFadden D, Simon P, Throckmorton G (2000) Surgical complications with open treatment of mandibular condylar process fractures. *J Oral Maxillofac Surg* 58:950–958
15. Tang W, Gao C, Long J, Lin Y, Wang H, Liu L et al (2009) Application of modified retromandibular approach indirectly from the anterior edge of the parotid gland in the surgical treatment of condylar fracture. *J Oral Maxillofac Surg* 67:552–558
16. Chossegros C, Cheynet F, Blanc J-L, Bourezak Z (1996) Short retromandibular approach of subcondylar fractures. Clinical and radiologic long-term evaluation. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 82:248–252
17. Trost O, Trouilloud P, Malka G (2009) Open reduction and internal fixation of low subcondylar fractures of mandible through high cervical transmasseteric anteroparotid approach. *J Oral Maxillofac Surg* 67:2446–2451
18. Manisali M, Amin M, Aghabeigi B, Newman L (2003) Retromandibular approach to mandibular condyle: a clinical and cadaveric study. *Int J Oral Maxillofac Surg* 32:253–256