Retroauricular Transmeatal Approach to Manage Mandibular Condylar Head Fractures

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Background: There is a multitude of reported surgical approaches and technical variants with some unresolved technical problems to gain direct access to mandibular condylar head fractures; they can be divided into 2 groups: intraoral and extraoral. In 2005, Neff et al (*Mund Kiefer Gesichtschir* 2005;9:80), supported by a previous experimental work, reported a successful clinical study of condylar head fractures treated by a retroauricular approach; this article is in German, and the later English-language literature does not mention about this approach to open reduction and internal fixation of mandibular condylar fractures. The retroauricular transmeatal access, selected and performed by the senior author to treat 14 patients affected by highly located condylar head fracture, is illustrated in details.

Methods: We collected data of 14 consecutive adult patients who, after the discussion about all options, had consented to have 16 mandibular condylar head fractures treated with open reduction and internal fixation by miniplates and screws via a retroauricular transmeatal approach. We exposed the temporomandibular joint area easily and better by dissecting via a retroauricular route with identification, ligation, and transection of the retromandibular vein; because of the posterior access, the frontal branch of the facial nerve and the auriculotemporal nerve are located and protected within the substance of the anteriorly retracted flap, superficial to the retromandibular vein. The follow-up clinical examination showed temporary weakness of the frontal branch of the facial nerve in 1 case with a recovery to normal function of 1.6 months; no patients had permanent weakness of the facial nerve or injury of the auriculotemporal nerve. There was absence of any salivary fistula, sialocele, and Frey syndrome; hearing was preserved in all cases, without any auditory stenosis or aesthetic deformity, and there was absence of any infections, hematoma, or scarring.

Conclusions: Retroauricular approach provides good exposure of the temporomandibular joint and satisfactory protection from nerve injuries and vascular lesions, allowing an adequate osteosynthesis. The scar is hidden behind the ear, and the morbidity is low in terms of auditory stenosis, aesthetic deformity, and salivary fistulas.

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Received September 2, 2010.
Accepted for publication September 24, 2010.

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The authors report no conflicts of interest.

ISSN: 1049-2275
DOI: 10.1097/SCS.0b013e318207f495

Key Words: Condylar head fractures, retroauricular approach, transmeatal access, facial nerve

(*J Craniofac Surg* 2011;22: 641–647)

There is a multitude of reported surgical approaches and technical variants to gain direct access to mandibular condylar fractures, and they can be divided into 2 groups: intraoral and extraoral.[1]

The first group includes the endoscopic[2] and the endoscopically assisted approaches[3]; some authors prefer this method, stating that it is advantageous because it minimizes the risks of facial nerve injury and leaves a hidden scar. The disadvantages are that it necessitates specific instruments and an additional training of the surgeon.[4]

Moreover, an intraoral approach can be technically demanding when treating high and medially displaced fractures, and it can lead to unsatisfactory results in terms of anatomic reduction and functionality. Some authors have described for this technique a high percentage of complications such as myofascial pain, condylar head resorption, incorrect reduction, and malocclusions.[5]

The extraoral approaches are preauricular,[6] modified preauricular,[7] retromandibular,[8] miniretromandibular,[9] transmasseteric anteroparotid,[10] submandibular,[11] and facial rhytidectomy.[12]

Extraoral approaches simplify the management of condylar fractures, but they are associated with some unresolved technical problems such as facial nerve, vascular structures, skin incisions, and parotid gland; the preauricular approach is indicated to manage high condylar neck fractures but can have a disadvantage when treating lower fractures such as subcondylar. By contrast, the submandibular and retromandibular accesses allow for a comfortable management of lower fractures, but they become troublesome in treating higher fractures.[13–18]

In 2005, Neff et al,[19] supported by a previous experimental work,[20] reported a successful clinical study of condylar fractures treated by a retroauricular approach; this article is in German, and the later English-language literature does not mention about this approach to open reduction and internal fixation of mandibular condylar fractures.

In the Maxillofacial Unit at the Novara Major Hospital, we choose open treatment for 14 patients affected by highly located condylar head fracture using the retroauricular transmeatal approach.[21,22]

The retroauricular transmeatal access, selected and performed by the senior author to treat these cases, is introduced. This method is a relatively simple route to gain direct access to fractures of the mandibular condyle, allowing an easy anatomic reduction of the stumps and a proper osteosynthesis with miniplates and screws.

This approach permits an easy and fast management of highly located condylar fracture while minimizing the risks of facial nerve injuries and leaving a hidden scar in a barely noticeable region.

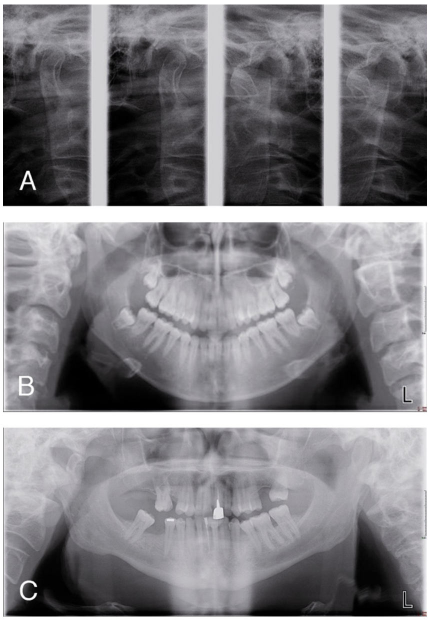

FIGURE 1. A–C, Preoperative conventional radiographic examinations showing 3 cases of highly located condylar head fractures.

Most surgeons use only screws for fixation because the segments of the condylar fractures are small and difficult to reduce and fix[23–26]; we found this technique unstable for our patients, so our methods of fixation used to improve stability were miniplates and screws.

We will not discuss which is the ideal surgical approach, which fractures should be managed with open reduction and internal fixation, or which type of osteosynthesis is most suitable biomechanically; these issues have already been addressed by other authors, and it is beyond the scope of this work[27–31]: we will entirely focus on the retroauricular transmeatal approach that is hereinafter illustrated step by step.

PATIENTS AND METHODS

We collected data of 14 consecutive adult patients (from January 2006 to December 2008; 7 white male and 2 North African male patients, 1 South American male patient, 3 white female patients, and 1 North African female patient; mean age, 33 years; age range, 17–64 years) who underwent open reduction and internal fixation for 16 condylar head fractures.

FIGURE 3. Amount of infiltration in the retroauricular region.

Twelve patients presented with unilateral fractures and 2 with bilateral fractures; the 16 condylar fractures consisted of 11 intracapsular condylar fractures and 5 extracapsular highly located condylar head fractures (Fig. 1). A total of 5 patients presented with associated fractures of the facial bones (3 mandibular body and 2 panfacial). The average duration of surgery was 43 minutes (range, 29–67) for each surgical procedure.

The diagnosis was performed by clinical examination, conventional radiography, and computed tomography (CT) scanning; after the discussion about other surgical and nonsurgical alternative, all patients had consented to have the mandibular condylar fractures treated by osteosynthesis with miniplates and screws via a retroauricular transmeatal approach.

SURGICAL TECHNIQUE

The operation is performed with the patient under general anesthesia with nasotracheal intubation; if other mandibular fractures are concomitant, these are treated first with a standard intraoral approach to recreate the continuity of the mandibular arch. Consequently, a new

FIGURE 2. Surgical field at the beginning of the procedure.

FIGURE 4. Skin and soft-tissue flaps dissected with the direct exposure of the concha.

FIGURE 5. The posterior aspect of the cartilaginous meatus transected.

FIGURE 7. The retromandibular space with the parotid gland.

sterile surgical field is made, and it is separated from the oral and nasal cavities using a sterile adhesive film to prevent bacterial contamination at the condylar site (Fig. 2).

Afterward, a preoperative drawing is made, marking the angle and the body of the mandible, the zygomatic arch, the glenoid fossa, and the fracture site. The ear, the lateral canthus of the eye, and the mandible are prepared and draped as pertinent landmarks of the face to properly expose the surgical field and to mentally visualize the fracture; placing a cotton soaked in the external auditory canal and shaving the preauricular hair are optional.

The retroauricular area is quite vascular, so it is preferable to inject a vasoconstrictor to decrease the amount of bleeding during the incision and the dissection. The posterior surface of the auricle and the occipital area are slowly infiltrated with 4 to 8 mL of 1% lidocaine with 1:100,000 epinephrine; although local anesthesia enhances hemostasis and demarcates the plane of dissection, it is preferable to inject a small amount of infiltration to avoid distortion of the tissues (Fig. 3).

A simple 25- to 30-mm vertical incision is made in the posterior occipital area, approximately 10 to 15 mm medial to the sulcus in a retroauricular crease, through skin and subcutaneous connective tissues. Normally, the edges of the incision are 0.5 to 10 mm cephalad to the radix of the auricular lobule and 0.5 to 10 mm caudal to the insertion of the helix; any bleeding superficial vessels are cauterized before proceeding with deeper dissection.

The anterior and posterior edges of the skin and soft-tissue flaps are elevated to gain a direct exposure of the concha and the mastoid fascia. A clean surgical dissection is kept during the flap elevation; muscle fibers and fat can be cleanly excised off the perichondrium and the mastoid fascia (Fig. 4).

Attention is now focused on the concha: the flap is retracted anteriorly, and a first incision with a scalpel is made through the posterior aspect of the cartilaginous meatus, sectioning the cartilage and the skin (Fig. 5); then a second incision is carried out through the anterior wall of the canal at a wide portion to prevent stenosis, transecting conclusively the external auditory meatus (Fig. 6).

At this depth, retraction of the external ear anteriorly permits the exposure of the retromandibular space with the parotid gland (Fig. 7), and blunt dissection commonly reveals the retromandibular vein that is ligated and transected (Fig. 8). Because of the posterior access, the frontal branch of the facial nerve and the auriculotemporal nerve are located and gently protected by a retractor within the substance of the anteriorly retracted flap, superficial to the retromandibular vein (Figs. 7 and 8).

At this point, the mandible is manipulated open and closed to help determine the location of the ramus and the condyle; when

FIGURE 6. Incision of the anterior wall of the canal and consequently the entire external auditory canal transected.

FIGURE 8. The retromandibular vein isolated.

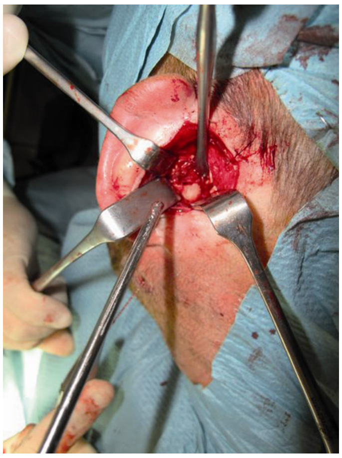

FIGURE 9. The anatomic reduction.

FIGURE 11. Closure of the retroauricular skin with interrupted slowly resorbing suture.

the bone surface is reached, the mandibular periosteum is incised, dissected, and elevated, revealing the fracture fragments.

The manipulation screw (386.902) and the handle for manipulation screw (386.903) of the endoscopic subcondylar/ramus fixation set (Synthes, West Chester, PA) are used similar to a "joystick" to facilitate the reduction of the condylar head; after a caudal distraction of the distal stump by intraoral pressure to the last mandibular molars with a finger, while taking great care to preserve sterility over the condylar surgical field by changing the surgical gloves, anatomic reduction has been completed (Fig. 9). Finally, after temporary maxillomandibular fixation, the osteosynthesis is performed with miniplates and screws (Fig. 10).

Attention is finally paid to close the access: the surgical site is generously irrigated with hydrogen peroxide, and any hemorrhage is meticulously controlled; afterward, the parotid capsule is closed tightly with running, slowly resorbing, horizontal mattress suture to prevent salivary fistula, and the auricular canal is reconstructed with interrupted, slowly resorbing suture to prevent stenosis. Subcutaneous and skin tissues are closed again with interrupted, slowly resorbing suture (Fig. 11).

A petrolatum gauze is inserted in the external auditory meatus, and it is left in place for 10 days; a compressive dressing is applied for 7 days (Fig. 12). In the postoperative period, the wound is kept moist twice a day for 1 week with hydrogen peroxide and antibiotic ointment; the ear is checked daily for hematoma and infection.

RESULTS

We have used 2 weeks of maxillomandibular fixation with elastics for all patients; postoperative conventional radiographic or CT scans were taken to check fracture osteosynthesis, and a soft diet was ordered for 1 month. After that, if a patient had mandibular hypomobility, mouth-opening exercises were taught: clinical follow-up was performed at 1 week; at 1, 3, and 6 months; and at 1 year; radiologic controls were scheduled in the immediate postoperative period, at 6 months, and at 1 year.

The follow-up clinical examination showed satisfactory results were achieved in all patients; temporary weakness of the frontal branch of the facial nerve was detected in 1 case, with a recovery to normal function after 1.6 months; no patients had permanent weakness of the facial nerve or injury of the auriculotemporal nerve.

There was absence of any salivary fistula, sialocele, and Frey syndrome; hearing was preserved in all cases without any auditory stenosis or aesthetic deformity, and there was absence of any infections, hematoma, or scarring.

The mean maximal interincisal mouth opening was 38 mm, and in every patient, good occlusion without dysfunctional

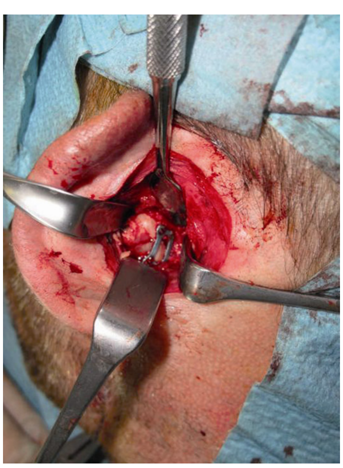

FIGURE 10. Rigid internal fixation.

FIGURE 12. A petrolatum gauze is inserted in the external auditory meatus.

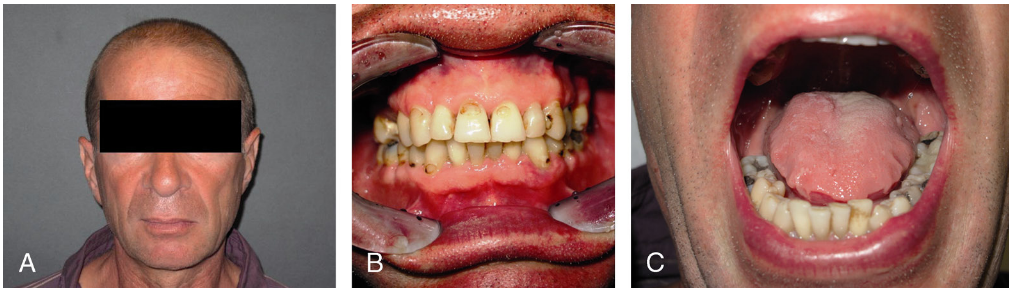

FIGURE 13. A–C, Postoperative clinical view (A), with a satisfactory occlusion (B) and a good articular function (C).

symptoms as well as facial morphology was restored (Fig. 13); examination on the basis of conventional radiography in 10 of the 14 patients and axial, coronal, and three-dimensional CT scanning in 4 of the 14 patients showed an acceptable osteosynthesis, except in 1 patient with a failure of fixation but with a satisfactory occlusion: no patient needed to return to the operating room for adjustment because of malocclusion (Fig. 14).

DISCUSSION

Condylar fractures are very common in craniomaxillofacial traumas, and they account for 20% to 52% of all mandibular fractures[32]; properly managing condylar fractures is of priority importance because a mistake during the diagnosis or the treatment can lead to severe anatomic and functional impairment.[33]

These fractures can be classified in several ways; moreover, the patient's age, the fracture' site, and the degree of displacement seem to be of critical importance when deciding the indications for surgical management.[34]

Historically, highly located condylar fractures are treated closed because of 3 main reasons: the difficulty to reduce and fix the small segments of the fracture, the concern about any facial nerve injuries, and the adequate satisfaction reported by most patients after conservative treatment during long-term follow-up.[35]

After the development of radiologic examinations, such as CT scanning and magnetic resonance imaging, surgeons analyzed the unsatisfactory results of the closed treatment and began to consider a more aggressive approach.[36,37]

One of the most important anatomic findings observed after the treatment of condylar fractures by functional therapy is the reduction of mandibular ramus height and severe functional impairment including poor occlusion, reduced opening, deviation, and limited lateral mandibular movement[38]; moreover, other possible complications such as temporomandibular joint (TMJ) ankylosis, TMJ dysfunction, and craniofacial pain need to be evaluated before considering a closed treatment.[39]

The surgical treatment of condylar fractures has been strongly debated, and various investigators have previously favored a nonoperative approach[40]; a number of reports have now suggested that the treatment of condylar fractures by open reduction and rigid fixation leads to much better anatomic and functional results compared with closed and functional treatment.[41–43]

Nonoperative treatment is still indicated for some cases such as pediatric patients and comminuted intracapsular fractures;

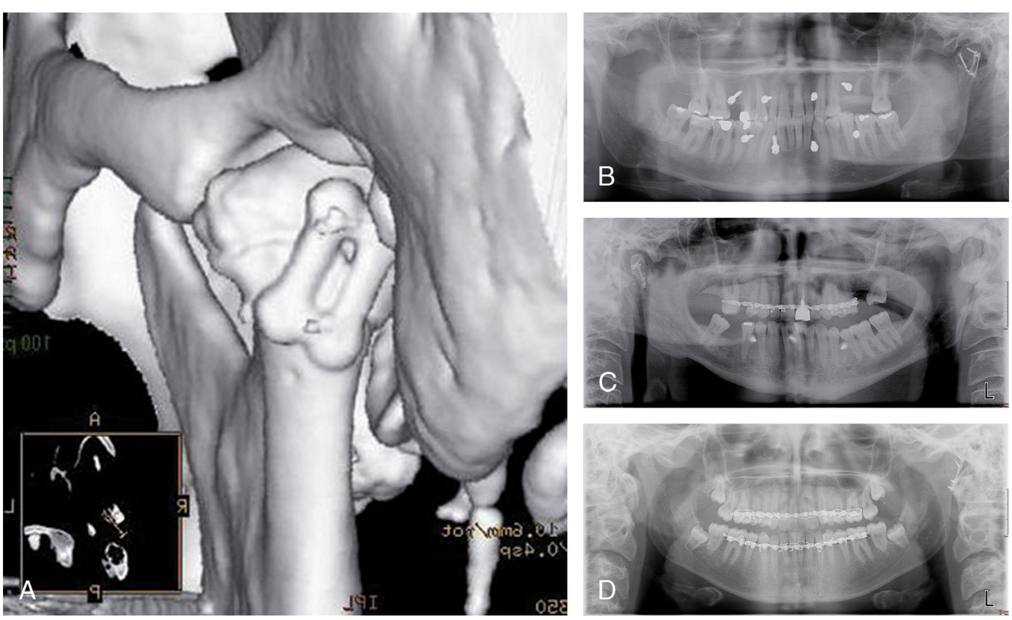

FIGURE 14. A–D, Postoperative three-dimensional CT scanning (A) and conventional radiographic examination (B–D) of 3 cases of highly located condylar head fractures demonstrating successful anatomic mandibular reduction and adequate osteosynthesis.

nowadays, evidence with statistical significance strongly supports surgical treatment, and consequently, a more focused debate should start on the ideal method to approach condylar fractures.[44–50]

Surgical access to condylar fractures varies according to the literature; those commonly used, often in combination or modified, are preauricular retromandibular and submandibular. For high condylar fractures, a preauricular approach is commonly used, but the exposure of this area is very limited because of the frontal branch of the facial nerve, the auriculotemporal nerve, and the parotid gland. The submandibular and the retromandibular approaches allow good fracture treatment but require long skin incisions and present some risk for the facial nerve fibers and vascular lesions.[6–12]

Furthermore, these methods are not equivalent for treating all condylar fractures; the preauricular access is well indicated only for treating fractures at higher levels, whereas the standard submandibular and retromandibular approaches do not allow comfortable management of the same type of lesion.[13–18]

The authors exposed the condyle easily and better by dissecting via a retroauricular transmeatal route with identification, ligation, and transection of the retromandibular vein; because of the posterior access, the frontal branch of the facial nerve and the auriculotemporal nerve are located and protected within the substance of the anteriorly retracted flap, superficial to the retromandibular vein.

This approach is not technically demanding; it provides excellent access, allowing direct visualization of highly located condylar fracture, and it ensures that the plates can be well adapted, and the screws placed at 90 degrees to the bony surface, giving maximum mechanical advantage, which is not always possible with the more traditional preauricular, retromandibular, and submandibular accesses.

Moreover, once the flap is retracted anteriorly, the surgical field is always perpendicular to the fractured stumps; this simplifies the treatment of even difficult fractures (anteromedial luxation of the condylar head, delayed treatment) and their rigid fixation.

The ideal surgical approach should be the one that allows fracture management while minimizing the risk of potential pitfalls; we believe that the retroauricular transmeatal approach can be a valid alternative to the common transfacial accesses in selected highly located condylar head fracture such as (1) patients with intracapsular condylar head fractures; (2) overweight patients with redundant cheek soft tissues; (3) patients with a genetic predisposition to develop hypertrophic keloids; (4) patients who do not accept preoperatively any potential nerve injuries or noticeable facial scars; (5) patients who refer during the clinical examination previous surgical procedures in the preauricular area (facelift, parotid surgery).

CONCLUSIONS

Retroauricular transmeatal access provides good exposure of condylar fractures permitting an adequate osteosynthesis; it is relatively easy and fast to perform; it presents an extremely low risk to injure the facial nerve, and it leaves a unnoticeable scar in a very hidden region behind the ear. The morbidity is extremely low in terms of auditory stenosis, aesthetic deformity, facial nerve lesions, vascular injuries, salivary fistulas, sialocele, and Frey syndrome.

The TMJ area frequently requires exposure for a multitude of surgical procedures such as internal derangements, arthritis, trauma, developmental disorders, and neoplasia; several approaches have been proposed and used clinically; up to date, the ideal access has not yet been found.

We have successfully performed this approach for 14 trauma cases, and we suggest this access to selected patients owing to its ease, speed, versatility, and freedom from the complications that are common with other extraoral approaches.

We cannot draw statistically significant conclusions, and we think that further experimental studies and prospective clinical trials should be necessary to analyze, develop, and eventually modify this approach; we believe that there is not an ideal approach for a type of fracture, but each patient needs to be evaluated carefully preoperatively, and the more convenient approach needs to be selected for each clinical case.

It will be possible to better understand risks and benefits of this technique, comparing this route with other accesses and extending this surgical technique to other pathologic situations such as developmental disorders and neoplasia of the TMJ area.

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