

## Case Report

# Treating of old dislocation of mandibular condyle into the middle cranial fossa by gap arthroplasty combined with temporalis myofascial flap implanting: a case report

Pan Liu<sup>1</sup>, Fujun Li<sup>1</sup>, Liwei Peng<sup>2</sup>

<sup>1</sup>Department of Oral and Maxillofacial Surgery, The First Affiliated Hospital, College of Clinical Medicine of Henan University of Science and Technology, Luoyang City, Henan Province, China; <sup>2</sup>Department of Oral and Maxillofacial Surgery, Henan Provincial People's Hospital, Zhengzhou City, Henan Province, China

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**Abstract:** Objective: To report a new therapeutic tactic for the old dislocation of intact mandibular condyle into the middle cranial fossa, which is extremely rare while the reported treatment methods are varied. Methods: The subject was a 29-year-old female who was diagnosed with old dislocation of intact left mandibular condyle into the middle cranial fossa and left zygomatic arch fracture. Gap arthroplasty combined with implanting the temporalis myofascial flap to the gap was performed. Results: Both her mouth opening ability and mandibular movement almost restored to normal level six months after surgery. Conclusion: The gap arthroplasty combined with temporalis myofascial flap implanting is useful in the treatment of old dislocation of condyle into the middle cranial fossa.

**Keywords:** Dislocation of the condyle, middle cranial fossa, gap arthroplasty, temporalis myofascial flap implanting, open reduction

## Introduction

Clinically, complete traumatic anterior dislocation of the mandibular condyle from the glenoid fossa is common; conversely, condyle dislocation into the middle cranial fossa is a rare event [1]. To date, only about 50 such cases were reported in English literatures, especially, few of them were aimed at old dislocation [2, 3]. Among these documents, even though a variety of therapeutic methods have been reported, such as closed reduction and open reduction, it is still a challenge for the treatment of the old dislocation of the condyle into the middle cranial fossa [2]. Herein, we presented a case of 29-year-old female who suffered from old and severe dislocation of her left intact mandibular condyle into the middle cranial fossa and a new therapeutic tactic on such injury.

## Case report

A 29-year-old female consulted in our department with complaints of difficulty in her mouth

opening for five weeks. 5 weeks ago, she suffered from coma caused by a traffic accident that struck her jaw on the ground. She was taken to a local hospital immediately and examined by computed tomography (CT) with three-dimension reconstruction of skull, maxilla and mandible. When awake, her chief complaints were limitations of mouth opening, malocclusion, and chin deviation to the left. Therefore, intermaxillary elastic traction (IMT) was performed to try to repair the dislocated condyle. After 5 weeks' IMT, chin deviation, malocclusion, restricted movement of mandible still existed.

Then she was transferred to our hospital. The physical exam indicated that the chin deviation to the left side, meanwhile, malocclusion with anterior open bite and limited mouth opening could be observed (**Figure 1**), additionally, mandibular lateral motion was limited. The primary CT scan showed that her left zygomatic arch was fractured and left condyle had broken and dislocated through the glenoid fossa into the

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**Figure 1.** Preoperative frontal view showing anterior open bite and deviation of her chin to the left.

middle cranial fossa (**Figure 2A, 2B**). CT re-examination showed that the left condyle was remaining in the intracranial space as before. Moreover, neurosurgical consultation showed no intracranial complication.

After signing informed consent, she was taken to operation room for further treatment. The patient first underwent closed manual reduction of dislocated left condyle, however, the mandibular ramus was as motionless as a statue. Then following induction of anesthesia, a 3 cm incision was made in the left submandibular region to exposed left mandible angle. We dragged and gripped mandible angle with a fracture clamp combined with intraoral pressure. However, the whole condylar head which had already almost dislocated into the fossa resulted in the failure of the surgery. In addition, open reduction and rigid internal fixation were also carried out for the fracture of the left zygomatic arc. During operation, the condylar stump was found to tightly stick in the middle cranial fossa.

Afterwards, we then performed gap arthroplasty on her left condyle to avoid probable intracranial injury and temporalis myofascial flap was prepared and filled into the gap to avoid ankylosis of the joint. Briefly, the osteotomy was performed between the neck of the left condyle and the sigmoid notch while the width was about 1 cm. A temporalis fascial flap with a size about 6 cm\*3 cm was prepared, of which the anatomy and surgical technique has been well documented [4]. Then the prepared flap was filled and sutured in the space as an interpositional graft (**Figure 3A, 3B**). After these procedures, the patient's left mandible was released

and the jaw movement was successfully restored.

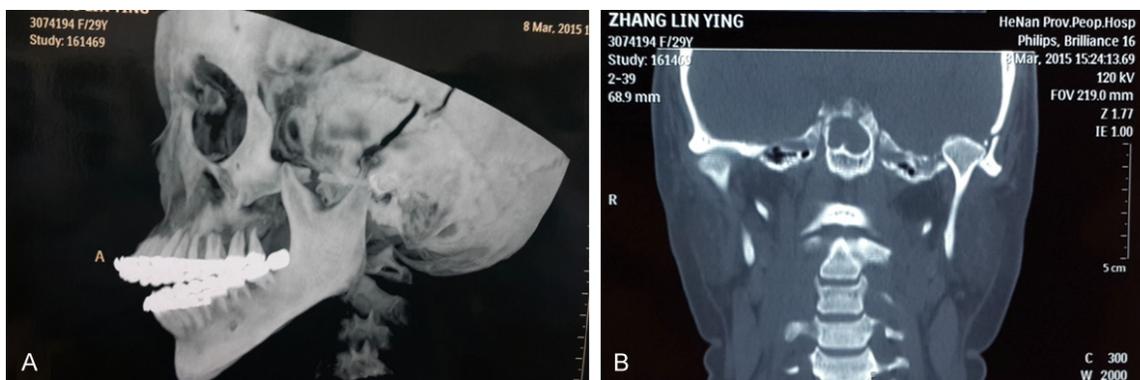
The patient was satisfied with the surgical treatment outcomes as the preinjury occlusion disappeared and chewing movement got easier immediately after surgery. We performed IMT on postoperative day 2 for a half month to maintain her postoperative occlusion. At 17<sup>th</sup> day after the surgery, postoperative images of both frontal picture and CT scans showed that the occlusion was well recovered, and the condylar head has got back to the primary site (**Figure 4A-C**). Six months after surgery, the patient had restored her normal occlusion and mouth opening (**Figure 5A, 5B**). There was no intracranial complication after the surgery.

### Discussion

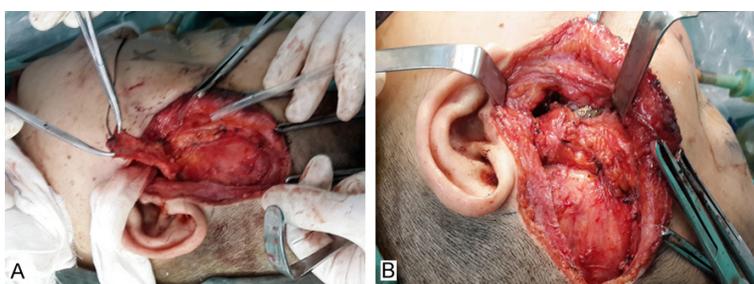
Dislocation of mandibular condyle into the middle cranial fossa is a kind of rare cases, which may be due to the anatomical features of mandible [5]. The self-protection mechanisms of the mandible play an important role in resisting condyle intracranial dislocation, which mainly work in three different ways: first, the condylar neck trends to fracture under appropriate force, thus to prevent the force is directly upwards transmitted against the glenoid fossa; second, the improvement of mediolateral length of the scroll-shaped condyle for most adult mandibles may assist to transmit the force across the fossa in the region with large surface area; last, posterior teeth may cushion the force so as to decrease occurrence of secondary condyle dislocation, moreover, the meniscus and musculature of the joint may additionally help reduce the impact forces [6-11]. Therefore, dislocation of condyle into the middle cranial fossa only occurs when such self-protection mechanisms were absent or abnormal. For example, a small and round condyle and an open mouth on impact combined with a posterior-superiorly directed blow to the jaw may lead to this intracranial dislocation [12-15]. In addition, children who lack mature medial and lateral poles of mandibular condyle are susceptible for such kind of injury [16-18].

The clinical findings of mandibular condyle dislocation into the middle cranial fossa were vary with each individual, including asymmetry of the face like shortening of the facial height on the injured side, occlusal disorders in the form

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**Figure 2.** The CT image showing that left glenoid fractures and condyle penetrates into the middle cranial fossa. A. Three-dimension reconstruction image; B. Coronal image.



**Figure 3.** Intraoperative views. A. The temporalis fascial flap was prepared; B. The temporalis fascial flap was filled into the space as an inter-positional graft.

of premature contact on posterior teeth and anterior teeth open bite, limited mouth opening, mandibular motion limitation, pain in the preauricular region, and intracranial tissue complications such as cerebrospinal fluid leakage, intracranial hematomas, facial nerve paralysis and so on [19, 20]. And these clinical findings are quite similar to that of subcondyle fracture, which may lead to misdiagnose when the doctor only diagnoses by clinical findings and routine radiographic images such as CT which has a prominent significance in diagnosing such injury, especially its coronal image and three-dimension reconstruction [18-22].

The treatment of this injury should be individualized and should consider the patient's age, growth potential, the degree of glenoid fossa destruction, the risk of ankylosis, and the risk of further intracranial injury [21]. Thus, the therapeutic goals in mandibular condyle dislocation into the middle cranial fossa mainly were to restore the normal function of mandibular movement, acquire preinjury occlusion, avoid further damage to the intracranial tissue, and

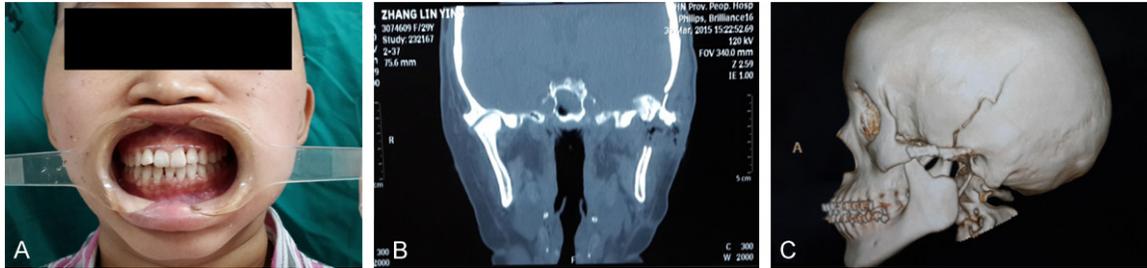
prevent recurrent dislocations and long-term complications, such as joint ankylosis [13, 19, 23].

In the previous reports, various therapeutic methods have been presented, such as closed reduction and open reduction [21, 22, 24]. Among them, closed reduction with intermaxillary fixation has been proposed by many authors as the simplest and least traumatic

method for intracranial dislocation of the condyle. That's because closed reduction is easy to perform and it can restore and maintain the physiological function of the mandible condyle extremely, especially for children whose condyles are serving as growing centers [19]. However, it is crucial to perform open reduction when condylar fracture occurs, the proper interventions are delayed or dislocation is involved in cerebral injuries [19, 20].

Open reduction includes craniotomy, condylectomy, condylotomy, subcondylar osteotomy, reposition without osteotomy, and combining with intracranial bone implantation or glenoid fossa reconstruction [18-20, 24], among which open reduction combined with glenoid fossa reconstruction can be performed after the condyle has been exposed intracranially by craniotomy or after the condylar neck and glenoid fossa have been exposed through extracranial approach [5]. Even though this method can ensure the postoperative function of the mandible, it is involved with more risk. Meanwhile, the close collaboration between the surgeons

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**Figure 4.** Postoperative images at 17<sup>th</sup> day after the surgery. A. The occlusion was well recovered; B. Coronal image from CT scan; C. Three-dimension reconstruction image showed that the condyle head has got back to the primary site.



**Figure 5.** Frontal views of the patient six months after surgery. A. The patient's occlusion was good; B. The patient's mouth opening was over 3 cm.

in both maxillofacial surgery and neurosurgery was essential as well. Moreover, intracranial complications such as intracranial infection, leakage of cerebrospinal fluid may happen and the possibility of ankylosis exists because of the damaged articular disk [5, 21].

Including this case, about 50 such cases have been reported in English literature [25]. Compared with most of other cases, this case has two characteristics: first, it is an old dislocation of mandibular condyle into the middle cranial fossa as the patient was put off the proper treatment for 5 weeks from she got injury to transferred to our hospital; second, the protrusion of the dislocated condyle that stuck in the middle cranial fossa was nearly beyond the neck of the condyle, of which the depth was more than that of most published cases.

For the patient in this case whose treatment is extensively delayed, closed reduction is not a suitable therapeutic method, because the ossification developed between the condylar neck and skull base during the five-week delay. Moreover, as the patient's intracranial tissue has not been damaged, open reduction com-

bined with glenoid fossa reconstruction is also unnecessary because of the longer surgical operative time and the higher possibility of damaging the intracranial tissue of open reduction combined with glenoid fossa reconstruction.

Gap arthroplasty, as a special therapeutic method for this unique case, can reduce the intracranial complications to the utmost. He et al proposed that gap arthroplasty could apply for the patients with delayed treatment who had extensive adhesion between the skull base and the condyle [21]. Although gap arthroplasty may influence the function of the posterior mandible, it can shorten the operative time and reduce the treatment complexity than open reduction with glenoid fossa reconstruction. Additionally, the patient's chewing function and occlusion after gap arthroplasty will not be impacted too much.

Temporalis myofascial flap, as a very reliable regional flap, has already been applied for defects reconstruction in the oral and maxillofacial region, such as mandible, orbit and eyelids, chin, cheek, maxilla, tongue, palate, and the base of skull [26-28]. It has also been used for the surgical treatment of temporomandibular joint ankylosis as an inter-positional graft [29, 30]. The less complications in the donor-site and the better adaptability in the recipient site both contribute to the good promotion of the temporalis flap application. However, the combination of gap arthroplasty and temporalis myofascial flap implanting has not been reported to be applied for the surgical treatment of

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old dislocation of mandibular condyle into the middle cranial fossa. Considering all the characters of this case, this combined treatment was adopted to treat the patient, which showed a satisfied result during the half-year follow-up. We suspect that the implanting of temporalis myofascial flap can effectively prevent the occurrence of the temporomandibular joint ankylosis.

In conclusion, gap arthroplasty combined with temporalis myofascial flap implanting can be regarded as an ideal therapeutic method for the old and severe dislocation of condyle into the middle cranial fossa without intracranial damage.

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### Disclosure of conflict of interest

None.

**Address correspondence to:** Liwei Peng, Department of Oral and Maxillofacial Surgery, Henan Provincial People's Hospital, No.7 Weiwu Road, Zhengzhou City, 450003, Henan Province, China. Tel: +86-18538298135; E-mail: lwp17770@163.com

### References

- [1] Man C, Zhu SS, Chen S, Jiang L and Hu J. Dislocation of the intact mandibular condyle into the middle cranial fossa: a case report. *Int J Oral Maxillofac Surg* 2011; 40: 118-120.
- [2] Zhang S, Wu J, Xu B, Shi J, Shen SG and Gui H. Features and management of intracranial mandibular condyle dislocation after trauma. *Cranio* 2014; 32: 63-67.
- [3] Jeyaraj P and Chakranarayan A. A conservative surgical approach in the management of longstanding chronic protracted temporomandibular joint dislocation: a case report and review of literature. *J Maxillofac Oral Surg* 2016; 15: 361-370.
- [4] By E, Wei FC and Samir Mardini M. Flaps and reconstructive surgery. *Saunders* 2009; 127: 475-476.
- [5] Koretsch LJ, Brook AL, Kader A and Eisig SB. Traumatic dislocation of the mandibular condyle into the middle cranial fossa: report of a case, review of the literature, and a proposal management protocol. *J Oral Maxillofac Surg* 2001; 59: 88-94.
- [6] Menon S and Sinha R. Gap arthroplasty for mandibular condyle dislocation and impaction into the middle cranial fossa. *J Oral Maxillofac Surg* 2008; 66: 2390-2393.
- [7] Musgrove BT. Dislocation of the mandibular condyle into the middle cranial fossa. *Br J Oral Maxillofac Surg* 1986; 24: 22-27.
- [8] Chuong R. Management of mandibular condyle penetration into the middle cranial fossa: case report. *J Oral Maxillofac Surg* 1994; 52: 880-884.
- [9] Clauser L, Tieghi R, Polito J and Galie M. Dislocation of the mandibular condyle into the middle cranial fossa. *J Craniofac Surg* 2006; 17: 590-594.
- [10] Engevall S and Fischer K. Dislocation of the mandibular condyle into the middle cranial fossa: review of the literature and report of a case. *J Oral Maxillofac Surg* 1992; 50: 524-527.
- [11] Sandler NA, Ozaki WH, Ochs MW and Marion DW. Intracranial reduction of an intact mandibular condyle displaced into the middle cranial fossa. *J Oral Maxillofac Surg* 1996; 54: 506-510.
- [12] Temiz G, Cakmakoglu C, Akpınar AC and Filinte GT. Dislocation of mandibular condyle into middle cranial fossa: two alternative methods for two patients. *J Oral Maxillofac Surg* 2015; 73: 1563, e1561-1516.
- [13] Oberman B, Setabutr D and Goldenberg D. Traumatic dislocation of intact mandibular condyle into middle cranial fossa. *Am J Otolaryngol* 2014; 35: 251-253.
- [14] Tutela JP, Verbist DE, Kelishadi S and Little JA. Traumatic dislocation of the mandibular condyle into the middle cranial fossa in an elderly patient. *J Craniofac Surg* 2013; 24: 1703-1705.
- [15] Barron RP, Kainulainen VT, Gusenbauer AW, Hollenberg R and Sandor GK. Management of traumatic dislocation of the mandibular condyle into the middle cranial fossa. *J Can Dent Assoc* 2002; 68: 676-680.
- [16] Barron RP, Kainulainen VT, Gusenbauer AW, Hollenberg R and Sandor GK. Fracture of glenoid fossa and traumatic dislocation of mandibular condyle into middle cranial fossa. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002; 93: 640-642.
- [17] Spanio S, Bacilliero U, Fornezza U, Pinna V, Toffanin A and Padula E. Intracranial dislocation of the mandibular condyle: report of two cases and review of the literature. *Br J Oral Maxillofac Surg* 2002; 40: 253-255.
- [18] Rosa VL, Guimaraes AS and Marie SK. Intrusion of the mandibular condyle into the middle

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- cranial fossa: case report and review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006; 102: e4-7.
- [19] Struwer J, Kiriadidis I, Figiel J, Dukatz T, Frangen T and Ziring E. Dislocation of the mandibular condyle into the middle cranial fossa causing an epidural haematoma. *J Craniomaxillofac Surg* 2012; 40: 396-399.
- [20] Magge SN, Chen HI, Heuer GG, Carrasco LR and Storm PB. Dislocation of the mandible into the middle cranial fossa. Case report. *J Neurosurg* 2007; 107: 75-78.
- [21] He Y, Zhang Y, Li ZL, An JG, Yi ZQ and Bao SD. Treatment of traumatic dislocation of the mandibular condyle into the cranial fossa: development of a probable treatment algorithm. *Int J Oral Maxillofac Surg* 2015; 44: 864-870.
- [22] Baldwin AJ. Superior dislocation of the intact mandibular condyle into the middle cranial fossa. *J Oral Maxillofac Surg* 1990; 48: 623-628.
- [23] Cillo JE, Sinn DP and Ellis E 3rd. Traumatic dislocation of the mandibular condyle into the middle cranial fossa treated with immediate reconstruction: a case report. *J Oral Maxillofac Surg* 2005; 63: 859-865.
- [24] Tagliatalata Scafati C, Aliberti F, Scotto di Clemente S, Tagliatalata Scafati S, Facciuto E and Cinalli G. Dislocation of a fractured mandibular condyle into the middle cranial fossa: a case treated by an extracranial approach. *Childs Nerv Syst* 2008; 24: 1067-1070.
- [25] Lindell B and Thor A. A case of glenoid fossa fracture, progressive ankylosis, total joint reconstruction with alloplastic prosthesis to normalized function including evaluation with F18-PET/CT-a four year follow-up. *Craniomaxillofac Trauma Reconstr* 2017; 10: 60-65.
- [26] Clauser L, Curioni C and Spanio S. The use of the temporalis muscle flap in facial and craniofacial reconstructive surgery. A review of 182 cases. *J Craniomaxillofac Surg* 1995; 23: 203-214.
- [27] Gupta AK and Jain S. Temporalis muscle sling revisited: a technique to restore ocular sphincter function. *Ann Plast Surg* 1994; 33: 496-499.
- [28] van der Wal KG and Mulder JW. The temporal muscle flap for closure of large palatal defects in CLP patients. *Int J Oral Maxillofac Surg* 1992; 21: 3-5.
- [29] He D, Yang C, Chen M, Zhang X, Qiu Y, Yang X, Li L and Fang B. Traumatic temporomandibular joint ankylosis: our classification and treatment experience. *J Oral Maxillofac Surg* 2011; 69: 1600-1607.
- [30] Yazdani J, Ali Ghavimi M, Pourshahidi S and Ebrahimi H. Comparison of clinical efficacy of temporalis myofascial flap and dermal graft as interpositional material in treatment of temporomandibular joint ankylosis. *J Craniofac Surg* 2010; 21: 1218-1220.