

Intrusion of the mandibular condyle into the middle cranial fossa: report of a case in an 11-year-old girl

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Abstract

Intrusion of the head of the condyle into the middle cranial fossa is a rare but highly significant result of trauma to the mandible. Various treatment modalities for this type of injury have been reported in the literature. This case report concerns the intrusion of the left mandibular condyle into the middle cranial fossa in an 11-year-old girl. Five days after the original injury, severe limitation of opening was noted, as was a significant overjet and posterior open bite. A CT scan revealed intrusion of the left condyle into the middle cranial fossa. Treatment consisted of closed reduction with intermaxillary fixation. At the 10-month follow-up, full range of motion was possible with only minimal deviation.

Facial fractures are uncommon in young children and infants. This is due primarily to the larger cranial vault and elasticity of developing bones. The most common fractures are of the nasal bone followed by fractures of the mandible. The majority of the mandibular fractures in children involve the condyle (Morgan 1975). Despite this relatively frequent involvement of the condyles, penetration of the condylar head into the middle cranial fossa is rare (Copenhaver et al. 1985).

The objective of this paper was to review the literature on intrusion of the mandibular condyle into the middle cranial fossa and to report a case in a pediatric patient.

Literature Review

Various methods of treatment of intrusion of a mandibular condyle into the middle cranial fossa have been reported in the literature. Condylar osteotomy with the condylar head remaining in the middle cranial fossa was the treatment of choice in the cases presented by Dingman and Grabb (1963), Peltier and Matthews (1969), and Seymour and Irby (1976). Condylectomy via either the craniotomy (Doane 1963; Stoltman 1965) or standard TMJ approach (Whitacre 1966; Rowe and Killey 1968) also has been reported. Closed or open

reduction with removal of the condylar head from the middle cranial fossa and re-establishment of the original joint relationship was presented in the cases reported by Zecha (1977), Kallal et al. (1977), Iannetti and Martucci (1980), and Copenhaver et al. (1985). Documented cases of intrusion of the mandibular condyle into the middle cranial fossa are summarized in the Table.

Case Report

A white female, 11 years, 2 months old, fell from her bicycle striking her chin on the pavement. No loss of consciousness occurred and she was evaluated and released from an outlying hospital the same day. Five days later she was seen by her pediatrician because of her inability to open her mouth. She was referred to the Dental Department of Children's Hospital of Pittsburgh.

Clinical examination revealed obvious facial asymmetry with deviation of the mandible to the left, a contusion on the right cheek, and a healing abrasion of the chin. Routine laboratory tests were within normal range. Range of motion of the mandible was severely limited and maximum interincisal opening was 5 mm. Manual palpation of the orbits, maxilla, and mandible was negative for fractures.

Intraorally, a significant overjet of 15 mm was noted along with a right-side posterior open bite. Routine radiographs were negative for fractures and TMJ tomograms and a CT scan were requested which revealed intrusion of the left mandibular condyle into the middle cranial fossa (Figs 1, 2 - page 70). Neurosurgical and neuroradiological consultations were obtained on admission. Utilizing the CT scan, the presence of a meningeal perforation was considered unlikely although it could not be ruled out totally.

With the neurosurgical service on standby, the patient was taken to the operating room on the seventh day

after the accident. Under nasotracheal general anesthesia, Erich arch bars were placed on both arches. A towel clip was placed in the angle region of the mandible extraorally and a second in the anterior region of the mandibular arch bar. With traction on both towel clips, the left TMJ and left ramus of the mandible were pulled inferiorly; and the fracture was reduced. At this point, the mandible was evaluated and there was full range of motion vertically and transversely. Intermaxillary fixation was accomplished with stainless steel wires and elastics. A minimal amount of bleeding from the left ear due to a small laceration of the anterior portion of the external auditory canal was observed.

The patient was placed on a Polymyxin B-Neomycin-Hydrocortisone otic suspension (Corisporin® Otic Suspension — Burroughs Wellcome Co; Research Triangle Park, NC). An audiogram was performed and the patient was noted to have a mild conductive hearing loss. Postoperative recovery was uneventful, and the patient was discharged on the fifth hospital day.

At the 10-month follow-up, full range of motion of the mandible was possible in both the vertical and transverse directions with only a slight deviation to the patient's left (Fig 3, page 70).

TABLE. Summary of Cases of Intrusion of Mandibular Condyle into the Middle Fossa

Authors	Age	Sex	Signs and Symptoms	Diagnosis	Method of Diagnosis	Treatment*
Dingman and Grabb (1963)	28	M	Cerebral concussion	Immediate	Unknown	Osteotomy
Doane (1963)	13	F	Amnesia, momentary unconsciousness	18 Days	TMJ radiographs after two unsuccessful attempts	Intercranial condylectomy
Stoltman (1965)	24	M	Unconsciousness	Several days	TMJ radiographs	Craniotomy with condylectomy
Stoltman (1965)	25	M	Diminished hearing intrusion side	Immediate	TMJ radiographs	Craniotomy with condylectomy
Peltier and Matthews (1965)	18	F	Mild loss of function of zygomatic and mandibular branch of central nerve VII	6 weeks	Limitation of movement at surgery	Osteotomy
Whitacre (1966)	15	F	Pain and limitation of mandibular function	10 days	TMJ radiographs	Reduction with condylectomy
Pirok and Merrill (1970)	19	M	Nausea	2 Months	Limitation of movement	No treatment
Rowe and Killey (1968)	50	M	Unconsciousness	Immediate	TMJ radiographs	Condylectomy
Seymour and Irby (1976)	64	M	Unconsciousness left side deafness	2 days	TMJ tomograms	Osteotomy, prosthetic glenoid fossa
Zecha (1977)	25	F	Limitation of mandibular function	Immediate	TMJ radiographs	Closed reduction
Kallal, Gans and Lagrotteria (1977)	15	F	Limitation of mandibular function	Immediate	TMJ tomograms	Closed reduction
Iannetti and Martucci (1980)	38	M	Pain and limitation of mandibular function	Immediate	TMJ radiographs	Open reduction menisectomy prosthetic fossa
Copenhaver et al. (1985)	9	F	Pain and limitation of mandibular function	2 days	TMJ tomograms CT scan	Closed reduction
Paulette, et al. (1988)	11	F	Limitation of mandibular function	5 days	TMJ tomograms CT scan	Closed reduction

* For the purpose of this chart the following terms are used: *Osteotomy*: surgical separation of the condylar neck from the head without removal of the condyle; and *Condylectomy*: removal of the condyle.

Discussion

Due to the regional anatomy of the mandible and the cranial base, it is extremely rare for the mandible to receive trauma of significant magnitude and proper angulation to cause intrusion of the condyle into the middle cranial fossa.

The lateral aspect of the floor of the middle cranial fossa is reinforced by the zygomatic process of the squama, but the floor overlying the medial aspect of the condyle is thin. Trauma to the mandible usually comes from a frontal or lateral direction, which most often directs the condyles against the dense posterior slope of the glenoid fossa. This results in fracture of the narrow, relatively weak neck of the condyle. Assuming that the trauma was directed in an upward and more posterior position, at the angle of the mandible, dental occlusion becomes a factor limiting the distance that the mandible can travel in a vertical direction unless the mouth was opened at the time of the accident.

Normal anatomical form of the mandibular condyle varies considerably. Yale (1969) and Klein (1970) considered in detail the variable shapes and angulations of the mandibular condyles. Whitacre (1966) pointed out that the infrequency of this type of dislocation may point toward a structural variance. Examination of the condyle in this case reveals it to be small and oval

instead of the typical scroll shape.

The middle meningeal artery is located in the floor of the middle cranial fossa in close proximity of the area of the penetration. This points out a need for neurosurgical evaluation for a possible epidural hematoma and signifies the importance of CT scans in early diagnosis.

Utilizing routine radiographs, it is often difficult to suspect intrusion of a condyle into the middle cranial fossa. This is especially true if additional fractures are present to account for the malocclusion. When detailed



FIG 1. Tomogram of left condyle revealing intrusion into the middle cranial fossa.

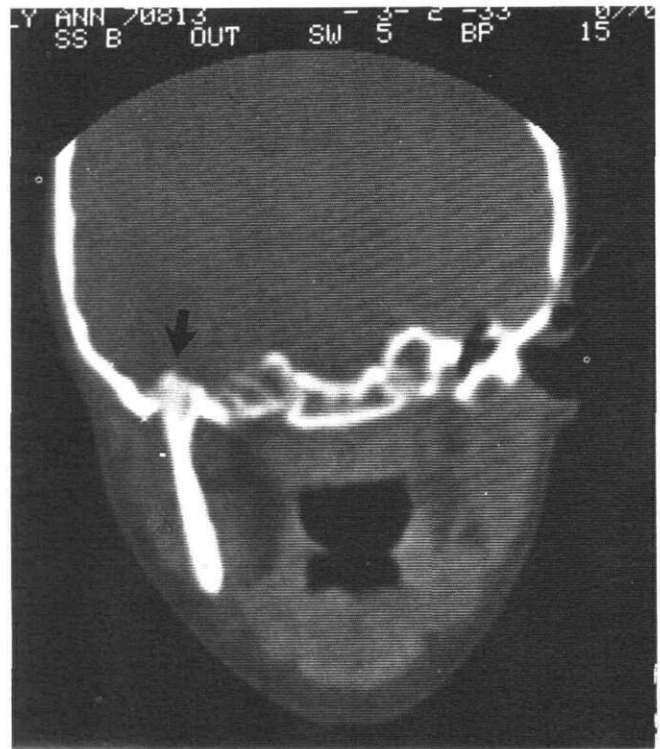


FIG 2. CT scan illustrating intrusion of the left condyle into the middle cranial fossa.

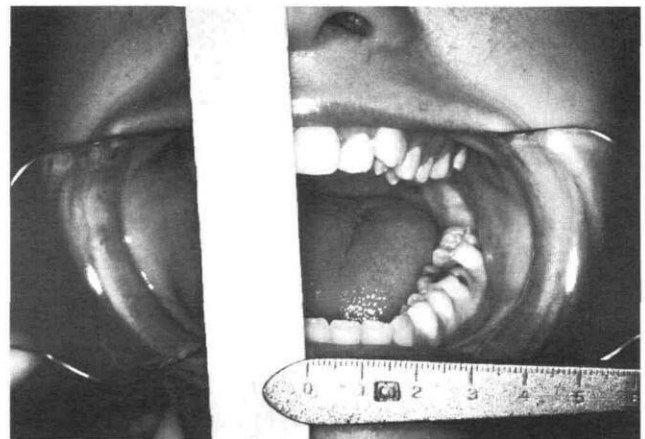


FIG 3. The patient at 10-month follow-up with slight deviation to the left on opening.

TMJ radiographs, tomograms, and CT scans are utilized, intrusion of the condyle into the middle cranial fossa can be diagnosed with greater efficiency. CT scans are recognized as the modality of choice for evaluation of head trauma (Tsai 1978). It offers direct and accurate soft tissue imaging of the brain which facilitates evaluation of cerebral hematomas, edema, and contusion. CT scans of the TMJ offer an advantage over other forms of imaging in that they eliminate superimposition and blur and also allow for the evaluation of soft tissue changes.

In cases of intrusion of the mandibular condyle into the middle cranial fossa the treatment modality employed should be decided upon after all clinical and radiographic data have been reviewed and neurosurgical consultation has been obtained. Closed or open reduction with reestablishment of the original joint anatomy would be the treatment of choice in the growing patient. This method of treatment allows for maximum growth potential and eliminates the need for a neurosurgical procedure. Condylectomy via either the standard TMJ or craniotomy approach or condylar osteotomy should be reserved for cases where reduction of the fracture and re-establishment of normal joint anatomy is impossible or impractical. Craniotomy procedures should be reserved for specific cases where neurosurgical consultation indicates the necessity for such a procedure.

Intrusion of the mandibular condyle into the middle cranial fossa is rare, especially in the pediatric population. Yet, such an entity should be considered in the differential diagnosis of all trauma patients who exhibit one or more of the following:

1. Significant deviation of the mandible
2. Significant malocclusion without evidence of fracture
3. Significant limitation of mandibular movement
4. Unusual neurological complications, e.g., hearing loss
5. Bleeding from the external auditory meatus.

Including the possibility of intrusive injuries in the differential diagnosis should minimize complications and facilitate early and conservative treatment.

Dr. Trop is an attending oral and maxillofacial surgeon, Dr. Nazif is chief of dental services, and at the time of the study Drs. Paulette and Webb were senior residents, pediatric dentistry, all at Children's Hospital of Pittsburgh. Dr. Paulette currently is in private practice in Richmond, Virginia. Reprint requests should be sent to: Dr. M.M. Nazif, Children's Hospital of Pittsburgh, One Children's Place, 3705 Fifth Ave. at DeSoto St., Pittsburgh, PA 15213.

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