

Review Article**Unusual supero-lateral dislocation of intact bilateral mandibular condyles associated with right parasymphysis mandibular fracture: A case report and review of literature**Meshram V¹, Fating N², Asar Z³, Tiwari M⁴, Bhagat A⁵

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ABSTRACT

The dislocation of the mandibular condyle / condyles occurs most commonly in an anterior direction due to trauma. This is a known fact as due to pull of lateral pterygoid muscle. On the contrary, posterior, superior, or lateral dislocations of the intact mandibular condyle occur rarely, and very few such cases have been reported in the English language literature. The rarity of these dislocations can be attributed to the varying anatomy of the condyle, the direction of pull of muscles attached to the condyle and low incidence of skull base fractures from an indirect blow. A case of bilateral supero-lateral dislocation of the condyle associated with a symphyseal fracture is presented. We discuss the dynamics, diagnostic features and clinical management of such dislocations with extensive review of literature.

Key Words: Supero-lateral dislocation, condyle

Introduction

Fracture of mandibular condyle is common following maxillofacial trauma as a protective mechanism to prevent more severe injuries to vital organs like brain. Dislocations of mandibular condyles are common in antero-medial direction under the influence of lateral pterygoid muscles but supero-lateral dislocations are rare. The aim of this paper is to report a case of bilateral supero-lateral dislocation of mandibular condyle associated with right parasymphyseal fracture to add up in the previously reported cases along with a literature review to understand the aetiology, pattern, dynamics and treatment modality of such dislocations. Furthermore, we have expanded our view regarding any prerequisite association of anterior mandibular fractures, condylar fracture or any form of

mandibular fracture to correlate biomechanics of supero-lateral dislocation.

Case report

A 35 year old male patient moderately built was brought unconscious by his relatives with history of road traffic accident. Patient was riding a scooter and ramped into a bullock cart from rare side. There was loss of consciousness which patient regained in hospital. Patient had two episodes of vomiting. Vomitus was mainly gastric content. Bleeding from both ears was noted. No cerebrospinal fluid otorrhea or rhinorrhea was evident. Patient was monitored by ENT and Neurosurgeon to rule out presence of any head injury. One week later, he was referred to Department of Oral and Maxillofacial Surgery

with a chief complaint of difficulty in mouth opening and pain over both pre-auricular regions. A thorough case history was taken which revealed he was struck over his chin as he fell on the ground. On extra oral examination there were diffused swellings in both preauricular regions with retrognathic chin, restricted mouth opening and lacerations over chin region. (fig. a, b)



Fig. a Front view

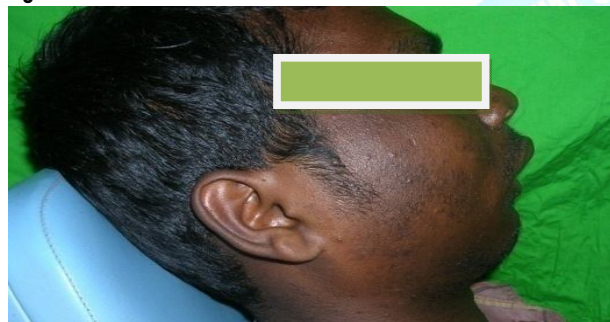


Fig. b Lateral view

On palpation, there was tenderness, pain and hard swelling bilaterally in TMJ region with no palpable TMJ movements. On intra-oral examination, pre-mature contact was present in the posterior region and increased anterior overjet. Step deformity and fragment mobility was noted in the right parasymphysis region with avulsion of mandibular right central incisor. Routine haematological investigations were within normal limits. Chest x-ray was also normal. Panoramic radiograph and three-dimensional computed tomography (3D CT) both axial and coronal view revealed fracture in right parasymphyseal region and bilateral dislocation of condyles with intact zygomatic arches (fig. c, d, e). Under general anesthesia via nasoendotracheal intubation, closed reduction of dislocated left mandibular condyle was carried out manually while open reduction was done for

right side as it was difficult to reduced manually by closed manoeuvre. Thoma's preauricular incision was placed to access the right side condyle. (fig. f)

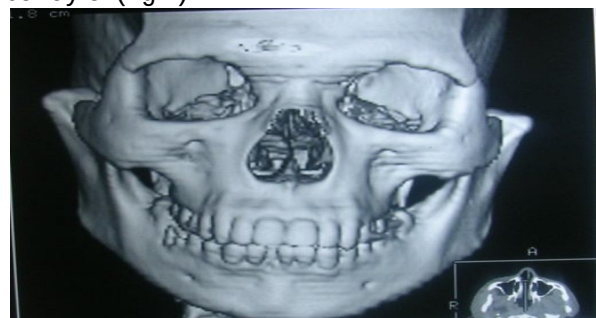


Fig. c Preoperative 3D CT (frontal view)



Fig. d Preoperative 3D CT (superolateral displacement of right condyle)



Fig. e Preoperative 3D CT (Supero-lateral displacement of Left condyle)

The right condyle was found hooked lateral to the zygomatic arch but the TMJ capsule was intact. The condyle was exposed by placing vertical incision over the capsule. It was levered into the glenoid fossa by applying downward traction with a blunt heavy periosteal elevator. The condyle was glided into the glenoid fossa without much difficulty and the patient's mouth opening was achieved.

Mandibular right parasymphysis fracture region was exposed using intraoral degloving incision in mandibular labial vestibule; (fig. g) the fractured fragments were reduced, approximated and fixed with miniplates. 2.0mm six hole

miniplates with gap at the inferior border along the Champy's lines and 2.0mm four hole miniplates was placed 3 mm below the apices of anterior teeth. (fig. h) The favourable occlusion was achieved with adequate temporo-mandibular joint movements (35mm mouth opening). Patient was advised for active jaw physiotherapy and was followed up. (fig. i, j)

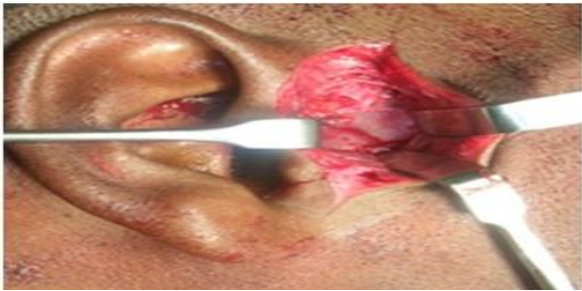


Fig. f Thoma's preauricular incision exposing right condyle



Fig. g Mandibular right parasymphysis fracture region



Fig. h Reduction and fixation had done for right parasymphysis fracture



Fig. i Post operative follow up after 6 months



Fig. j Post operative follow up after 6 months

Discussion

Biomechanics of traumatic injuries to slender condylar neck is such that whenever a high impact force is exerted over condylar region, the condylar neck fractures before condyles dislocates or displaces into the middle cranial fossa. However, in present case there is bilateral supero-lateral dislocation of intact condyles due to high impact trauma. The forces of impact over the chin resulted in fracture of right parasymphysis followed by flaring in the condylar region and displacement of both the condyles superiorly and lateral to zygomatic arches. Worthington et al ^[1] suggested a mechanism for such dislocations stating that two obstacles need to be overcome to achieve such a condition. First, the soft tissue attachment around the condyles must be ruptured. Second, the transverse dimension of condylar head must be exceeding the lateral dimension of space between zygomatic arch and medial bony wall of temporal fossa. In order for condylar head to pass this obstacle, it is necessary for at least one of the following three things to happen: the zygomatic arch may fracture, affording more room for condyle to pass; the condylar head may fracture, decreasing the bulk; the condylar head may rotate around a vertical axis, which would be likely to occur only in association with mandibular fracture disposed to facilitate rotation of ramus. In the present case, right parasymphyseal fracture facilitated rotation of ramus and supero-lateral dislocation.

David Tauro et al ^[2] suggested that more than one impact is necessary for such type of dislocation to occur. The initial primary impact to the chin resulted in fracture of symphysis and subsequent second impact resulted in dislocation.

Li et al ^[3] explained the dynamics of dislocation by simulating the dislocation on a dried skull. They concluded that, the factors considered essential to such an injury occurring are the size and the direction of applied force, the position of the jaw during impact (the mouth may be in a wide open position), and the anatomic features of the joint (joint capsule and pterygoid muscles). In the present case the etiology was road traffic accident, the impact was on the chin and the jaw might be in open position. In addition to this, the laxity of capsule has prevented its rupture and hence the capsule was intact.

There are various classifications proposed in the literature for supero-lateral dislocation of mandibular condyle. Allen and Young (1969) ^[4] classified lateral dislocation of mandibular condyle into: Type 1 - lateral luxation, Type II - complete dislocation. Satoh (1994) et al ^[5] sub classified type II dislocations into: Type IIA - The condyle is not hooked above the zygomatic arch, Type IIB - The condyle is hooked above the zygomatic arch and Type IIC - The condyle is lodged inside the zygomatic arch, which is fractured. But type II classification is based on anterior mandibular symphysis fracture. Hence David Tauro et al ^[2] (2010) modified classification and added, Type III - complete dislocation without anterior fracture of mandible, TypeIIIA - the condyle is not hooked above the zygomatic arch, TypeIIB - the condyle is hooked above the zygomatic arch and TypeIIC - the condyle is lodged inside the zygomatic arch, which is fractured. According to these classifications our case falls under the type IIB on both the side but slightly more displaced upwards on the right side. We, the authors are of the opinion that lateral dislocation of condyles should be considered when the displaced condyle is lying lateral to the anatomical articulation i.e. glenoid fossa and not lateral to the temporal bone. Fracture of zygomatic arch is must if the condyle is medial to arch and has to displace laterally. Without fracture of arch the position of condyle will remain medial to arch and so antero-superior to glenoid fossa and hence should be considered as antero-superior displacement. Worthington ^[1] reported a case of dislocation of condyle in

temporal fossa and found zygomatic arch fracture on surgical exploration so the case comes under Type IIC according to Satoh classification.

Lloyd et al ^[6] published his case report of supero-lateral dislocation of left condyle that had impacted cranially through temporal bone while the zygomatic arch remained intact. Similar case was published by Shou-Shan Bu et al ^[7] where left condyle was dislocated in temporal fossa medial to intact zygomatic arch. The described conditions cannot be classified under any of the subclasses proposed by Satoh. But whether to consider it as a supero-lateral dislocation or a supero-anterior dislocation is a matter of controversy and more expert opinions are required to put light on the issue. Worthington ^[1] described the diagnostic features of such dislocations as follows: malocclusion persisting after jaw fracture was reduced, persistence of an open bite, persistent restriction of mandibular movements, an apparent loss of ramus fragment and facial asymmetry. In our case, we found persisting malocclusion, restricted jaw movements and apparent reduction in bilateral ramal height and retrognathic chin. 3D-CT scan are very effective and useful in diagnosis of this type of dislocations as these scans can clearly demonstrate dislocated condyle, dislocation type, and whether or not there is fracture.

Early reduction is always advisable for condylar dislocations. The closed reduction becomes difficult in long standing cases due to fibro-osseous ankylosis. ^[6] Delay in reduction induces fibrosis of joint space resulting in imperfect and unsuccessful reduction. Presence of fibrous tissue makes closed reduction impossible. ^[2] It is preferable to perform the procedure under general anesthesia as it gives the opportunity to reduce and fix the associate fracture and allowing more range of manipulation during reduction. Open reduction is reserve for those cases not amenable to closed reduction. ^[2] In our case, closed reduction was performed on left side and open reduction with capsulorrhaphy on right side. The needful open reduction on right side may be due to the lag of seven days and condyle was more superiorly displaced and hooked on right side. Facial nerve damage ^[1, 8]

might accompany lateral displacement of intact condyle because the degree of displacement will usually result in traction of facial nerve. In our case no facial nerve paralysis was evident preoperatively and post operatively. There have

been 49 cases reported in literature. We have reported a 50th case to add up in literature. An extensive search for supero-lateral displacement of mandibular condyle on Google search engine found 28 relevant articles (Table I).

Table I:- Reported cases of superolateral dislocation of intact mandibular condyles

Authors and Year	cases	Unilateral (UL)/ Bilateral (BL)	CLOSED/ OPEN REDUCTION	TYPES
Allen and Young ⁴ (1969)	5	UL Right	Declined for condylectomy	I
		UL Left	Declined for condylectomy Malunion occurred	II
		BL	Treatment given (Not mention open/closed)	I
		UL Left	Treatment given (Not mention open/closed)	I
		UL Right	Treatment given (Not mention open/closed)	II
Brusati and Paini ⁷ (1978)	2	UL Left	Closed reduction resulting with facial palsy	II
		UL Right	Open reduction resulting with facial palsy	II
Worthington ¹ (1982)	1	UL Left	Closed reduction. Wire passed through bone at left angle to facilitate ownward traction. No positive results obtained so finally open reduction was done and thought successful but resulted in fibro-osseous ankylosis	Not mentioned as condyle is medial to zygomatic arch
Devita et al ⁹ (1988)	1	BL	Left side- Open Reduction Right side- Open Reduction	II
Ferguson JW et al ¹⁰ (1989)	1	UL Left	Closed reduction as mandible is tracked down ward by heavy wire by drilling hole in the left angle	IIB
To EW ¹¹ (1989)	1	UL Split bifid mandibular condyle of right side	Split condyle a) Lateral portion - Open reduction on the 14 th day of injury b) Medial portion- Left untouched	II
Radhakishna et al ¹² (1991)	1	UL	Left condyle - Open traction and closed reduction using Keen's approach in left maxillary vestibule + IMF done	NA
Sato et al ⁵ (1994)	1	BL	Bilateral condylectomy with reconstruction of the head using costal cartilage	Type II
Kapila et al ¹³ (1996)	1	UL left side	Closed reduction	Type IIB
Hoard et al ¹⁴ (1998)	1	BL	Open reduction and followed by use of scissors mouth props, Erich arch bars, and postoperative elastic traction	Type II
Joshua et al ¹⁵ (1998)	1	UL	NA	Type I
Yoshii et al ¹⁶ (2000)	1	BL	Open reduction. Temporary removal of zygomatic arch to fully detach the adhesion of mandibular condyle and then it was reduced to glenoid fossa	Type II
Rattan et al ¹⁷ (2002)	2	UL Right With bifid, medial fragment fractured	Open reduction	II
		BL	Not reduced, inter-positional gap arthroplasty	II
Hsieh et al ¹⁸ (2007)	1	BL	Surgical	II
Li et al ³ (2009)	1	UL Left	Closed reduction. Manual manipulation under general anesthesia with muscle relaxants	IIB
Lloyd et al ⁶ (2010)	1	UL Left	Open reduction of condyle, rigid inter-maxillary fixation (IMF), and intensive jaw physiotherapy	II
Papadopoulos et al ¹⁹ (2010)	1	UL Right	Right side coronoidectomy A Seldin elevator was placed lateral to the right ramus then downward medial pressure on condyle. Inter-maxillary fixation (IMF) utilizing Erich arch bars and a combination of 24 and 26 gauge wires, for 2 weeks	IIC
Tauro et al ² (2010)	1	UL Left	Closed reduction under sedation	IIA

Márcio Bruno Amaral MB et al ²⁰ (2011)	1	UL Left	Inter-maxillary fixation & reduction	I
Hegde et al ²¹ (2011)	1	UL Left	Open reduction and Inter-maxillary Fixation	IIB
Virender et al ²² (2013)	1	BL	Right side - Open (Finck's technique) reduction; Left- closed	II
Bong Chul Kim et al ²³ (2013)	1	BL	Left- Closed reduction Right- Bone traction hook at sigmoid notch through stab incision, reduction achieved	Left side -type IIA Right side-type IIB
Shen L et al ²⁴ (2014)	10	UL Left side	Manual reduction of dislocated condyle. Miniplate for symphysis fracture	Type IIB
		BL	Mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini-plate and reconstructive plate	Type IIB
		UL Left side	Left mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini titanium plate to fix fractured condyle and mandibular ramus	Type IIB
		UL Right side	Mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini plate for symphysis fracture	Type IIA
		UL Right side.	Manual reduction of dislocated condyle. Mini-titanium plate at angle fracture	Type IIA
		Bilateral.	Mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini-plate and reconstruction plate	Type IIA
		Unilateral Right side	Manual reduction of dislocated condyle. Mini-plate	Type IIB
		Unilateral Left side	Mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini-plate	Type IIA
		Unilateral Left side	Mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini-plate	Type IIB
		Bilateral	Mandibular sagittal split osteotomy. Manual reduction of dislocated condyle. Mini titanium plate & reconstruction plate to fix symphysis fracture	Type IIB
Gupta et al ²⁵ (2014)	1	Bilateral	Closed reduction of condylar and open reduction with internal fixation of symphyseal fracture	Left side & Right side- type IIB
Mishra et al ²⁶ (2015)	7	Left condyle	Deep sedation by lateral and inferior movement of ramus	Type IIB
		BL	Manual manipulation and reduction of condyles	Type I
		Right condyle	Open reduction under general anesthesia	Type IIB
		Right condyle	Manual manipulation and reduction of condyles	Type IIA
		Left condyle	Manual manipulation and reduction of left condyles	Type IIA
		BL	Manual manipulation and reduction of bilateral condyles	Type IIA
		BL	Manual manipulation and reduction of bilateral condyles	Type IIB
Kotak Rajkumar et al ²⁷ (2015)	1	BL	Right side-closed reduction Left side - Open reduction and TMJ capsulorrhaphy with the help of conventional procedure of inferiorly based split thickness Temporalis myofascial Flap	Type-IIA Type –IIB
Tabishur Rahman et al ²⁸ (2015)	1	UL	Muscle relaxant and Downward traction with loop of wire at molar under General Anesthesia	Type IIB
Degala Saikrishna et al ²⁹ (2015)	1	UL	Left condyle was reduced by manual manipulation through coronal incision under general anesthesia	Type IIB
Present study	1	BL	Left side – manual reduction of condyle by closed reduction. Right side – open reduction and TMJ capsulorrhaphy then condyles were levered into the glenoid fossa by applying down ward traction with a blunt heavy periosteal elevator	Left side-Type IIB Right side-Type IIB

According to available literature we found that 68 condyles were dislocated from glenoid fossa in 49 cases. This form of trauma had mostly occurred in

male, that too, mainly because of road traffic accidents. Based on above review, the unilateral dislocations had occurred in 32 cases (64%) while

bilateral in 18 (36%) cases out of 50 cases (Table II). Hence unilateral dislocations are more common than bilateral dislocations. The 50 cases of superiorly dislocated condyles include unilateral as well as bilateral cases. This means that there are 68 superiorly dislocated condyles in total. We have available information of 48 cases for its types. Out of 48 cases, the 42 cases were type II dislocated. The rest 6 cases were type I dislocated. The Worthington described his type of case with the term unusual and the information was not available for the case of Radhakrishna (Table III) (Table IV). Based on above, statics it can be concluded that the most common form of supero-lateral dislocation was Type II i.e. 58/66 dislocations (87.87%). The type I comprising just of 8/66 dislocations (12.12%). The various techniques had been tried for the management of supero-lateral dislocation of condyles. As the treatment factor of open reduction or closed reduction depends upon lag period from occurrence of supero-lateral dislocation of condyle till onset of treatment. This factor is directly proportional to treatment modality of open or closed reduction. Out of 50 cases (68 supero-lateral dislocated condyles), we have information of 49 cases (67 dislocated condyles) about its treatment. The 31 dislocations cases (50.7%) was managed by non surgical techniques [1-4,7,10,12,13,22-28] while 34 dislocations (46.26%) was managed by surgical modalities [5-7,9,11,14,16-22,24,26,27,29] while no treatment was given for 2 cases (2.98%) resulting in fibrous ankylosis [4] (Table V). It can be concluded that most of all surgeons had used open reduction techniques for management of supero-lateral dislocation. This may be because most of the cases were type II dislocations, hooked above the zygomatic arch and was difficult to be reduced by closed reduction.

Table: II Number of Unilateral /Bilateral cases

Type	(n= 50)
Unilateral	32 cases (64 %)
Bilateral	18 cases (36%)

Table: III Number of cases Type I/Type II in unilateral

Unilateral	N=30
Type I	4 cases (12.5%)
Type II	26 cases (81.25%)

Table: IV Number of cases Type I/Type II in Bilateral

Bilateral	N=18
Type I	2 cases (11.1%)
Type II	16 cases (88.8%)

Table: V Treatment modalities of supero-laterally dislocated condyle (n = 49 cases) / (67 supero-lateral dislocations)

Treatment method	Superolaterally dislocated condyles
Surgical	34 (50.7%)
Nonsurgical	31(46.26%)
No treatment	2 (2.98%)

Commonest procedure performed by surgeons is open reduction and TMJ capsulorrhaphy. Ferguson et al [10] and Satoh et al [5] earlier did condylectomy and arthroplasty by costal cartilage. Yoshi et al [16] had a case of superolateral dislocation with zygomatic arch fracture, so he temporarily removed the arch to reduce the mandibular condyle. Shen L et al [24] had done bilateral sagittal split osteotomy for reduction of condylar fracture. Kotak rajkumar et al [27] did capsulorrhaphy by suturing split thickness temporalis myofascial flap on lateral aspect of capsule was to prevent repeated early dislocation of superolateral condyle. The closed reduction/non surgical technique mostly had been managed by manual manipulation under sedation [2] or general anesthesia [3, 26] with muscle relaxants. Worthington [1] had tried managing his case by passing a wire through bone at left angle to facilitate downward traction but no avail and finally open reduction was done. Radhakrishna [12] had managed his case by open traction and closed reduction using Keen's approach in maxillary vestibule of involved side. Virender [22] managed his case by frinck's technique. Bong chul kim [23] was successful in

reducing condyle by placing bone traction hook at sigmoid notch through stab incision. Tabishur Rahman ^[28] applied a downward traction by passing a loop of wire at molar region under general anesthesia.

On thorough literature review, we have got information of 48 cases regarding associated fractures. Out of 48 cases there were 43 cases with facial fracture. These includes maxillary fractures (7cases), nasal (1case), zygomatic fracture (3cases) malar fractures (2cases) palatal fractures (2 cases) naso-orbito-ethmoidal fractures (1case), pan facial fractures (2 cases) and 42 cases of mandibular fractures. None of any fracture was observed in 5 cases of supero-lateral dislocation. There were 42 cases of mandibular fractures out of 48 cases and rest 6 cases were without mandibular fractures. (Table-VI) No information was available for associated fractures in 2 cases. There were 25 symphyseal, 12 parasymphyseal and 1 dento-alveolar fractures is noted when condyles were superolaterally dislocated. This means out of 48 cases, there were 38 cases (79.16%) with anterior mandibular fractures while rest 10 cases had no symphysis/ parasymphysis/anterior dento-alveolar fractures. It can be stated that in majority (20.83%), associated mandibular fracture is prerequisite for flaring of condyles and hence supero-lateral displacement.

Table: VI Anatomical mandibular fracture

Associated mandibular fracture	No of cases (n=42)
Dento-alveolar	1 (2.3%)
Symphyseal	25 (59.52%)
Parasymphyseal	12 (28.57%)
Body	2 (4.7%)
Angle	2 (4.7%)
Condyle/ Sub-condyle	9 (21.4%)
Coronoid	1 (2.3%)
No fracture	5 (11.9%)

Out of 48 cases of supero-lateral displacement, there were 39 cases with no fracture of condyles, while other 9 cases were associated with condylar fractures. ^[1, 10, 7, 11, 13, 24, 26] Out of these 9 cases, there were only 2 cases having fracture

and supero-lateral displacement of same side condyle,^[24] while rest 6 cases of condylar fractures were on the opposite side of supero-laterally displaced condyle.^[1, 10, 7, 11, 13, 26] There is 1 case of bilateral condylar fracture having bilateral supero-lateral dislocation.^[24] (Table VII)

Table: VII Side of Supero-lateral displacement and side of condylar fracture (n=48 cases)

Side of Supero-lateral displacement.	Side of condylar /sub-condylar fracture
Right side	Opposite Left side
Left side	Opposite Right side
Left side	Opposite Right side
Right side	Opposite Left side
Left side	Opposite Right side
Left side	Same Left side
Bilateral	Bilateral
Left side	Same Left side
Left side	Opposite Right side

Table: VIII Relationship between condylar fracture and symphyseal/ Parasymphyseal fracture. (n=48)

Condylar fracture	Symphyseal/Parasymphyseal Fracture
Left condyle	No fracture of symphysis
Right subcondyle	Right parasymphyseal fracture
Right condyle	Symphyseal fracture
Left condyle	Symphyseal fracture
Right condyle	Symphyseal fracture
Left condyle	Symphyseal fracture
Bilateral condylar	Symphyseal fracture
Left condyle	Symphyseal fracture
Right condyle	Right parasymphyseal fracture

It can be stated that there must be a force of impact coming from one direction resulting in condylar fracture of same side and displacement

of condyle on the opposite side. While the force of impact hitting at mid-symphysis resulted in bilateral supero-lateral displacement. ^[24] Out of 9 condylar fracture stated earlier, 6 were associated with symphysis fracture, 2 with right parasymphysis and another 1 case have no symphysis/ parasymphysis fractures. (Table VIII)

Conclusion

Several factors are responsible for supero-lateral dislocation of mandibular condyle which includes anatomy of joint, type of impact, direction of impact, magnitude of impact, position of mandible (open/closed), laxity of joint capsule, condition of dentition and other associated fracture. The above said factors interplay synchronously to bring about supero-lateral dislocation. Early surgical reduction is desirable and should be the aim of treatment as time lag results in fibrosis of glenoid fossa and subsequently resulting in imperfect or unsuccessful reduction and fibrous ankylosis. In our case delay in reduction by seven days and more superiorly displaced and hooked right condyle might be the reason for needful open reduction and capsulorrhaphy. Long term follow up is always needful in such cases.

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