Classification of condylar process fractures

M. Schneider, U. Eckelt

An important prerequisite for the appropriate treatment of fractures of the mandibular condyle is an unambiguous and therapy-relevant classification.

In the clinical situation, any fracture that is located above the mandibular foramen and that runs from the posterior edge of the ramus into the sigmoid notch or the condylar head, is classified as a fracture of the condylar process. There is a subclassification into deep, medium and high condylar process fractures. Fractures of the condylar head are referred to as intraarticular or diacapitular fractures. However, different systems of classification of these fractures make any comparison of treatment results difficult.

Regarding malposition of the fracture, the German classification differentiates between displacement (Dislokation) and dislocation (Luxation). Displacement describes the shift of the fracture fragments. According to Wassmund, displacement occurs ad axim, ad latus, ad longitudinum cum contractionem and, in rare cases, due to muscle traction cum distractionem. The term dislocated fracture is applied in cases where the cranial fracture fragment exarticulates. In such cases, the distal fracture fragment is often displaced or dislocated medially or anteromedially. Sometimes anterior or posterior, rarely lateral displacement or dislocation is encountered. In the English classification however, the terms “deviation”, “displacement” and “dislocation” differentiate the fractures. “Deviation” describes a simple deviation of the proximal fragment, while the shifted fracture fragments are still in primary contact. “Displacement” is applied in cases, where there is no contact of the fracture fragments. A “Dislocation” describes the entire exarticulation of the joint.

In the past, there have been various attempts to classify condylar process fractures. In 1927, Wassmund classified mandibular condylar fractures, by subdividing the fractures according to their anatomical position and to the cause of trauma:

- Vertical collum fracture, including rupture of the condylar head
- Transverse collum fracture
- Diagonal collum fracture

Köhler developed a classification based purely on the anatomical position. He differentiated between high diacapitular and subcondylar fractures, medium collum fractures and basal or deep collum fractures at the level of the sigmoid notch. Reichenbach differentiated high and deep collum fractures. Even today, a classification according to anatomical criteria is still commonly used (Fig. 1).

- Fracture of the condylar base
- Fracture of the condylar collum
- Diacapitular fracture through the condylar head

This classification describes the location of the fracture, however the equally important and treatment relevant degree of displacement and dislocation is not represented.

According to Müller, Dingmann and Natvig, the insertion line of the lateral pterygoid muscle is an essential criteria for the classification of condylar process fractures. This anatomical classification is rarely used in clinical practice due to the fact that this insertion line is difficult to find clinically. Nevertheless, Müller classified the degree of displacement and dislocation respectively into three classes of axial deviation from 10 to 90 degrees. In clinical practice, the classification according to Spiessl and Schroll proved most useful, however it is instead of this difficult to differentiate displacement and dislocation. The relation of the fossa to the condylar position can only be precisely evaluated in cases where the fracture fragment of the condylar head is located in the projection level of the x-ray image. Dislocated fractures cause a disarticulation of the condylar head and a rupture of the joint capsule. According to Wassmund and Gilhuus Moe, a degree of fragment malposition of more than 60 degrees can be presumed to be a dislocation.

Fig. 1: Elementary classification of condylar process fractures – without information about displacement or degree of dislocation.
The fragment can be dislocated medially, laterally, ventrally and dorsally. Although this classification does not explicitly demarcate the degree of displacement or dislocation, which is relevant to the prognosis, it is currently considered the basis of many comparative studies and multiple publications.

Classification of collum fractures according to Spiessl and Scholl

Type I: Collum fractures without considerable displacement (Fig. 2)

Type II: Deep collum fractures with displacement (Fig. 2)

Type III: High collum fractures with displacement (Fig. 3)

Type IV: Deep collum fractures with dislocation (Fig. 3)

Type V: High collum fractures with dislocation (Fig. 4)

Type VI: Intracapsular/diacapitular fractures (Fig. 4)

Fig. 2: Fractures type I and II according to Spiessl and Scholl.

Fig. 3: Fractures type III and IV according to Spiessl and Scholl.
An explicit definition of high and deep fracture displacement is still not available. According to Lund, Loukota et al. proposed the sigmoid notch to be the border between high and deep condylar process fractures (Fig. 5).

Following the classification of Spiessl and Schroll, Rasse, Neff, Hlawitschka and Loukota additionally classified the intraarticular or diacapitular condylar fractures according to the fracture line. A diacapitular fracture is defined by a fracture line starting within the articulation surface (Fig. 6).

**Type A (VI A)**: Displacement of medial condylar pole with preservation of the vertical dimension. The fracture is supported, stable and not shortened. The joint supporting articulation surface is partially affected at the medial condylar head fragments.

**Type B (VI B)**: The lateral condylar pole is involved with loss of the vertical dimension. The fracture is not supported, unstable and shortened. The joint supporting articulation surface is subtotally affected, together with the lateral gauge and the lateral ligament.

---

*Fig. 4: Fractures type V and VI according to Spiessl and Scholl.*

*Fig. 5: Classification of fractures of the condylar process in accordance with the height of fracture. First, a tangent line is placed between the dorsal gauge of the condylar process and the mandibular angle. Line A is perpendicular to the tangent line and crosses the deepest point of the semilunar notch. High condylar fracture: The fracture line starts below line A and runs to over 50% of its length above line A. Deep condylar fracture: The fracture line runs above the mandibular foramen and is with over 50% of its length below line A.*
This classification is clinically relevant as diacapitular fractures of type VI A and do not lose support within the articular fossa. There is no shortening, functional impairment is minimal and an open reduction is not indicated (Fig. 7).

Type C (V): The joint supporting articulation surface is entirely affected with a dislocation of the entire condylar head. This corresponds to class V according to Spiessl and Schroll.

This classification is clinically relevant as diacapitular fractures of type VI A and do not lose support within the articular fossa. There is no shortening, functional impairment is minimal and an open reduction is not indicated (Fig. 7).

Fig. 6: A diacapitular fracture exists if the fracture line runs within the area of the articular capsule. Left picture: Fracture type A with continuous bony contact within the articular fossa (no loss of ramus height). Middle picture: Fracture type B with loss of the support within the articular fossa and loss of height of the mandibular ramus. Right picture: Fracture type C with the uppermost part of the fracture below the base of the lateral ligament – also with loss of ramus height.

Fig. 7: Computertomographic demonstration of diacapitular fractures in a coronal section. Left: Diacapitular fracture Type VI A without loss of the support in the articular fossa. Right: Diacapitular fracture Type VI B with considerable loss of the support and indication for open treatment by osteosynthesis.
Hlawitschka and Eckelt added an additional type of fracture to fractures of type VI A and VI B:

Type M, comminuted fracture with loss of vertical dimension. The fracture is shortened and not supported.

Conventional radiography is important in routine diagnosis of mandibular fractures. As a basic principle in fracture diagnosis, visualisation in two radiographic planes is necessary. According to Clementschitsch, panoramic tomography and posterior-anterior radiography are the established basic views.

In order to select a surgical approach and to choose the appropriate osteosynthesis, computer tomography (CT) or digital volume tomography (DVT) are necessary, offering more differentiated sectional images. This is especially the case for the preoperative diagnosis of diacapitular condylar fractures. Fracture height and the degree of displacement can be properly visualised in coronal tomographic sections (Fig. 7). Three-dimensional reconstruction improves the accuracy of classification, especially for high fractures. In relation to the significance of computer tomography, exposure to radiation is relatively low and will be further decreased by modern techniques and the application of digital volume tomography (DVT).

The Spiessl and Schroll classification of fracture types I to VI and together with the explicit differentiation between condylar base and condylar collum fractures Loukota allows a clear and therapy-relevant classification. The additional identification of the degree of displacement and dislocation in millimeters and the determination of the degree of angulation enable an even more precise evaluation of the severity of the fracture. The classification according to Rasse and Neff together with Hlawitschka and Loukota prove useful for the classification of diacapitular fractures. In summary, Fig. 8 illustrates the relation between commonly applied classifications and the surgical approaches.

**Fig. 8: Classification of condylar fractures and surgical approach**
References

1) Cattaneo, G.
Erlangen, 1984

2) Dingman R. O., P. Natvig
Surgery of Facial Fractures.

3) Eckelt, U.
Gelenkfortsatzfrakturen. [Fractures of the mandibular condyle.

4) Eulert, S.
Die Behandlung von Gelenkfortsatzfrakturen des Unterkiefers unter besonderer Berücksichtigung der Würzburger Zugschrauben-Platte.
Würzburg, Julius-Maximilians-Universität, 2002.

5) Gilhuus-Moe, O.
Fractures of Mandibular Condyle in the Growth Period.
Oslo Norway, Universitetförlaget, 1969.

6) Hlawitschka, M.
Klinische, radiologische und funktionsdiagnostische Ergebnisse konservativ funktionell und operativ behandelter Frakturen des Caput mandibulae.

7) Hlawitschka, M., Eckelt U.
Assessment of patients treated for intracapsular fractures of the mandibular condyle by closed techniques.

8) Köhler, J.
Diagnostik und Therapie der Kieferfrakturen.
Heidelberg, Hüthig 1951.

9) Loukota, R., Neff A., Rasse M.
Nomenclature/classification of fractures of the mandibular condylar head.

10) Loukota, R. A., Eckelt U., DeBont L., Rasse M.
Subclassification of fractures of the condylar process of the mandible.

11) Lund, K.
Acta Odontol Scand Suppl 1974;32(64): 3-117

12) Mokros, S.
Die operative Behandlung von Gelenkfortsatzfrakturen des Unterkiefers über den intraoralen Zugang - Optimierung der Methodik, Ergebnisse.

13) Müller, W.
Neuere Erkenntnisse in der Diagnostik und Therapie der Gelenkfortsatzfrakturen des Unterkiefers.

Neue Aspekte zur Indikation der operativen Versorgung intra-artikulärer und hoher Kiefergelenkluxationsfrakturen.
[New aspects for indications of surgical management of intra-articular and high temporomandibular dislocation fractures].

15) Rasse, M.
Diacapituläre Frakturen der Mandibula. Eine neue Operationsmethode und erste Ergebnisse.

16) Reichenbach, E.
Zur Frage der operativen Knochenbruchbehandlung im Bereich des Gesichtsschädels.

17) Rowe, N., Killey H.C.
Fractures of the Facial Skeleton.

18) Schimming, R., Eckelt U., Kittner T.
The value of coronal computer tomograms in fractures of the mandibular condylar process.

19) Spiessl, B., Schroll K.

20) Spiessl, B., Schroll K.

21) Wassmund, M.
Frakturen und Luxationen des Gesichtsschädels unter Berücksichtigung der Komplikationen des Hirnschädels.

22) Wassmund, M.
Über Luxationsfrakturen des Kiefergelenks.
Dtsch Kieferch 1934;1:27-54.