A trainee's experience in the learning curve for operating independently for open reduction and internal fixation of condylar neck fractures of the mandible

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Abstract

German: Die operative Reposition mit Fixierung durch Osteosynthese von Kiefergelenkhalsfrakturen ist heute ein anerkanntes Verfahren und häufig die Methode der Wahl. Diese retrospektive Studie beschreibt die Lernkurve eines einzelnen, in Weiterbildung befindlichen, Kollegen bei der Durchführung von 30 aufeinander folgenden Eingriffen und die jeweilige Komplikationsrate.

Einleitung

In nur zwanzig Jahren hat sich die chirurgische Reposition und interne Fixierung (Osteosynthese) von Kiefergelenkhalsfrakturen als Hauptverfahren in der Praxis durchgesetzt. Die vorher praktizierten, konservativ geschlossenen Behandlungen verwendeten verschiedene Verfahren wie Bögen, Ösen, Leonard-Knöpfe oder kurzfristige intermaxilläre Fixierungen, um eine intermaxilläre Zuggurtung zu erreichen, damit die Zähne in Okklusion gehalten werden, während der kondyläre Knochen heilte.[4] Der Hauptgrund für die Nichtdurchführung einer operativen Reposition war die Möglichkeit einer iatrogenen Schädigung des Nervus facialis. Die Kiefergelenkchirurgie ist heute gut etabliert und die vorher gefürchtete Verletzung des siebten Hirnnervs tritt nicht so häufig auf, wie früher angenommen.[5,6] Dies, zusammen mit Mitchells Beobachtung, dass einige Patienten mit konservativer Frakturbehandlung dürftige Ergebnisse zeigten, hat den Behandlungsweg der Chirurgen für diese Art von Verletzung geändert, im wörtlichen und auch übertragenen Sinn.[1]
Andere Techniken zur kondylären Fixierung, wie Nagelung, wurden vorgeschlagen. Es wurde behauptet, eine Schädigung des N. facialis wäre geringer,[7] aber die Plattenosteosynthese bietet eine direkte Frakturreinsicht und führt zu einer dreidimensionalen Stabilität.[8] Es gilt als gesichert, dass es in der Weiterbildung Zeit, Erfahrung und Aufsicht benötigt, um besondere technische Fähigkeiten zu entwickeln, wie z. B. die operative Versorgung einer Kiefergelenkhalsfraktur.
Diese retrospektive Studie untersucht die Komplikationsrate von 30 aufeinander folgenden Fällen, die vom selben Behandler durchgeführt wurden. Sie ermöglicht eine Diskussion über wichtige Weiterbildungs- und technische Aspekte, die während der Lernkurve erworben werden. Alle Fälle wurden durch einen retromandibulären transparotiden Zugang durchgeführt. Im Falle von kondylären Frakturen im Zusammenhang mit Frakturen zahntragender Teile des Unterkiefers wurden letztere zuerst mit Platten versorgt.

Educational pointers

Access and how it was modified over time.
Initially a 2.5 cm long incision, 1 cm posterior to the ramus was used, but it was found that significant dissection was required to reach the bone. The incision was subsequently modified to lie directly over the posterior border of the ramus. This was in due course modified again to a stepped incision for the skin and capsular incisions, 1 cm apart, in order to reduce the risk of a sialocele.
When only two surgeons were operating, access could be difficult, especially if one surgeon was inexperienced.

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The trainee developed a preference for malleable instruments as these could be shaped to suit different anatomical situations. One instrument was inserted vertically through the sigmoid notch, medial to the ramus and a second instrument inserted horizontally posteromedial to the ramus. These instruments could be secured in place with towel clips.

Three techniques used for distraction to prevent segments overlapping.

The first was manual distraction of the fracture, with the assistant bringing the mandible downwards and forward. The second used a standard bite block or mouth prop between the teeth. Finally, if required, a screw was inserted transcutaneously at the lower border of the mandible, and a 0.5 mm wire used to apply downward traction from the screw.

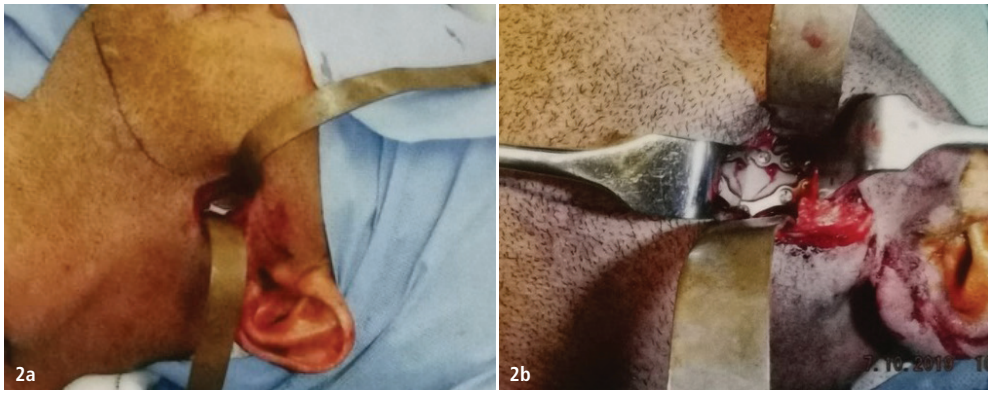
Intermaxillary screws for intraoperative maxillary and mandibular fixation.

In the past, closed treatment of condylar neck fractures in dentate patients utilised arch bars. These were wired to the teeth and elastic bands pulled the teeth and jaws together. Intermaxillary fixation screws (IMF) allowed temporary fixation. These screws were placed conventionally, overlapping fractures distracted and reduced. The maxillary and mandibular fixation was applied with elastic bands or a power chain. This freed up the assistants hands and allowed them to be of help with the plating procedure of the fracture with the teeth in occlusion.

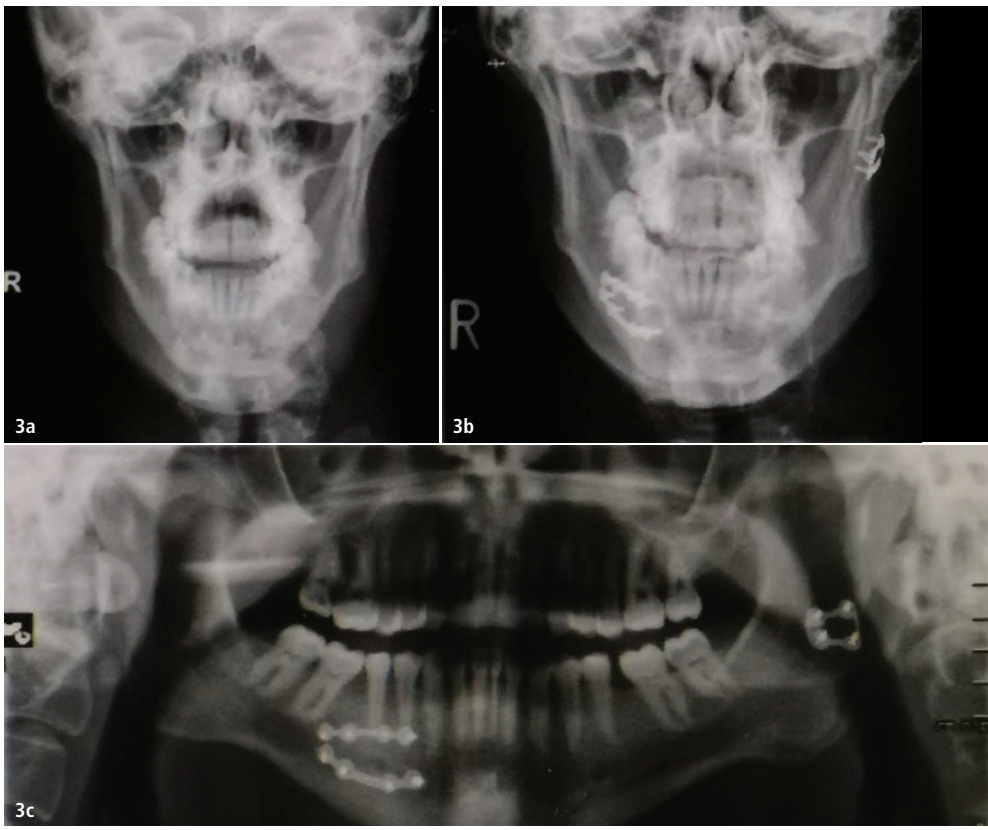
The reason why different shapes of 2.0 mm plates were used.

Most frequently, the operator preferred a four-hole plate with a spacer at the posterior border and placed a four-hole non-spaced plate anteriorly. If access to the anterior part of the condylar fracture was difficult, a two-hole spaced plate was used there. The trainee did not feel that one trapezoid shaped plate offered advantages in terms of successfully completing the procedure instead of

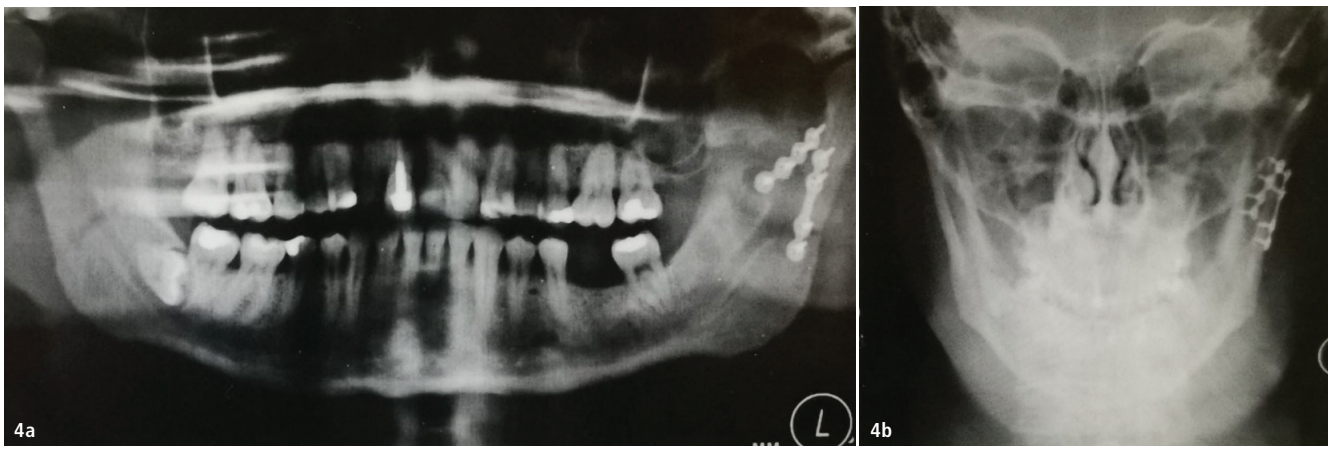
Figs. 1a and b: Modified approach to the condyle for plating.



Figs. 2a and b: The use of retractors to improve access.



Figs. 3a–c: Pre and post views of the Trapezoid plate in position.



Figs. 4a and b: Two four-hole plates with space in position.

using two conventional plates. Subjectively, the operator felt that one single conventional four-hole plate on the posterior border of the condylar neck allowed easier manipulation of the condylar segment into the reduced position.

Audit

The aims of the Audit were to assess compliance with the Strasburg Osteosynthesis Research Group criteria and surgical outcomes (SORG).[8, 14] This was a retrospective audit of all patients who underwent open reduction and internal fixation of fractured condylar necks by a single trainee (IA) between August 2017 and October 2018. The cohort was predominantly male, and the most frequent mechanism of injury was alleged assault. The distribution of the nature of the injuries is shown in Figure 5.

Complications

One patient developed a sialocele, which resolved spontaneously. Another patient had a return to theatre with malocclusion. It was felt that the condylar fracture was satisfactorily reduced and fixed, and that the cause of malocclusion was a suboptimally reduced anterior mandibular fracture.

Conclusions/discussion

From an educational point of view the trainee felt that having had consultant supervision for several cases made it possible for him to perform condylar open reduction and internal fixation with progressively less consultant trainer input and became fluent in the management of these injuries.
Clearly trainees vary in all domains of their diagnostic and technical skills, including the complex psychomotor skills, needed to perform this type of operation. So the need for repeated exposure to and performance of specific operative procedures has long been recognised.[9, 10] Although the technique is well-established, there is little in the literature about training surgeons in the open reduction and internal fixation technique. In the United Kingdom, trainees in recognised training programmes use the Intercollegiate Surgical Curriculum Pathway (ISCP) for continual assessment. One form of workplace-based assessment (WBA) is Direct Observation of Procedure (DOPS). This allows semiobjective assessment of the trainee from novice to those appropriate for certification.[11] The trainee had been assessed at Level 3a, prior to independent operating, meaning the trainee was judged by consultant trainers to be able to perform the procedure with minimal guidance or intervention. Perhaps unsurprisingly the trainee reported that having two assistants reduced the operative time and facilitated the procedure. He commented that the careful use of malleable retractors was a key element in completing the procedure.
All patients who had open reduction and internal fixation to the condyle of the mandible met the SORG criteria for that treatment.[9, 14]

These were as follows:
1. Fracture through the condylar head (Diacapitular fracture)
2. Fracture through the neck of the condyle
3. Fracture of the condylar base
4. Greater than 2 mm displacement

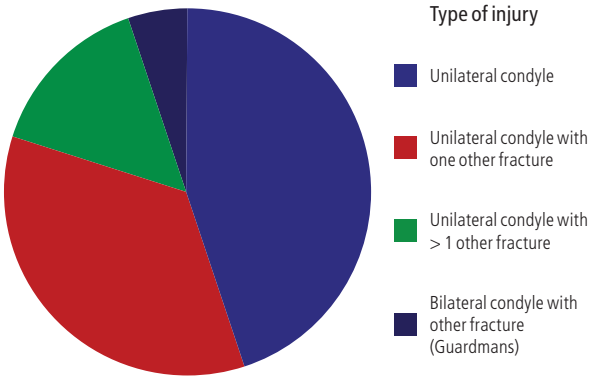
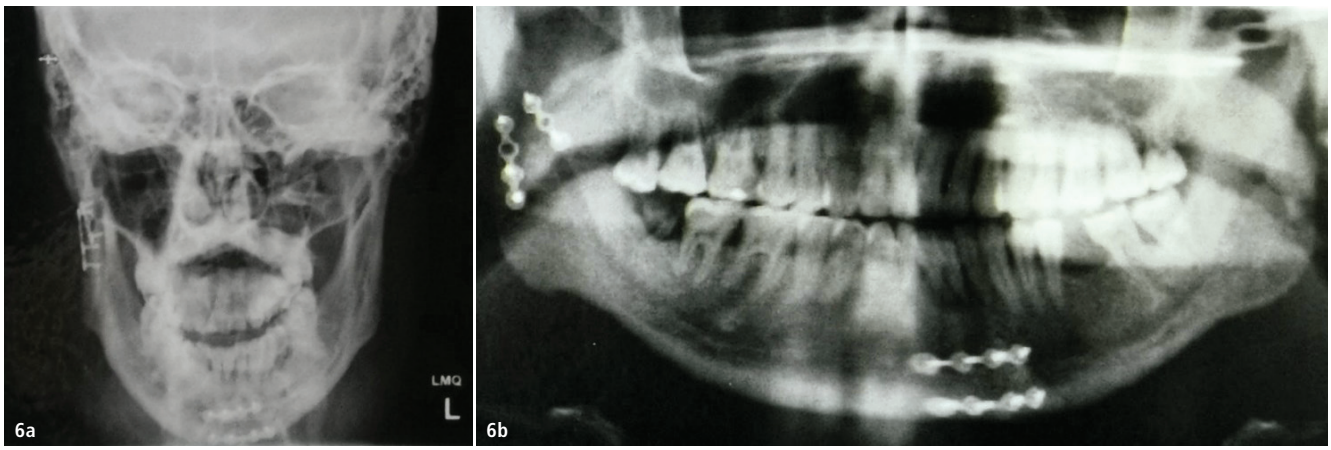


Fig. 5: Nature of injuries sustained in condylar fractures.



Figs. 6a and b: Postoperative radiographs showing bilateral fracture and malocclusion of the anterior mandible.

Open reduction and plating of fractured condylar neck fractures had a low complication rate with only one directly attributable to the procedure and this resolved spontaneously. It was considered a safe approach and no facial nerve weakness was observed even on the first postoperative day.

Tips for trepidations trainees

Access to condylar neck fractures, by means of the retromandibular/trans parotid approach, was direct and safe. The skin incision should not be placed directly over the posterior border of the ramus of the mandible. The use of a stepped incision reduced the risk of sialocele. Intermaxillary fixation screws could be used intraoperatively for maxillary and mandibular fixation. Malleable retractors improved access and freed the assistants hands. Using a four-hole spaced plate on the superior condylar fragment, fixing it with two screws, and then using it to pull the condyle into place, before securing the final two holes of the plate with screws to the ramus of the mandible, was a useful technique.

Summary

Open reduction and internal fixation of mandibular condylar fractures presents less danger to the facial nerve than previously thought, and trainees must gain experience of the procedure. We have shown that when a trainee was provided an adequate training and therefore gains experience, they can undertake these procedures safely. In the United Kingdom, there is a move towards competence-based rather than time-based training, using ISCP differently and DOPS. Open reduction and internal fixation of such fractures can be assessed using DOPS. But time spent in surgical training is important and although it may be possible for some trainees to acquire the necessary psychomotor skills to perform operative procedures, it must be remembered that non-technical skills may take longer to develop.[12]
Our intention is to continue this work as larger numbers give greater strength to the assessment.[13]

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Conflict of interest
There is no conflict of interest.

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