

Management of mandibular condyle fractures in Jordan

Zaid H. Baqain, BDS, FDS RCS (Eng), MSc

مقدمة: تهدف هذه الدراسة الى النظر في طريقة تدبير كسور رأس و عنق لقمة الفك السفلي لدى البالغين من قبل اختصاصي جراحة الفم والفكين في الأردن. **طريقة البحث:** أعد استبيان مكون من خمسة حالات دراسية سريرية حول تدبير كسور رأس وعنق لقمة الفك السفلي المفردة أو مع وجود كسور أخرى في الفك السفلي، بالإضافة إلى مجموعة أسئلة تتعلق بطرق التثبيت والأسلوبي الجراحي المتبع. تم إرسال الاستبيان إلى جمع اختصاصي جراحة الفكين و الوجه المسجلين في الأردن (54 اختصاصي). **النتائج:** بلغت نسبة الرد على الاستبيان 61%. كان هناك أجماعاً على استخدام المعالجة المحافظة للكسور المزاحة قليلاً ($P < 0.001$) والكسور داخل المحفظة والمتصلة ($P < 0.001$)، والغالبية فضلت المعالجة الجراحية لكسور لقمة الفك المزاحة ($P < 0.05$) والمخلوطة ($P < 0.001$) لمتراقة مع سوء إطباق. أما في حالات كسر لقمة الفك السفلي ثنائي الجانب بوجود إزاحة أو خلع في أي من الجهتين كان اختيار المعالجة الجراحية هي المفضلة لجهة واحدة على الأقل. أبدى معظم الجراحين معرفتهم في استخدام الصفائح العظمية الصغيرة من خلال الشق الجراحي المحيط بالأذن. **الخلاصة:** يفضل معظم اختصاصي جراحة الفم والفكين في الأردن الرد الجراحي لكسور لقمة الفك السفلي المزاحة أو المخلوطة المترافقة مع سوء إطباق، وهذا يتوافق مع ماورد في المقالات الحديثة.

Objectives: The aim of the study was to assess the attitudes of Jordanian oral and maxillofacial surgeons (OMFS) with regard to the management of mandibular condyle head and neck fractures in adults and to compare results with those found in the international literature. **Methods:** A questionnaire comprising five clinical scenarios on the management of condylar head and neck fractures in isolation and in combination with other mandibular fractures, and questions on fixation method and surgical approach was used. The questionnaire was sent to 54 registered OMFS practicing in Jordan. **Results:** Thirty-three completed questionnaires were returned (61%). A consensus was found among the respondents on the use of closed treatment for slightly displaced ($P < 0.001$) and intra-capsular and/or comminuted fractures ($P < 0.001$), and the majority preferred open treatment for displaced ($P < 0.05$) and dislocated ($P < 0.001$) condylar fractures with abnormal occlusion. In bilateral fractures, the respondents were more likely to openly treat at least one condyle if either was displaced or dislocated. Almost all surgeons were familiar with the use of osteosynthesis mini-plates and the preauricular approach was the most favoured. **Conclusion:** Oral and maxillofacial surgeons in this survey were more likely to use open reduction for displaced and dislocated fractures associated with malocclusion in adults, and this is in accordance with the current trend in the literature.

INTRODUCTION

Condylar fracture is the most common mandibular fracture accounting for 20-35 % of all mandibular fractures.^{1,2,3} It is associated with a considerable morbidity of malocclusion, temporomandibular joint dysfunction especially with intra-capsular fractures,⁴ limitations in mouth opening,⁴ slowing and changes in the pattern of the chewing cycle.⁵

The treatment of condylar fracture of the mandible has attracted a lot of attention over the past few decades and the number of publications on this topic is in the hundreds now. The scientific knowledge of maxillofacial trauma has brought to conclusion many aspects related to the management of mandibular

fractures, but some aspects of condylar fractures remain controversial. It is generally agreed that a successful treatment includes a pain-free joint with a normal range of movement and a mouth opening of more than 30 mm, good occlusion and symmetry of the mandible.⁶

There is an onus on health care professionals to provide patients with information on treatment options in line with evidence-based practice to support proposed treatment protocols.⁷ However, there are no randomized clinical trials addressing the clinical issue of open versus closed reduction of mandibular condyle fractures because of ethical issues involved in the conduct of such an investigation.⁸ Therefore surgeons continue to deal with the management

Assistant Professor in Oral & Maxillofacial Surgery
Chairman of the Oral Surgery
Oral Medicine and Periodontology Department
Faculty of Dentistry, University of Jordan
Amman, Jordan

Address reprint requests to
Zaid H. Baqain
P.O. Box 13930
Amman 11942, Jordan
Email: zbaqain@ju.edu.jo

of mandibular condyle fractures based on clinical experience, peer advice and opinion.⁹

The aims of our study were to explore areas of consensus and difference among Jordanian OMFS in managing mandibular condyle fractures in adults, and comparing the results with those reported in international literature.

MATERIALS AND METHODS

A questionnaire derived from that produced by Baker *et al.*¹⁰ concerning the treatment strategies of mandibular condyle fractures in adults was used and it comprised five clinical scenarios. The first three scenarios described a unilateral displaced condylar neck fracture; displacement as an indication of the degree of separation between the two fragments or overlap of both ends or both. The degree of displacement for the index condyle was different for each as shown:

1. Condylar fracture which is undisplaced and associated with normal or abnormal occlusion.
2. Condylar fracture which is slightly displaced, displacement of less than 10° or overlap of the bone ends of less than 2mm or both,¹¹ and associated with abnormal occlusion.
3. Condylar fracture which is displaced, displacement of more than 10° or overlap of the bone ends of more than 2 mm or both and associated with abnormal occlusion.
4. Condylar fracture which is dislocated, when part of the condyle is displaced outside the glenoid fossa and associated with abnormal occlusion.
5. Condylar fracture which is intra-capsular and/or comminuted associated with abnormal occlusion.

Each clinical scenario comprised a number of treatment options with additional information as follows:

- Isolated unilateral condylar fracture.
- Index condylar fracture combined with mandibular body fracture (displaced and undisplaced).
- Index condylar fracture combined with contralateral condylar fracture (displaced and undisplaced).

In addition to the clinical scenarios the questionnaire included two questions on the surgical approach(es) and the fixation method(s) practised by the surgeon for the treatment of condylar fractures. Intermaxillary fixation in this study consisted of applying intermaxillary guiding elastics to control the occlusion for 1-6 weeks.¹²

OMFS practising in Jordan and registered on the specialist register list (65 surgeons) were contacted by phone prior to sending the questionnaire to confirm the corresponding address, training institutions attended and experience in treating mandibular condyle fractures. Six surgeons were not contactable because the addresses on the register were not correct. Consequently, 59 surgeons were informed about the questionnaire; five of them were excluded because they never treated mandibular condyle fractures after completing their surgical training. Thereafter, the questionnaire with an explanatory letter was posted to or delivered by hand along with a prepaid self addressed envelop to only 54 surgeons.

Data were processed and analyzed by means of the Statistical Package for the Social Sciences (SPSS version 10.0). All of the responses were weighted equally within questions and among questions. The Chi-square test was used to compare the answers. The level of statistical significance for all tests was set at $P < 0.05$.

RESULTS

Of the 54 questionnaires delivered, 33 completed questionnaires were returned to the author giving a response rate of 61%. The results of the questionnaire were as follow:

Condylar fracture which is undisplaced and associated with normal or abnormal occlusion (Fig. 1, Table 1)

Slightly more than half (55%) used a period of intermaxillary fixation (IMF) for the treatment of isolated unilateral condylar fracture. When combined with undisplaced mandibular body fracture, a significant number of surgeons (73%) used a period of IMF as the treatment of choice (Chi-square = 41.06, $P < 0.001$). For condylar fracture associated with displaced body fracture, 61% used open reduction and rigid fixation (ORIF) of the body and a period of IMF (Chi-square = 11.09, $P = 0.004$). Index condyle fracture associated with undisplaced contralateral condylar fracture was treated using a period of IMF by the majority (82%, Chi-square = 35.64, $P < 0.001$), whereas with a contralateral displaced condylar fracture, a significant number (67%, Chi-

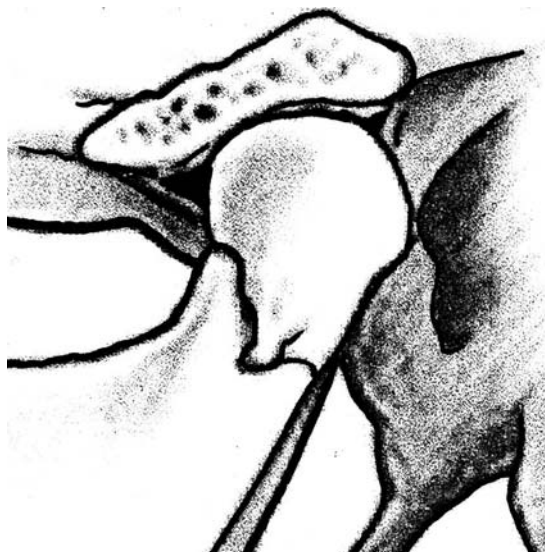


Fig. 1. Condylar fracture which is undisplaced.

square = 45.64, $P < 0.001$) used ORIF of the contralateral displaced condyle and a period of IMF.

Condylar fracture which is slightly displaced and associated with abnormal occlusion (Fig. 2, Table 2)

The vast majority (91%) used a period of IMF for the treatment of this fracture and this was greatly significant (Chi-square = 49.27, $P < 0.001$). When combined with undisplaced mandibular body fracture, 73% used a period of IMF as the treatment of choice (Chi-square = 60.18, $P < 0.001$), whereas when

Table 1. Condylar fracture which is undisplaced and associated with normal or abnormal occlusion.

	Jordanian Survey	International Survey	Case Scenario			
			A	B	C	D
No active treatment	45%	66%	3%	-	15%	3%
A period of intermaxillary fixation (IMF)	55%	33%	73%	18%	82%	9%
Open reduction and internal fixation (ORIF)	-	1%	15%	21%		
ORIF of body and a period of IMF			9%	61%		
ORIF of body and index condyle			-	-		
ORIF of body and index condyle and a period of IMF			-	-		
ORIF of index condyle alone					-	-
ORIF of contralateral condyle alone					-	12%
ORIF of index condyle and a period of IMF					-	9%
ORIF of contralateral condyle and a period of IMF					-	67%
ORIF of both condyles					3%	-
ORIF of both condyles and a period of IMF					-	-

- A Combined with an undisplaced body fracture
 B Combined with a displaced body fracture
 C Combined with contralateral undisplaced condylar fracture
 D Combined with contralateral displaced condylar fracture

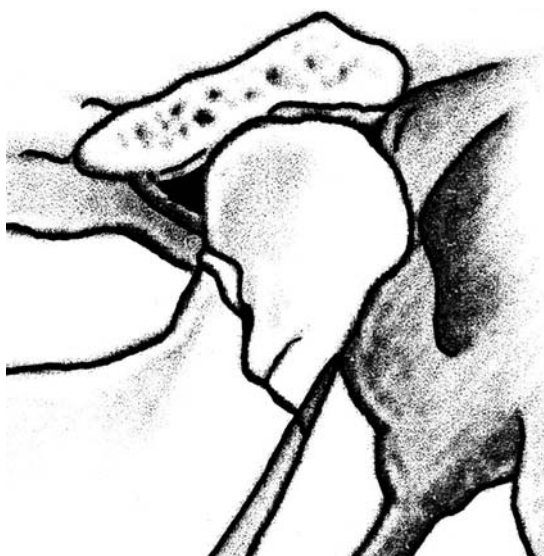


Fig. 2. Condylar fracture which is slightly displaced.

Table 2. Condylar fracture which is slightly displaced and associated with abnormal occlusion

	Jordanian	International		
	Survey	Survey		
No active treatment	3%	6%		
A period of IMF	91%	90%		
ORIF of index condyle	-	1%		
ORIF of index condyle and a period of IMF	6%	3%		
	Case Scenario			
	A	B	C	D
No active treatment	3%	-	3%	-
A period of IMF	73%	3%	88%	9%
ORIF of index condyle alone	-	-	3%	-
ORIF of body only	3%	12%		
ORIF of index condyle and a period of IMF	3%	3%	3%	-
ORIF of body and a period of IMF	18%	79%		
ORIF of body and index condyle	-	3%		
ORIF of body and index condyle and a period of IMF	-	-		
ORIF of contralateral condyle alone			-	6%
ORIF of contralateral condyle and a period of IMF			-	82%
ORIF of both condyles			-	3%
ORIF of both condyles and a period of IMF			3%	-

associated with displaced body fracture, 79% used ORIF of the body and a period of IMF (Chi-square = 72.3, $P < 0.001$). For fractures associated with undisplaced contralateral condylar fracture, 88% used a period of IMF for treatment (Chi-square = 95.03, $P < 0.001$) and with a contralateral displaced condylar fracture, 82% used ORIF of the contralateral displaced condyle and a period of IMF (Chi-square = 57.06, $P < 0.001$).

Condylar fracture which is displaced and associated with abnormal occlusion (Fig. 3, Table 3)

The majority (78%) used open treatment for the management of isolated fractures (Chi-square = 10.94, $P = 0.01$), but less than half of those thought a period of IMF was necessary postoperatively. When combined with undisplaced mandibular body fracture, 64% used ORIF of the condyle and a period IMF (Chi-square = 42.0, $P < 0.001$), whereas when associated with displaced body fracture, 64% used ORIF of both the condyle and body (Chi-square = 30.88, $P < 0.001$). When the fracture was associated with undisplaced contralateral condylar fracture, 67% chose ORIF of the

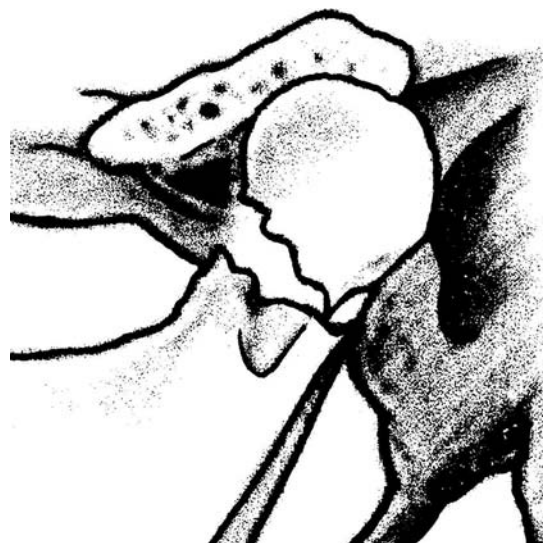


Fig. 3. Condylar fracture which is displaced.

Table 3. Condylar fracture which is displaced and associated with abnormal occlusion

	Jordanian Survey	International Survey		
No active treatment	-	3%		
A period of IMF	21%	78%		
ORIF of index condyle	42%	9%		
ORIF of index condyle and a period of IMF	36%	10%		
Case Scenario				
	A	B	C	D
No active treatment	3%	-	3%	-
A period of IMF	18%	-	12%	6%
ORIF of index condyle alone	-	-	18%	-
ORIF of body only	-	-		
ORIF of index condyle and a period of IMF	64%	6%	67%	21%
ORIF of body and a period of IMF	3%	27%		
ORIF of body and index condyle	12%	64%		
ORIF of body and index condyle and a period of IMF	-	3%		
ORIF of contralateral condyle alone			-	-
ORIF of contralateral condyle and a period of IMF			-	6%
ORIF of both condyles			-	18%
ORIF of both condyles and a period of IMF			-	49%

index condyle and a period of IMF (Chi-square = 32.09, $P < 0.001$), while with a contralateral displaced condylar fracture, half (49%) used ORIF of both condyles and a period of IMF (Chi-square = 19.88, $P = 0.001$).

Condylar fracture which is dislocated and associated with abnormal occlusion (Fig. 4, Table 4)

A significant proportion of the respondents (85%) opted for open treatment (Chi-square = 16.03, $P < 0.001$) and more than half of those thought a period of IMF was necessary postoperatively. When combined with undisplaced mandibular body fracture, 58% used ORIF of the condyle and a period

**Fig. 4.** Condylar fracture which is dislocated.**Table 4.** Condylar fracture which is dislocated and associated with abnormal occlusion

	Jordanian Survey	International Survey		
No active treatment	-	21%		
A period of IMF	15%	53%		
ORIF of index condyle	33%	26%		
ORIF of index condyle and a period of IMF	52%	-		
Case Scenario				
	A	B	C	D
No active treatment	-	-	3%	-
A period of IMF	21%	3%	6%	3%
ORIF of index condyle alone	-	-	6%	-
ORIF of body only	-	-		
ORIF of index condyle and a period of IMF	58%	24%	82%	27%
ORIF of body and a period of IMF	-	6%		
ORIF of body and index condyle	21%	64%		
ORIF of body and index condyle and a period of IMF	-	3%		
ORIF of contralateral condyle alone			-	-
ORIF of contralateral condyle and a period of IMF			3%	3%
ORIF of both condyles			-	24%
ORIF of both condyles and a period of IMF			-	43%

of IMF as their treatment (Chi-square = 8.73, $P = 0.013$). When associated with a displaced body fracture, 64% used ORIF of the condyle and body (Chi-square = 44.42, $P < 0.001$). In fractures combined with undisplaced contralateral condylar fracture, 82% used ORIF of the index condyle and a period of IMF (Chi-square = 78.97, $P < 0.001$), whereas when combined with a contralateral displaced condylar fracture, less than half (43%) chose ORIF of both condyles and a period of IMF (Chi-square = 18.97, $P = 0.001$).

Condylar fracture which is intra-capsular and/or comminuted and is associated with abnormal occlusion (Fig. 5, Table 5)

Seventy-six percent of the respondents chose a period of IMF as the treatment of choice (Chi-square = 45.91, $P < 0.001$). When combined with undisplaced mandibular body fracture, 52% used a period of IMF as their treatment (Chi-square = 23.52, $P < 0.001$), whereas with a displaced body fracture, 73% used ORIF of the body and a period of IMF (Chi-square = 41.06, $P < 0.001$). For fractures combined with undisplaced contralateral condylar fracture, 73% used a period of IMF (Chi-square = 58.36, $P < 0.001$). However, when combined with a contralateral displaced condylar fracture, 73% used ORIF of the contralateral displaced condyle and a period of IMF (Chi-square = 58.36, $P < 0.001$).

The second section of the questionnaire revealed that almost all (97%) of the surgeons preferred the use of osteosynthesis mini-plates for the treatment of mandibular condyle fractures. For the surgical approach to the mandibular condyle, 88% of the respondents were comfortable with the preauricular approach, 46% with the submandibular, 42% with the retromandibular and only 6% with the intra-oral. When it came to where the respondents obtained their surgical training, 13 (39.5 %) did in the UK, 13

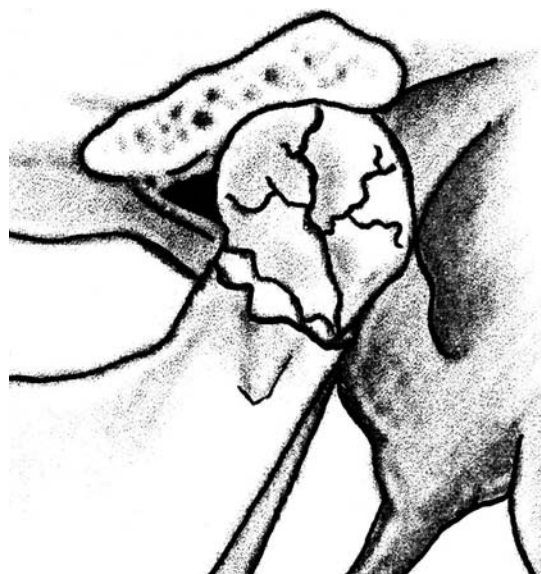


Fig. 5. Condylar fracture which is intra-capsular and/or comminuted.

Table 5. Condylar fracture which is intra-capsular and/or comminuted and is associated with abnormal occlusion.

	Jordanian Survey	International Survey	Case Scenario			
			A	B	C	D
No active treatment	12%	6%				
A period of IMF	76%	82%				
ORIF of index condyle	3%	1%				
ORIF of index condyle and a period of IMF	9%	11%				
No active treatment	3%	-	9%	-	-	-
A period of IMF	52%	-	73%	3%	-	3%
ORIF of index condyle alone	-	-	3%	-	-	-
ORIF of body only	9%	9%				
ORIF of index condyle and a period of IMF	15%	3%	12%	3%	-	-
ORIF of body and a period of IMF	21%	73%				
ORIF of body and index condyle	-	15%				
ORIF of body and index condyle and a period of IMF	-	-				
ORIF of contralateral condyle alone					-	9%
ORIF of contralateral condyle and a period of IMF					3%	73%
ORIF of both condyles					-	-
ORIF of both condyles and a period of IMF					-	12%

(39.5%) in the former East European countries, 6 (18%) did in the Middle East, and 1 (3%) from North America.

DISCUSSION

The criteria put forward by Zide and Kent in 1983¹³ regarding the absolute and relative indications for open reduction suited the wire osteosynthesis era and the absolute indications are rarely encountered. Since the introduction of rigid internal fixation, surgeons have raised concerns regarding the functional outcome of closed treatment of mandibular condylar fractures.

In children, the case against the use of open treatment for condylar fractures had been established.¹⁴⁻¹⁶ In adults, there is a suggestion, in cases of bilateral dislocated mandibular condyle fractures, that open reduction and internal fixation of one dislocated condyle may be indicated.¹⁷ There is however, no consensus on the ideal recommended treatment for patients with unilateral displaced mandibular condyle fractures. Closed treatment has an ongoing popularity because of the satisfactory results achieved, the absence of large series with long follow up on open treatment, the avoidance of risking damage to the facial nerve and scarring.^{7,18,19} There is a growing agreement that in selected cases where there is a considerable shortening of the ascending ramus of the mandible and/or considerable displacement of the condylar fragment, open treatment provides a better outcome, otherwise the chance of temporomandibular joint dysfunction and functional disturbances are significant.²⁰⁻²²

The questionnaire has been useful in identifying aspects of consensus among OMFS surgeons in a developing country and highlighting areas of controversy related to the treatment of mandibular condylar fractures in adults. Importantly,

is the opportunity to compare the results of this questionnaire with the international survey, published in 1998,¹⁰ assessing how OMFS surgeons in Jordan treat similar scenarios and try to explain areas of similarities and differences.

This survey has demonstrated a split amongst surgeons on the management of isolated undisplaced condylar fracture, as shown in Table 1. This reflects the reluctance of more than half to leaving their patients without active treatment, even for such subtle injury when the occlusion could be normal and when there is no evidence in the literature on added benefits of IMF for this injury. A possible explanation is the belief that patients are less likely to comply with instructions if they do not receive treatment.

A period of IMF is seen as a gold standard in managing slightly displaced condylar fractures when associated with malocclusion. This applies to isolated fractures and when combined with displaced body or contralateral condylar fracture (Tables 2), as most surgeons would openly treat the associated injuries turning a multiple injury to the jaw into a single one at the index condyle. However, when dealing with isolated displaced fracture associated with altered occlusion, the majority (78%) preferred open treatment and this represents a shift from what was found previously¹⁰ when only 20% preferred this treatment modality (Table 3). This is possibly due to the dissatisfaction with the results achieved with closed treatment and the increased awareness of the better outcome with open treatment including a better occlusion,^{23,24} prevention of dysfunction problems,^{7,25,26} better mandibular movement^{3,4,25} and a higher chance of anatomical reinstatement.²⁷ As for dislocated fractures, the majority in this study sought open treatment for the dislocated condyle whether isolated fracture or when combined with

other fractures. Although this trend in management is similar to what was found previously,¹⁰ the figures showed that the tendency towards open treatment was higher in this study. This reflects the general agreement of the respondents on the importance of this treatment method as a means to re-establish the reduced ramus height avoiding long term functional disturbances.^{10,20-22} This survey also showed that if either of the condyles were displaced or dislocated, a majority of the surgeons openly treated at least one condyle. This is in line with emerging evidence which showed a smaller mouth opening with closed treatment and the persistence of anterior open bite.¹⁷ However, a considerable proportion opted for ORIF of both condyles, with a period of IMF in bilateral displaced fractures (Tables 3 and 4) and this is a surprising finding in the absence of evidence in the literature on the advantage of openly treating both sides over one side. An explanation for the enthusiasm of openly treating both sides could not be offered. Understandably, only a minority preferred open treatment of intra-capsular and/or comminuted condylar fractures as application of any form of fixation is usually impossible because of the lack of space and absence of support in the literature for open treatment.

The questionnaire confirmed that the preauricular approach to the mandibular condyle was the most popular, although more than half of the respondents were familiar with more than one approach. The retromandibular approach was sought by less than half and fewer respondents used the intra oral approach which might be due to the lack of training and resources to allow this endoscopically aided treatment modality. Almost all respondents used osteosynthesis mini-plates to achieve fixation as it is known that using 2 mini-plates produces better stability and fewer complications when compared to other techniques.^{28,29}

However, this questionnaire did not specify the number of mini-plates to be used.

The philosophy adopted by OMFS in Jordan is largely in accordance with the current literature relating to the management of mandibular condylar fractures, despite the fact that the respondents had different training background. The present study confirmed that Jordanian Oral and Maxillofacial Surgeons show an increased willingness to carry out ORIF of mandibular condyle fractures when compared with the results of a previous international study.¹⁰ A multi-centre prospective study is recommended to assess the actual treatment outcome based on the current guidelines.

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