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## Dysocclusion after maxillofacial trauma: A 42 year analysis

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## ABSTRACT

**Background:** The aim of this study was to evaluate the surgical management of posttraumatic dysocclusion in the Department of Oral and Maxillofacial Surgery in the VU Medical Centre in Amsterdam.**Patients and methods:** All patients who underwent surgical correction of a posttraumatic dysocclusion between 1970 and 2012 were reviewed. Patient charts were reviewed retrospectively.**Results:** A total of 42 patients were included. Twenty-seven patients had a mandibular condyle fracture (64.3%). The initial fracture-treatment was either conservative, consisting only of intermaxillary fixation (IMF), or open reduction and internal fixation (ORIF). Though different orthognathic treatment options were used to regain normal occlusion, the most frequently used surgical techniques were a uni- or bilateral sagittal split osteotomy of the mandible in 21 patients (50.0%), followed by a Le Fort I osteotomy of the maxilla in 17 patients (40.5%).**Conclusions:** Most dysocclusions occur after mandibular condyle fractures, however fractures of other maxillofacial structures also account for a considerable number of cases. Good results are achieved with orthognathic surgery for posttraumatic dysocclusion.

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## 1. Introduction

Dysocclusion is one of the most common hard tissue complications after treating patients with maxillofacial trauma (Laine et al., 2004). The incidence of posttraumatic dysocclusion is reported to be between 5 and 20% in the literature (Haralabakis et al., 2007; Worsaae and Thorn, 1994). It is the main indication for secondary operative intervention after maxillofacial trauma (van den Bergh et al., 2012b). Previous studies have shown orthognathic surgery to be a stable and predictable treatment of severe posttraumatic dysocclusion due to mandibular condyle fractures (Becking et al., 1998; Nakayoshi et al., 2004; van den Bergh et al., 2012a; Zhou et al., 2008). In the literature, condyle fractures account for 15.6–22.6% of all maxillofacial fractures (Brasileiro and Passeri, 2006; Gassner et al., 2003; Krishnaraj and Chinnasamy, 2007; Li et al., 2006). Posttraumatic dysocclusion is however not always a complication of mandibular condyle fractures (de Souza et al., 2007; Guler et al., 2009).

According to a study by Haralabakis et al., posttraumatic dysocclusion has a complex aetiology. Patients treated with maxillomandibular fixation, without surgical fracture reduction, are reported to have a higher chance of developing severe dysocclusions (Haralabakis et al., 2007). A statistically significant difference in the development of postoperative complications after mandibular fracture repair between early and late treatment groups has been reported (Laine et al., 2004; Lucca et al., 2010). The best time to treat a facial fracture is the period immediately following the trauma. Delayed, inadequate or absent treatment of displaced facial fractures and even previous attempts at treatment may result in deformities causing aesthetic or functional impairment (Bussieres and Tatum, 2000; Ellis, III and Walker, 2009; Vega, 2011).

Although since the 1960s several case reports and few case series of patients treated with orthognathic surgery for a posttraumatic dysocclusion have been published, there is still a lack in the literature concerning surgical treatment of posttraumatic dysocclusion (Becking et al., 1998; Bussieres and Tatum, 2000; de Souza et al., 2007; Ellis and Throckmorton, 2005; Ellis, III and Walker, 2009; Guler et al., 2009; Haralabakis et al., 2007; Laine et al., 2004; Nakayoshi et al., 2004; Rubens et al., 1990; Spitzer et al., 1997; Vega, 2011; Zachariades et al., 1993; Zhou et al., 2008).

The aim of this study was to evaluate the surgical management of posttraumatic dysocclusion in our department. A retrospective

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study was performed on patients who had surgical correction of a posttraumatic dysocclusion between 1970 and 2012.

## 2. Patients and methods

A database consisting of all patients who underwent orthognathic surgery between 1970 and 2012 was reviewed. The following inclusion criteria were used: (1) dysocclusion indicating osteotomy (2) maxillofacial trauma in medical history. Exclusion criteria were: (1) treatment abroad (2) missing data on fracture type, type of dysocclusion or type of surgical dysocclusion treatment.

A retrospective study was performed. Data collected included age, gender, cause of injury, type of fracture, type of dysocclusion, operative techniques, time between trauma and surgical treatment of the dysocclusion and any complications of the orthognathic surgery performed if present.

Data were stored and analysed using SPSS.

## 3. Results

In total, 64 patients underwent orthognathic surgery for a posttraumatic dysocclusion between 1970 and 2012. After applying exclusion criteria 42 patients remained. Twenty-six were male (61.9%) and 16 were female (38.1%). The mean age was 34 years (range 16–70 years).

In nine patients the cause of trauma was unknown. For the remaining 33 patients, the two main causes of injuries were traffic accidents ( $n = 15$ , 35.7%) followed by falls ( $n = 9$ , 21.4%). Four patients (9.5%) had sports-related accidents, two fractures (4.8%) were work related and two patients had interpersonal violence as a cause (4.8%). One patient had a condyle fracture as a complication of an osteotomy (2.4%).

Seventy-nine fractures were diagnosed in 42 patients. The mandibular condyle was the most frequently involved structure. In twenty-seven (64.3%) patients one or both condyles were fractured. Nineteen patients (45.2%) had a solitary fracture of either mandible or maxilla, the remaining 23 patients (54.8%) had two or more fractures combined. Table 1 shows fracture localisation with corresponding percentages. Five concurrent fractures of the zygomatic complex were omitted as these fractures do not involve the occlusal plane.

The initial fracture-treatment was conservative in 13 (31.0%) cases, intermaxillary fixation (IMF) was used in 10 cases (23.8%), open reduction and internal fixation (ORIF) was performed in 17 cases (40.5%). In two cases (4.8%) no data on initial fracture-treatment was documented.

During follow-up, all developed dysocclusions were severe enough to be treated by secondary correction in order to re-establish a normal occlusion. This was on either functional or aesthetic grounds. Table 2 shows the different types of dysocclusions. Twelve patients had developed an anterior open bite (28.6%).

**Table 1**  
Fracture localisation.

	Frequency	%
Unilateral condyle	9	21.4
Unilateral condyle + corpus/angle/ramus	4	9.5
Unilateral condyle + midface	1	2.4
Bilateral condyle	3	7.1
Bilateral condyle + corpus/angle/ramus	9	21.4
Bilateral condyle + midface	1	2.4
Corpus/angle/ramus/combination	9	21.4
Midface	5	11.9
Midface + corpus	1	2.4
<b>Total</b>	<b>42</b>	<b>100</b>

**Table 2**  
Types of dysocclusions.

	Frequency	%
Anterior open bite	12	28.6
Lateral open bite	9	21.4
Cross-bite	3	7.1
Mandibular retrognathia	3	7.1
Maxillary retrognathia	6	14.3
Laterognathia	9	21.4
<b>Total</b>	<b>42</b>	<b>100</b>

Nine patients presented with lateral open bites (21.4%) and nine with laterognathia. Six patients developed a maxillary retrognathia (14.3%), three patients had mandibular retrognathia (7.1%) and three patients had a crossbite.

In Table 3 the surgical treatments used to regain normal occlusion are shown. Fourteen patients (33.3%) had a Le Fort I osteotomy, and fourteen had a unilateral sagittal split osteotomy. Four patients (9.5%) had bilateral sagittal split osteotomies, two patients (4.8%) were treated with a segmental osteotomy of the mandible and in three (7.1%) a vertical ramus osteotomy was the treatment of choice. The remaining five patients (11.9%) underwent multiple simultaneous osteotomies.

The average interval from trauma to treatment of the dysocclusion was 17.7 months (range 2–152). Seven patients (16.7%) were treated within 6 months after the injury, 14 patients (33.3%) were treated between 6 and 12 months, eight patients (19.0%) between 12 and 24 months and 13 patients (31.0%) more than 24 months after trauma.

In Table 4 the different types of dysocclusion are listed according to the fracture side. Table 5 gives an overview of which type of dysocclusion was treated with what surgical technique.

**Table 3**  
Orthognathic surgical techniques used.

	Frequency	%
Sagittal split	14	33.3
BSSO	4	9.5
BSSO + Le Fort I	1	2.4
BSSO + segmental	2	4.7
Le Fort I	14	33.3
Le Fort I + vertical ramus	1	2.4
Vertical ramus	3	7.1
Vertical ramus + segmental	1	2.4
Segmental	2	4.7
<b>Total</b>	<b>42</b>	<b>100</b>

Abbreviation: BSSO: bilateral sagittal split osteotomy.

**Table 4**  
Type of dysocclusion according to fracture type.

Type of dysocclusion	AOB	LOB	CB	ManR	MaxR	LG	Total
<b>Type of fracture</b>							
Unilateral condyle	–	4	–	–	–	5	9
Unilateral condyle + c/a/r	1	1	2	–	–	–	4
Unilateral condyle + midface	–	1	–	–	–	–	1
Bilateral condyle	1	1	–	–	–	1	3
Bilateral condyle + c/a/r	7	–	–	1	–	–	9
Bilateral condyle + midface	–	–	–	–	–	1	1
Corpus/angle/ramus <sup>a</sup>	2	1	1	2	2	1	9
Midface	1	1	–	–	3	–	5
Midface + corpus	–	–	–	–	1	–	1
<b>Total</b>	<b>12</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>9</b>	<b>42</b>

Abbreviations: AOB: anterior open bite; LOB: lateral open bite; CB: crossbite; ManR: mandibular retrognathia; MaxR: maxillary retrognathia; LG: laterognathia; c/a/r: corpus/angle/ramus.

<sup>a</sup> Patients in this group may have had a single fracture or multiple fractures of the mandibular corpus/angle/ramus.

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