# The Psychosocial Impacts of Orofacial Features: With Examples from Orthognathic Surgery

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## Contents




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The objectives for orthognathic surgery are clear in most cases, in that it seeks to improve function and aesthetics in individuals with orofacial/dentofacial deformities. However, the term *deformity* or *anomaly* is viewed by many as having a negative connotation (as a "deviation") and, as such, the term maxillo-mandibular discrepancies will be used throughout this chapter. Despite the clear objectives of orthognathic surgery, the surgical results do not necessarily harmonize with patient motivation or satisfaction. In this chapter, the psychosocial impacts of orthognathic surgery will be highlighted, and the objectives for different orthognathic surgery procedures will be described. A case report will provide further insights into the complexity that orthognathic surgery might constitute for patients. It is important to have in mind that different oral health conditions such as missing teeth, severe orthodontic malocclusions, and teeth with inherited disorders such as Amelogenesis imperfecta will have similar psychosocial challenges as orthognathic surgery.

**Learning Goals**

- To learn about the psychosocial relevance of orofacial features
- To learn about body dysmorphic disorder
- To learn about the objectives of different orthognathic surgery procedures
- To learn about the psychosocial outcomes of dental interventions with alteration of orofacial features such as orthognathic surgery

## 19.1 The Psychosocial Relevance of Orofacial Features

The way we appear to ourselves and others has profound psychological and social impacts [1, 2]; however, the role of the mouth, teeth, and jaws (i.e. orofacial features) in research on appearance has perhaps received less attention than other facial aesthetic features, for instance, facial symmetry [3]. A poignant example of the importance of appearance taken from Nancy Etcoff's popular science book on the science of beauty encapsulates the essence of this topic [4]. Here she refers to the work of Donald Giddon and colleagues [5] where research participants would manipulate the facial features of an image of a person in profile, and where minute changes – down to a few millimetres – could change the perception of a face profile as either attractive or unattractive.

Judgments of attractiveness, albeit seemingly superficial, are known to have real-life consequences both on an interpersonal and intrapersonal level. For instance, attractiveness judgements influence how we regard others, choose friends or romantic partners, and how we view ourselves (for an overview, see [1, 6, 7]). From an evolutionary perspective, perceptions concerning facial appearance could have relevance as markers of the quality of a potential mate, for instance giving indirect information about the health status of an individual [8–10], and interestingly perceptions of facial attractiveness has been shown to predict longevity [11]. As for the individual's own judgments and perceptions, however orofacial areas – and the mouth in particular – could be argued to constitute a hierarchy of needs that includes both biological and social elements, which range from survival, via socialization, to self-actualization [12]. Thus, the importance of the orofacial areas in human life reaches beyond concepts such as "beauty" and "attractiveness". The lower levels of this hierarchy address the fundamental biological needs, most prominently perhaps the acquiring of sustenance. These aspects are readily accepted as important to oral health professionals, since it is a clear link between functionality and health behaviours, for instance that tooth loss among the elderly prevents eating behaviours [13]. Also, more fundamental social functions, for instance related to non-verbal communication of emotional states as well as verbal communication, are related to orofacial functioning or perception of orofacial elements [14, 15]. At the higher levels of this hierarchy, however, one will find psychological concepts such as an individual's experience of self-esteem and self-worth, both which are closely related to perceptions of both general quality of life and health-related quality of life [16–18]. These increasingly abstract concepts can perhaps be difficult to apply in oral health care settings, due to biomedical thinking or lack of time or tools to assess these states. In line with this, some authors have argued that self-evaluation processes such as self-esteem should be regarded as both a protective factor and a potential risk factor related to physical and mental health, and that self-esteem should be specifically targeted in development of health promotion programs [19]. Although self-esteem is not exclusively tied to one domain such as appearance or attractiveness [18], it nevertheless becomes highly relevant to view orofacial areas and functional aspects as part of a broader picture of general health and well-being. This also ties in with the modern definition of oral health as outlined in ▶ Chap. 5.

Thus, any surgical efforts to alter or manipulate orofacial areas, whether it is for aesthetic or functional reasons, should be viewed also in light of their psychosocial impacts. One example of such a surgical effort is in orthognathic surgery.

**Box**

Important: Alterations of orofacial features in orthognathic surgery may influence not only function and aesthetics but also general health and well-being!

## 19.2 Body Dysmorphic Disorder (BDD)

Body Dysmorphic Disorder (BDD) also known as dysmorphophobia, is an disorder that encompasses excessive preoccupation with physical appearance [20]. While other psychiatric diagnoses might involve distorted evaluation of physical appearance (for example, anorexia nervosa), BDD appears to be specifically sensitive to the individual's own facial appearance [21]. Explanations of BDD range from psychosocial risk factors [22] to abnormalities in visual processing and perception, in particularly related to the face [23]. Concerning oral health, BDD has been linked to requests for orthognathic surgery since patients suffering from the disorder could be more likely to seek out physical and aesthetic procedures aimed at alleviating their symptoms [24, 25] rather than addressing other aspects of the disorders (for example, psychological treatment). A recent systematic review has indicated that the prevalence of BDD within the population of orthognathic patients is between 5% and 13% [25], and even outside the diagnostic criteria of BDD, a high percentage of patients appear overly and excessively concerned with their appearance [26]. Based on this, there has been increased attention on psychological assessment of patients referred to orthognathic surgery [24] and to increase the clinical competence among oral health professionals with regards to this topic [27]. Also, it is worth noting that patients referred to orthognathic surgery may have other psychological problems, notably symptoms of depression, OCD, and anxiety [28–30], which may merit consideration among oral health professionals.

## 19.3 Orthognathic Surgery

Orthognathic surgery, i.e. corrective surgery of the facial skeleton, aims to improve both the functionality and aesthetics [31]. The term orthognathics means "straight jaws" coming from the Greek language (orthos = straight, gnathos = jaws).

There are different types of maxillo-mandibular discrepancies such as (1) *mandibular prognathia / hyperplasia* (Fig. 19.1); increased anterior–posterior growth of the mandible, (2) *mandibular rethrognathia / hypoplasia* (Fig. 19.2); reduced anterior–posterior growth of

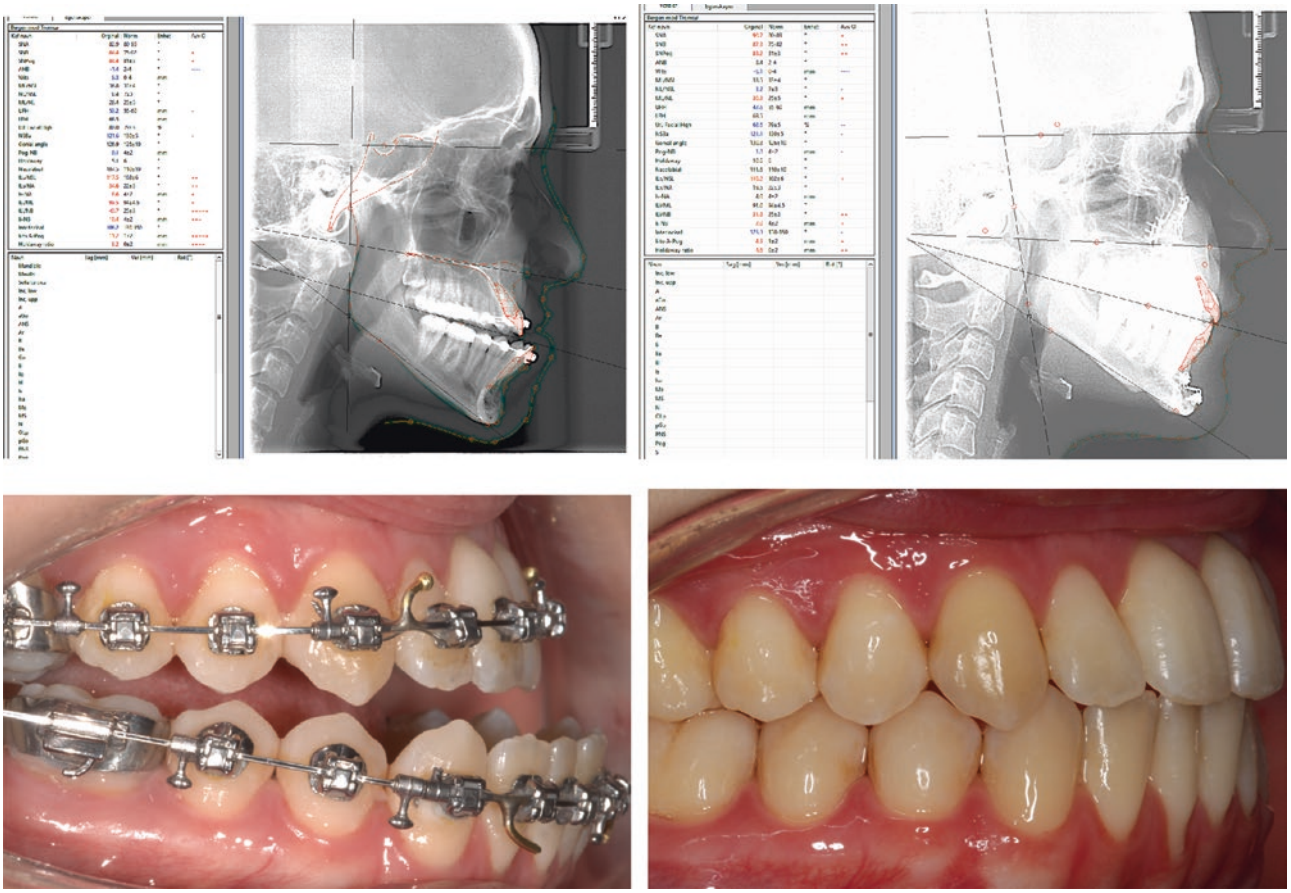

**Fig. 19.1** Cephalograms and photos of mandibular prognathia treated with bimaxillary orthognathic surgery and genioplasty. (Photos permission granted by the patient)

the mandible, (3) *maxillary prognathia / hyperplasia* (Fig. 19.3); increased anterior–posterior growth of the maxilla, (4) *maxillary rethrognatia / hypoplasia* (Fig. 19.4); reduced anterior–posterior growth of the maxilla, (5) *Apertognathia* (Fig. 19.5); reduced vertical growth of the posterior part of the mandible and increased growth of the posterior part of the maxilla resulting in an anterior open bite, and (6) *mandibular asymmetry* (Fig. 19.6); asymmetric growth of the mandible.

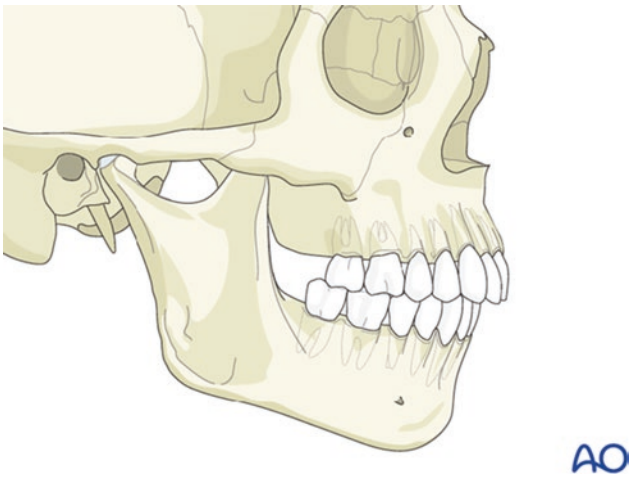

**Fig. 19.2** Mandibular rethrognathia. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

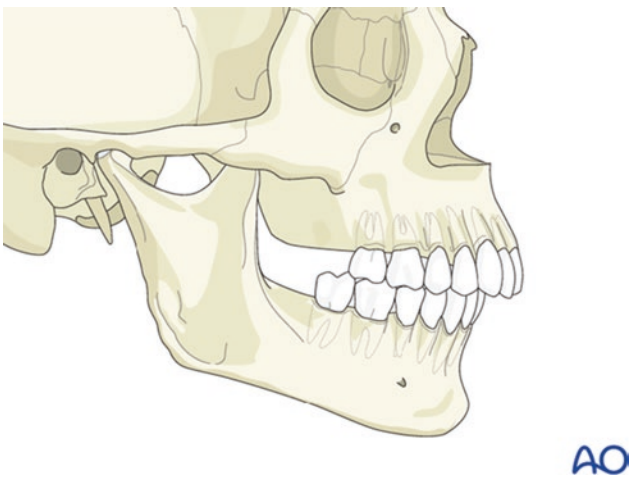

**Fig. 19.3** Maxillary prognathia. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

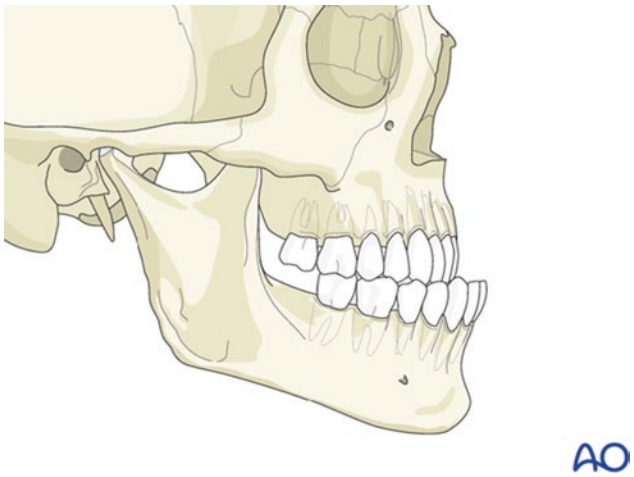

**Fig. 19.4** Maxillary rethrognatia. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

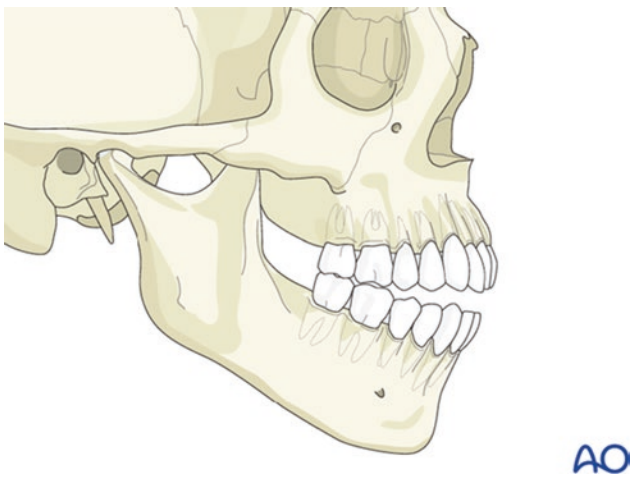

**Fig. 19.5** Apertognathia. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

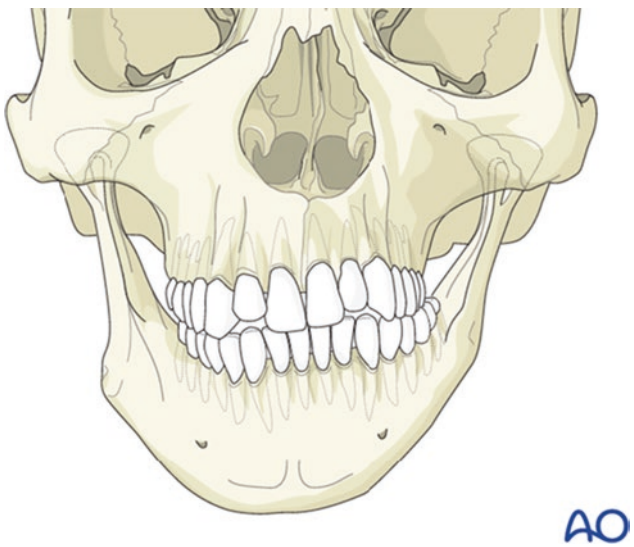

**Fig. 19.6** Mandibular asymmetry. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

**Box**
Examples of maxillo-mandibular discrepancies:
1. Mandibular prognathia/hyperplasia
2. Mandibular rethrognathia/hypoplasia
3. Maxillary prognathia/hyperplasia
4. Maxillary rethrognatia/hypoplasia
5. Apertognathia
6. Mandibular asymmetry

### 19.3.1 Prevalence

In the Scandinavian countries Norway and Sweden with 15 million inhabitants, approximately 1300 patients undergo orthognathic surgery annually at the different University Hospital clinics and some County Hospitals [32, 33]. In USA, 10345 patients were hospitalized in 2008 [34] and in England and Wales, 2600–2900 patients undergo these treatments annually [73].

### 19.3.2 Treatment *Strategies*

Malpositioned teeth caused by maxillo-mandibular discrepancies may be treated by three different strategies [31]: (1) Growth modification by orthopaedic appliance (how much growth may be altered is a controversial topic) (2) orthodontic camouflage by orthodontics alone (mild maxillo-mandibular discrepancies) and (3) orthognathic surgery combined with orthodontics is often required in severe maxillo-mandibular discrepancies.

### 19.3.3 Indications for Surgery

Most patients going through orthognathic surgery are healthy individuals with a maxillo-mandibular discrepancy (sagittal, vertical, transversal) affecting orofacial function. Impaired orofacial function may lead to problems with chewing, mouth opening, phonetics, and maintenance of optimal oral hygiene. Mouth breathing may be the result of lip incompetence (inability to fully seal the lips) due to excessive vertical growth of the maxilla. There are also psychosocial impacts to address, and these can affect the patient's quality of life (QoL) [24, 35, 36].

However, some patients have growth related maxillo-mandibular discrepancies associated to sleep apnoea [37], airway defects and soft tissue discrepancies such as cleft-lip-and palate deformities [38] and also discrepancies associated with temporomandibular growth disturbances [39]. Further, patients with syndromes such as Crouzon, Apert, and Treacher Collins often have maxillo-mandibular discrepancies [40]. Therefore, the goal for treatment is to normalize the chewing and phonetic function, to improve the airway space and to improve the psychosocial function [31].

### 19.3.4 Evaluation of the Facial Morphology

Analyses of lateral X-rays (cepahlograms) of sagittal and vertical discrepancies are evaluated by the orthodontist. The goal of cephalometrics is to compare the patient (or victim in forensic investigations) with a normal reference group [41]. Facial morphology depends on different factors such as gender, ethnicity, race, and genetic constitution. The normal reference group may therefore differ between different groups [42]. In cases with asymmetry and a tilted occlusal plane, evaluation of frontal X-rays and CT scans are performed, and the soft tissue is evaluated. The profile is divided into a convex, concave or a straight profile. The nasolabial angle is measured and also how much of the teeth are present in a relaxed position and in a smile position is calculated.

### 19.3.5 Orthognathic Surgery Osteotomies

Different osteotomies are described in the literature such as the Vertical Ramus Osteotomy (VRO), the Bilateral sagittal split osteotomy (BSSO), the Le Fort I osteotomy, the Genioplasty, and the Bimaxillary osteotomy [31]. Together with conventional orthognathic surgery, there is also the distraction osteogenesis osteotomy [43].

#### 19.3.5.1 Vertical Ramus Osteotomy

This procedure is used for correction of a class III relation and an open bite. It may be performed either with an extraoral (EVRO) or an intraoral (IVRO) approach with osteosynthesis or intermaxillary fixation, respectively (◘ Fig. 19.7). The osteotomy is performed between the incisura of the ramus and vertically down to the posterior border of the ramus. Skeletal relapse is reported to be 17% for EVRO [44] and 12–26% for IVRO [45, 46] 6–12 months after surgery. With the EVRO procedure there will be a 2.5-cm-long scar behind the jaw angle but the majority (97%) of the patients are satisfied after surgery [44]. The risk of facial nerve damage is low. With the IVRO procedure, there is no facial scar but a small risk of sensory damage of 9% [47].

#### 19.3.5.2 Bilateral Sagittal Split Osteotomy

Bilateral sagittal split osteotomy (BSSO) is the most common osteotomy in orthognathic surgery, first introduced by Hugo Obwegeser in 1957 [48]. Through this osteotomy, it is possible to move the mandible in all

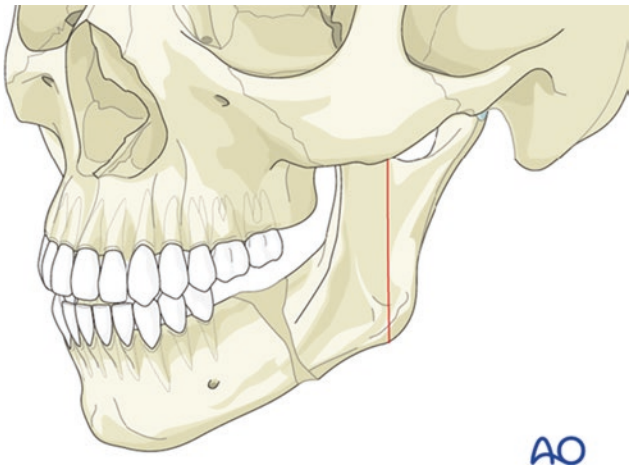

**Fig. 19.7** Vertical ramus osteotomy (VRO). (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

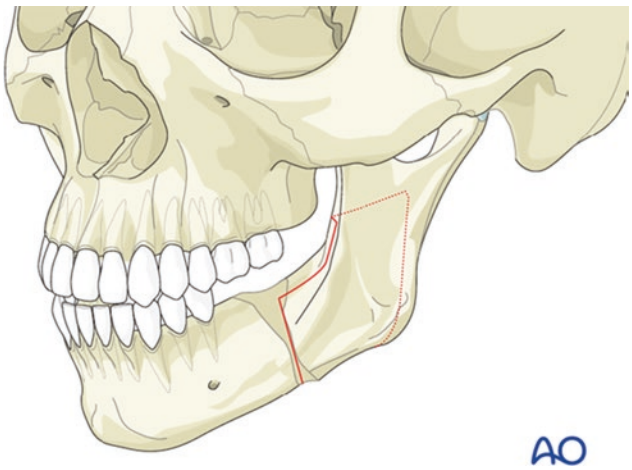

**Fig. 19.8** Bilateral sagittal split osteotomy (BSSO). (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

directions, i.e. mandibular prognathism, mandibular retrognathism, mandibular asymmetry and apertognathia (open bite) (Fig. 19.8).

With a BSSO a sagittal osteotomy in the ramus and the body of the mandible is performed with preserved bony contacts between lateral and medial sites. Between these bony fragments the inferior alveolar nerve is situated and can be damaged during surgery. Osteosynthesis with bicortical screws or plates are used.

Approximately 50% of the patients have changed sensibility in their lower lip and chin after the BSSO osteotomy [44, 47], and the risk is increased above the age of 35. However, most of these patients are not so bothered by this.

The relapse is 17% for a mandibular setback [44] and 33% when the mandible is moved forward [49]. Most (95%) of the patients are satisfied after a BSSO osteotomy and mandibular setback [44] and 84% of the patients are satisfied after moving the mandible forward [33].

### 19.3.5.3Le Fort I Osteotomy

In 1901, the French doctor Renè LeFort dropped skulls of cadavers to study the fracture pattern. The Le Fort fractures I, II and III were introduced. Indications for a Le Fort I osteotomy are maxillary rethrognathia/hypoplasia, maxillary asymmetry, apertognathia, and maxillary hyperplasia / gummy smile (a lot of exposed gingiva when smiling). The Le Fort 1 osteotomy [50] is performed 5 mm superior from the apices of the teeth through the lateral part of the front wall of the maxilla and superior from the nasal floor [31] (Fig. 19.9). The osteotomy separates the pterygoid plates from the maxilla. Fixation is performed by osteosynthesis plates, and it is possible to perform 1, 2, and 3 piece segmental maxilla. Few complications are seen after a Le Fort I osteotomy and relapse is 18% of the movement [51] and most patients are satisfied after this osteotomy [33].

### 19.3.5.4Genioplasty

A genioplasty is indicated when the patient has a retruded, asymmetric or a very prominent chin. A horizontal osteotomy is performed of the anterior part of the chin and moved to the desired position and fixed with osteosynthesis plates (Fig. 19.10). It is also possible to transplant bone into the osteotomy or remove bone depending on the desired movement. Instead of a bony osteotomy, it is also possible to adapt a silicon or a polyethylene implant directly on the chin [52]. Some patients may have changed sensibility after the proce-

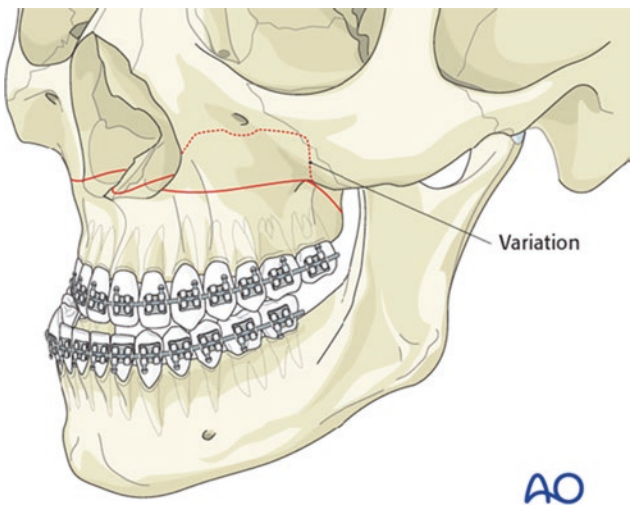


**Fig. 19.9** Le Fort I osteotomy. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

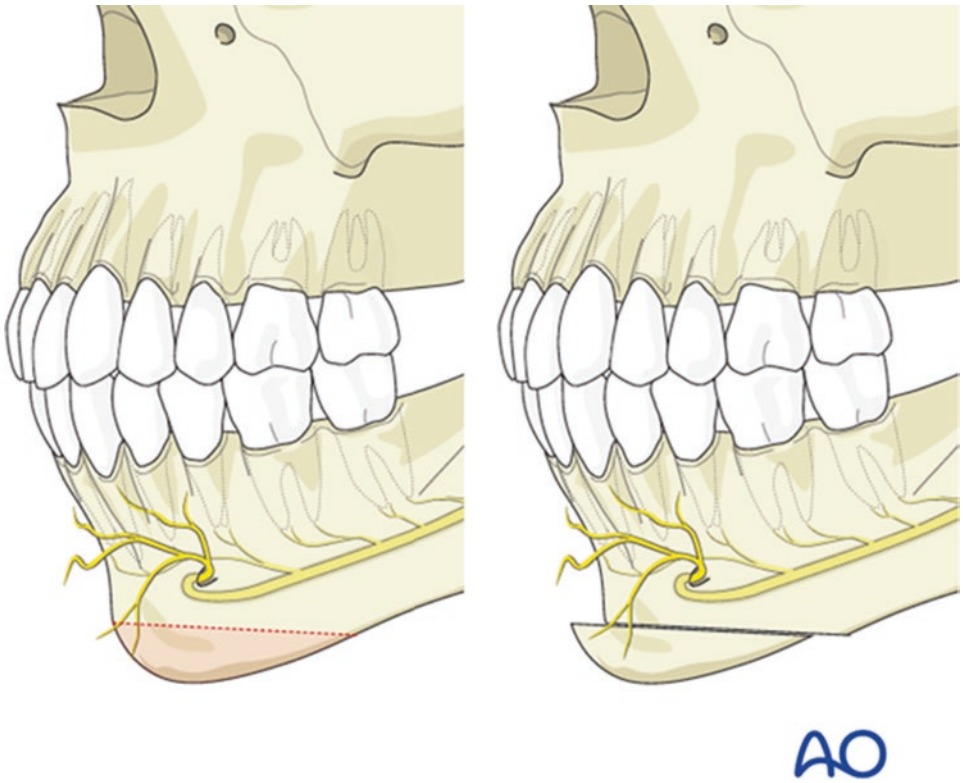


**Fig. 19.10** Genioplasty. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

dure and skeletal relapse is approximately 8% of the movement forward [53]. A sliding genioplasty forward is very predictable and most patients are satisfied with this procedure.

### 19.3.5.5 Bimaxillary Orthognathic Surgery

When the total movement is large, the orthognathic procedure is often distributed on both jaws due to aesthetic reasons and also not to compromise the posterior airway space with a too large setback movement in the lower jaw (Fig. 19.11).

### 19.3.5.6 Distraction Osteogenesis

In cases with a large movement, especially in patients with a severe rethrognathic mandible and high-angle cases, distraction osteogenesis may be more stable over time compared to conventional orthognathic surgery [39, 43] (Fig. 19.12).

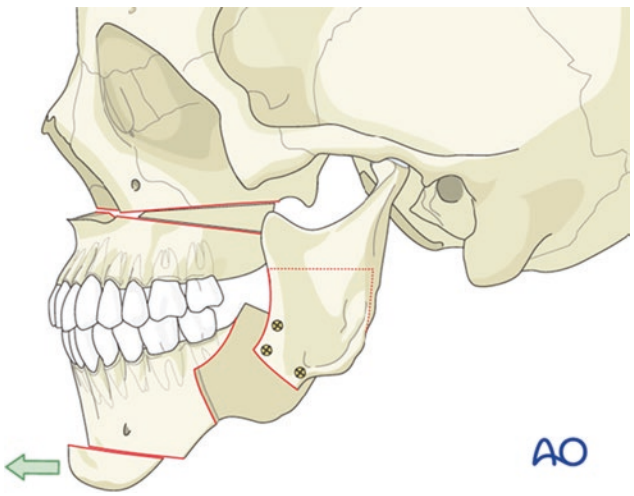


**Fig. 19.11** Bimaxillary orthognathic osteotomies. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

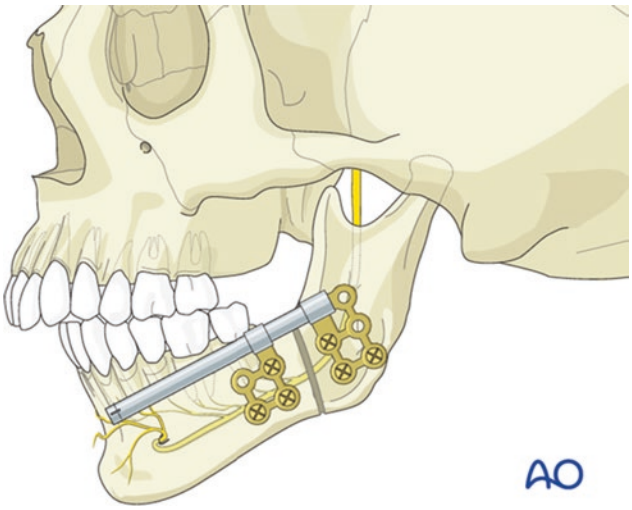


**Fig. 19.12** Mandibular osteotomy with the distraction device. (Copyright by AO Foundation, Switzerland. Source: AO Surgery Reference, ► www.aosurgery.org)

**Box**

Examples of orthognathic surgery osteotomies:

- Vertical ramus osteotomy
- Bilateral sagittal split osteotomy
- Le Fort I osteotomy
- Genioplasty
- Bimaxillary orthognathic surgery
- Distraction osteogenesis

### 19.3.6 Terminology

The terminology often used in relation to orthognathic surgery treatment need, for instance, "dentofacial deformity" or "anomaly", refers to a comparison with normal standards [41]. Based on these standards, nearly 30% of the general population present with malocclusions determined to be in need of orthodontic treatment, and 5% with dentofacial deformities in need of orthognathic surgery [54]. However, since ideas about aesthetics and normality could be argued to be somewhat malleable and flexible [55, 56], the validity of the normal standards for orthognathic surgery can perhaps also be debated [42]. Recently, the appropriateness of the terminology "dentofacial deformity" has been specifically questioned, not only in light of issues concerning accuracy [57], but also in light of the social implications of this particular term [58]. Alternative terms, such as maxillo-mandibular discrepancy, has been suggested [58]. While it is important that terminology is clear and consistent in the research literature and within a clinical discipline, it is also important to acknowledge that the terminology and language used in healthcare settings matters and could be a contributing factor in the dehumanization of patients [59, 60]. Development of terminology that is consistent and accurate, while remaining neutral and respectful of the patient's perspective, should be encouraged, perhaps along the lines suggested for the media with regards to how to address visual differences [61].

### 19.3.7 Case Report

Most patients report satisfaction after going through orthognathic surgery [33, 35], and orthognathic surgery has shown to have a positive impact on the QoL of patients with maxillo-mandibular discrepancies [62]. However, the current case will provide an example where the patient at first was not satisfied with the result after orthognathic surgery.

A 20-year-old woman was referred to the Department of Oral and Maxillofacial Surgery at the University Hospital North Norway and Public Dental Service Competence Centre of North Norway (TkNN), Tromsø, for evaluation and treatment of her maxillo-mandibular discrepancy. She had problems with her bite/occlusion and phonetics and was diagnosed with a skeletal class III relation and an open bite. Treatment suggestion was a bimaxillary orthognathic surgical procedure together with a sliding genioplasty, which was accepted by the patient. The patient went through the procedure without any medical complications. A sliding genioplasty was however not performed during this first surgery, but was planned as a second procedure after asking the patient about her thoughts about it. After the first surgery, the patient was not satisfied. She told the surgeons that she thought her face had become much shorter and that she felt depressed because of this. In response, a second procedure with a sliding genioplasty with anterior and inferior advancement was planned for, but the patient wanted to talk to a psychologist before proceeding with another surgery. Together with her depression, she also developed a myalgia in her muscles of mastication and was therefore treated with Botulinum Toxin (Botox®).

Psychological assessment and psychometric testing were done by a psychologist working with dental phobia at TkNN, and the results indicated that the patient suffered from severe depression and had massive challenges with regards to accepting her appearance and adjusting to her new, post-operative life situation. Her symptoms had marked impact on her daily activities and life in general. For instance, she experienced social withdrawal

relating to friends and social gatherings, loss of interest in activities that had been important to her and difficulties with motivation concerning important life decisions, such as choice of education and ideas about future vocation. Negative thoughts and self-evaluation featured prominently and appeared across many different situations.

From the psychological consultations, some key themes emerged. Concerning the motivation for treatment, it became clear that the patient had been aware of considerable external expectations for orthognathic surgery during her childhood and adolescence, and that her own motivation for surgery appeared in large parts tied to these external expectations. Although she noted negative experiences with functional aspects of her bite, and some notable experiences of being bullied or teased (for example, she had been given a derogatory nickname), she expressed that she had been quite content with her facial aesthetics, and that the functional aspects in her eyes were minor. Overall, she appeared to be relatively unprepared for both the physiological and psychosocial consequences of surgery; for instance, the experience of waking up after surgery with her jaws locked, and the marked change of her appearance. Furthermore, her depression and problems adjusting to her "new appearance" showed signs of being tied to the loss of her own personal identity, also related to her entry into young adulthood with heightened expectations related to life choices and identity formation. Also, since all external agents that were important to her and that had been involved in the decision to undergo surgery (friends, family) appeared to be positive about her undergoing orthognathic surgery, as well as about the results, she had little opportunities to express her displeasure about the outcome and the process. At some point, the psychological consultations perhaps became more about providing her an emotional outlet than about specific psychological treatment, although elements of cognitive therapy were implemented throughout the sessions. The patient was scheduled for in total 27 appointments with the psychologist after surgery. Four years after the first surgical procedure, she completed the genioplasty and expressed that she was satisfied with the result after this. Finally, the decision regarding accepting genioplasty should be regarded not merely as an attempt not only to regain some of her former orofacial characteristics, but also as a definite and mature decision of her own choosing, which can be viewed as a contrast to her former experiences regarding surgery.

This case report highlights the potential negative psychological impact of orthognathic surgery, and in particular the insight that measurements that might be interpreted as an objective need for invasive procedures does not necessarily mirror the patient's motivational mindset or guarantee success. Case reports and patient narratives related to orthognathic surgery are rare, most often addressing surgical outcomes in relation to specific pre-existing conditions or diagnoses. The current report describing the experiences of a unique, young individual, nevertheless mirror others' experiences, for instance the importance related to the patient's pre-surgical "true motivation" for surgery [63]. Also, the case report provides support to former research that indicates that motivation and satisfaction with surgical outcome often have strong ties to aesthetic judgements [64, 65], and that satisfaction can be impacted by unexpected post-surgical events [66]. As a result of this case report, inclusion of a psychologist in the team of orthognathic surgery now is a standard care at the Department of Oral and Maxillofacial Surgery at the University Hospital North Norway and Public Dental Service Competence Centre of North Norway (TkNN) in Tromsø, Norway. All patients going through orthognathic surgery assessment are offered a pre- and post-evaluation by a psychologist.

**Box**

Practical guidelines: Inclusion of a psychologist in the team of orthognathic surgery and other dental interventions where the orofacial features will be changed may be an important support in pre- and post-evaluation of the patient. Careful consideration should be made with regards to the patient's true motivation for surgery, and steps should be taken to prepare patients for the physiological and psychosocial consequences that may follow. For patients in need of psychological support, such efforts should preferably be initiated pre-surgery and followed up post-surgery.

## 19.4 Psychosocial Outcomes of Orthognathic Surgery

As outlined in the previous section, orthognathic treatment can impact on individuals in a number of ways, including oral function, psychosocial well-being and wider quality of life (QoL). This section will provide an overview of the psychosocial outcomes of orthognathic surgery, reflect on the limitations of the evidence base so far, and suggest future avenues for research in the area.

Since the 1980s, when the first paper in the area was published, there have been a plethora of articles on the psychosocial outcomes of orthognathic surgery. Given

the large and ever-growing evidence-base, we will focus this section only on published reviews, primarily systematic reviews. This is because well-conducted systematic reviews attempt to identify, appraise and synthesize all empirical evidence that meets pre-specified eligibility criteria and as such are considered to be the highest levels of evidence reviews (when including randomized controlled trials).

In the first systematic review in the area, Hunt and colleagues (2001) identified 29 studies published between 1984 and 2000 [67]. Nearly all studies that were included in the review concluded that there were beneficial psychosocial effects resulting from orthognathic surgery. Benefits included improvements to body image, personality, self-esteem, social and interpersonal functioning, and overall mood. However, most of the studies were deemed to be of low quality with nearly all including no control group (28 out of the 29 studies). In addition, there was a lack of consistency in how psychosocial status was measured across studies (the 29 studies included 30 different questionnaires!), with few of these measures having been validated. There were also very few longitudinal studies (17 of the 29 studies), which would allow for an assessment of pre- to post-surgery changes in psychosocial outcomes. As a result, the authors of the systematic review suggested that any psychosocial benefits should be interpreted with caution.

In a more recent (non-systematic) review, conducted by one of the authors of this chapter (SB) and her colleagues (Liddle et al. 2015) [36], 38 new articles were identified between 2001 and 2013. These studies were conducted in many countries around the world including Europe, USA, China, Brazil, Japan, and Scandinavia. The studies reported improvements in areas such as satisfaction with facial appearance, self-confidence, self-esteem, body image, anxiety and social functioning. Findings in relation to, for example, facial appearance, showed that patient-rated improvements varied across studies but were high (57–97%). As we noted in our review, the lowest percentages were most likely due to when patients were asked to rate their appearance; that is, shortly after surgery (4–6 weeks) when recovery was not yet complete, and patients may still have been experiencing post-surgery discomfort. Interestingly, very few studies explicitly asked patients about dissatisfaction. It is therefore difficult to know whether those that did not rate being satisfied were actively dissatisfied or neutral.

Gains in self-concept and more specifically self-esteem, self-confidence and body image were reported in a number of studies. For example, several studies have reported improved confidence ratings for between 58% and 85% of participants. Unfortunately, many of these studies report percentage increases post-surgery, with no statistical (or indeed clinical) significance provided. As such, it is difficult to assess whether patients do have higher scores at follow-up than control patients.

Social functioning has received much less attention in the literature. In the 38 studies included in the review, those that had subscales related to social functioning reported improvements in social interactions, and communication and social relations. For example, some studies reported that participants felt orthognathic treatment had a positive impact on relationships with family, friends and colleagues (20% of participants; although it is worth noting that 44% felt there was no effect). Others have found participants were more comfortable eating in front of others (54% of participants), positive influence on relationships with the opposite sex (49%), social activities (54%), and their "personal lifestyle" (49%).

Most of the 38 studies included in the review incorporated a measure of patient satisfaction with treatment outcome. Levels of satisfaction tended to be high, ranging from 73% to 100%. Interestingly, the percentage of patients who would choose to have orthognathic treatment again ranged from 61% to 88%, and between 70% and 90% would recommend the treatment to others. Reasons for dissatisfaction were often not explicitly explored in studies, although rates of dissatisfaction ranged from 4% to 8%. It may be that patient dissatisfaction was linked to treatment outcomes (e.g. changes to facial appearance, post-surgery complications), expectations (e.g. unrealistic expectations may be linked to more dissatisfaction), or motives for surgery (e.g. aesthetic or functional reasons).

Liddle and colleagues (2015) [36] noted that 13 years on from the earlier systematic review by Hunt et al. (2001) [67], there was still limited use of validated measures and often confusion and inconsistency about the concepts under study. The wide variation in how concepts were defined and measured meant that comparisons across studies remained difficult. Interestingly, Liddle and colleagues found more consistency in the areas of mental health and QoL [36]. These studies indicated that mental health appeared to worsen in the immediate post-surgery phase but that this improved by 6 months post-surgery – or there was a return to pre-surgery levels of functioning. Again, this was difficult to untangle as there were few longitudinal studies that included a measure of mental health at baseline (i.e. pre-surgery) alongside a matched control group. Indeed, of the 38 studies included in the review, only two were of a prospective design with a control group. A further 18 (of 38 studies) were longitudinal allowing some assessment

of psychosocial outcomes over time but few followed patients beyond 2 years after surgery. Although these studies suggest that there may be significant gains in self-concept, social functioning, emotional and interpersonal relationships, mental health, QoL and satisfaction which are sustained, caution is needed without non-patient (or waiting list) matched comparison groups and studies with longer post-surgery follow-up periods.

Given the methodological limitations of the studies conducted between 1984 and 2013 and included in the reviews by Hunt et al. (2001) and Liddle et al. (2015), it remains difficult to answer, with any degree of certainty, the question *'Do patients show psychosocial benefits from orthognathic surgery?'* [36, 67]. In a recent systematic review in the area, Broers and colleagues (2017) attempted to definitively answer this question in order to help inform dental health professionals and oral surgeons in treatment planning and decisions for individual patients [68]. To do this, they conducted a systematic review that was based on very rigorously defined criteria; including only prospective studies with a minimal follow-up of 6 months, a parallel control group, and measures of psychosocial functioning and/or patient satisfaction. With such tightly defined criteria, it is perhaps not surprising that the review only included nine studies. In addition, the authors concluded that all nine studies were at high risk of bias. Risk of bias was assessed by whether there was selection bias (randomization, concealment), information bias (blinding), or completeness of data (complete description of all patients included). The authors concluded that there were no valid studies to support the claim that orthognathic surgery for adults leads to benefits in patient satisfaction and psychosocial functioning. They went further and stated "we would recommend for practitioners to explain to patients >17 years of age, who consider elective orthognathic surgery, that there is no evidence for the benefit of this surgical intervention for adults, in terms of psychosocial functioning and patient satisfaction" and "it is not clear whether patients will gain sufficient and sustainable benefit from this rather invasive procedure" (p. 417). As with the two earlier reviews described above, Broers et al. (2017) drew attention to the poor methodological quality in the area – despite the large and ever-growing number of studies [68].

Hot-off the press, the very latest recently published systematic review by Meger and colleagues (2021) also included the first meta-analysis of studies in the area [62]. This review was focused specifically on quality of life, for which they used the World Health Organization's (1995) definition; 'the individuals perception of their position in life in the context of the culture and value systems, in which they live and in relation to their goals, expectations, standards and concerns'. Although a far broader concept than psychosocial functioning, the topics of this current section, the two are very much linked, with psychosocial status a key determinant of an individual's QoL.

The authors included very clear criteria for study inclusion; only observational cohort studies with pre- and post-surgery QoL, which used either of two validated measures; the oral health impact profile (OHIP-14) and the orthognathic quality of life questionnaire (OLQL). There were 12 studies that met the criteria. All had small sample sizes between 14 and 74 patients, and a follow-up between 3 and 12 months. Of the 12 studies, 11 reported improvements in oral health and/or orthognathic specific quality of life as a result of surgery. As was reported in the previous systematic review, the authors found that in terms of the risk of bias, four studies were at high risk, eight at moderate risk, and none at low risk.

For the meta-analysis, Meger and colleagues (2021) included only those studies that had a 6-month follow-up and which were of moderate risk of bias ($n = 7$) [62]. For the OHIP-14, three studies were included with a mean pre-post surgery difference of 7.63 (1.62–13.65 95% CI). This difference was significant indicating that orthognathic surgery had a positive impact on oral-health related quality of life. For orthognathic specific quality of life (OLQL), six studies were included with a mean difference of 20.53 (14.27–26.79 95% CI). Again, the difference was statistically significant indicating a positive effect of surgery. Although this study reports a positive benefit of orthognathic surgery, as in previous reviews, the authors' note that the studies were not of high methodological quality, none of the studies were at low risk of bias, and given the small sample sizes, with no sample size calculation reported, more well-designed studies are needed.

**Summary**

Consistent positive psychosocial outcomes have been reported as a result of orthognathic treatment. Yet, despite the plethora of and seemingly ever-increasing number of studies in the area, there is a need to develop more well-designed studies which incorporate pre- and post-surgery assessments of a range of psychosocial outcomes, utilizing standardized and validated measures, with adequate sample sizes. The small sample sizes in studies to date limit the statistical power of the analysis and few studies in the area have reported effect

sizes. In other areas of oral and dental research, we have increasingly seen treatment centers collaborate and this is helpful to enable more appropriate samples. Additionally, multi-site studies may help to facilitate recruitment of a wider representation of participants in terms of for example, sex, ethnicity and age group – this will enable us to understand more about how psychosocial outcomes of surgery potentially vary on key socio-demographics for example, between men and women.

With regard to outcome measures, future research in the area needs to ensure consistency in measures used to evaluate psychosocial status. There have been some interesting developments in measures developed and validated specifically for orthognathic patients, and these are to be welcomed to ensure consistency (and thus comparisons) across studies. For example, the Orthognathic Quality of Life Questionnaire (OQLQ; Cunningham et al. 2000) which assesses oral functioning, facial aesthetics, social functioning and awareness of dentofacial appearance [69]. Although not specific to orthognathic patients, or to the orofacial region, the Derriford Appearance Scale (DAS-59; Carr et al. 2000) measures distress and dysfunction resulting from body image disturbance [70]. A further suggestion would be to develop a Core Outcome Set (COS), which could be used in all future studies evaluating orthognathic treatment. Such an approach has been advocated by the COMET Initiative (Core Outcome Measures in Effectiveness Trials) (► https://www.comet-initiative.org/) and a number of COS have been developed in relation to oral and dental conditions (e.g. Ni Riordain et al. 2020) [71].

Future studies also need to ensure the use of suitable matched control groups, and consistency in follow-up points. At present, follow-up time points have varied considerably, have been unclearly specified and often do not go beyond 6 months. It may well be that for some psychosocial outcomes of interest, 6 months or less may not be sufficient time for changes in self-concept, body image and improvement in interpersonal and emotional functioning.

Aside from methodological issues, in terms of the focus of future research, further exploration is required of processes underpinning adjustment to facial change, the role of psychological support during treatment and the decision-making process. There have been some interesting qualitative studies in recent years which have served to provide more detail from an idiothetic perspective on orthognathic surgery, together with research on decision-making (e.g. Paul et al. 2021) [72]. These studies enable us to begin to understand the complexity of patient experiences during the lengthy treatment process, as well as the factors, which play a role in decision- making. A recent study by one of the authors of this chapter (SB) and her colleagues (Paul et al. 2021) [72], for example, provided a detailed exploration on the role of dental professionals in decision making. The study included face-to-face interviews with 22 patients in the UK of which 12 were 6- to 8-week post-surgery, four were 1–2 years post-surgery, and six were in the decision-making phase. Data were also collected from online forums and blogs to supplement the understanding of processes involved in decision making for orthognathic treatment. There were six themes related to decision making; awareness about their underlying dentofacial problems and the treatment options available, information available about treatment, the timeline of when surgery would occur, patients' motivations and expectations, social support available, and fear of the surgery itself, of hospitalization and the possibility of disliking their new face. As part of this study, we concluded that clinicians needed to be informed about the importance of their role in the decision-making process (being far from a neutral observer) and on how they could improve the patient experience.

Regarding practical guidelines for interventions altering orofacial features, such as orthognathic surgery, a multidisciplinary approach should be taken with regards to the planning and follow-up of surgical procedures. This should include psychological assessment prior to surgery, and psychological follow-up after surgery, which would warrant the inclusion of a mental health professional in the team of clinicians.

### Psychological Implications of Complex Dentistry Affecting Appearance

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As a Research Psychologist, my role is to understand the psychological impact of appearance-altering conditions, and to trial interventions to reduce psychological distress in those affected. Complex conditions, such as cleft lip and palate, often result in a visibly different appearance, and involve long-term multidisciplinary intervention to improve facial appearance as well as function. Those requiring complex dentistry may be up to five times more likely to experience intrusive questions, staring, and teasing as a result of their appearance. These experiences can have a long-term impact on emotional wellbeing, relationships, and academic performance.

Improving appearance through dental work can have a positive impact on psychological health, but the process needs to be carefully managed. Dental professionals can support this process by learning more from the patient/parent about the origin of the problem and what other interventions (e.g. counselling, other specialist treatment) are being implemented. Understanding a patient's motivations for treatment can determine whether their expectations of the outcome are realistic. Further, not all patients are concerned about their appearance, and treatment specifically to improve appearance may therefore not be necessary.

Appearance is a sensitive topic, and both patients and health professionals can worry about how to raise it. Screening/decision-making tools can be helpful in assessing the degree of appearance concern, and beginning a beneficial dialogue about the patient's goals for dental work. Using neutral language (such as 'condition'), rather than stigmatising medical terminology (such as 'disfigurement' or 'deformity') is important for building rapport. Helping the patient to feel informed and empowered to make their own decisions based on what is right for them at that time is one of the most important opportunities a health professional can offer. If more serious concerns about appearance, teasing, or emotional wellbeing are flagged, dental professionals can refer patients to a psychological specialist, and signpost them to reliable local/national support services.

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