International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Demographic Assessment of Jordanian Orthognathic Patients Retrospective Study

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Abstract: ***Objectives: To investigate the assessment, skeletal deformity and type of procedure of orthognathic surgery patients, as well as their functional needs, treated in a Royal Medical Services hospital. Materials and methods: This study included the clinical records of 100 patients (57 females and 43 males) who had orthognathic surgery in the period from March 2013 to October 2019. Skeletal deformity, procedure type and Index of Orthognathic Functional Treatment Need (IOFTN) score were also recorded. Results: Overall, procedures were distributed as follows among the included male patients: 48.3% of them were treated with bimaxillary surgery (Bimax) procedures, 23.2% were treated with LeFort I procedures, 23.2% were treated with bilateral sagittal split osteotomy (BSSO) procedures and 5% treated with other procedures. As for the included female patients, 40.3% of them were treated with Bimax procedures, 24.5% were treated with BSSO procedures and 17.5% were treated with LeFort I procedures. Regarding skeletal deformity, the results found that 31 included female patients had Class II malocclusion, while 24 of them had Class III malocclusion. As for the included male patients, nine of them had Class II malocclusion, while 34 of them had Class III malocclusion. There were gender differences (P>.05) for skeletal deformity. Also, there were gender differences for procedure type. Conclusion: It was identified by retrospective assessment employing IOFTN that 95% of patients had functional needs that were considered great or very great, but more research employing IOFTN assessing orthognathic surgery needs are needed. It was also found that the most common skeletal deformity in this study was Class III malocclusion, followed by Class II malocclusion.***

Keywords: Demographic Assessment of Jordanian Orthognathic Patients Retrospective Study

1. Introduction

Individuals with dentofacial anomalies may be stereotyped or have social relationships that are distinct. Orthognathic surgery can improve these people's psychological well-being; quality of life; and functional qualities, such as speech articulation, swallowing, chewing capacity and breathing [1-6]. A combination of orthodontics and orthognathic surgery can be used to improve occlusion, facial skeletal appearance and jaw function. The number of elderly persons requesting orthognathic surgery has increased. According to one study, men sought orthognathic surgery mostly for functional reasons, whereas women sought orthognathic surgery mostly for aesthetic improvements[7].

Orthognathic surgery has become mainstream throughout the world in the last 60 years to treat dentofacial abnormalities and severe malocclusions that cannot be treated with orthodontics alone. The three steps of orthognathic treatment are pre-surgical orthodontics, surgery and post-surgical orthodontics [8-9]. In the past few years, osteosynthesis and osteotomy techniques have greatly improved, allowing for fast post-surgical jaw function in the majority of cases. The total role of patients in their own medical treatment has been altered substantially as a result of these technological improvements, from being a passive recipient of care to becoming an active decision maker alongside the clinical team [10].

Consequently, when a good technical outcome indicated by the physician no longer fits the requirements for successful medical care, the perspectives of the patient and their spouse/family/close friends must be taken into account. The orthodontist's and/or surgeon's agendas may differ when it comes to receiving orthognathic therapy. In any case, orthognathic treatment should be evidence-based and patient-centred, integrating clinical expertise, the patient's preferences and needs, and the most recent therapeutically relevant evidence [8-10].

Advancements in masticatory performance, dental and face aesthetics, as well as overall quality of life, are the most common motivators for treatment, which is usually elective. Consequently, the patient's participation in deciding whether or not to start therapy is crucial. During the decision-making process, it is vital that the healthcare team and the patient discuss and comprehend the treatment goals and possible results.

Cunningham and Shute[11] postulated that four key aspects influence a patient's satisfaction with treatment: a technically good result, internal patient-related factors, interaction/ communication between patient and personnel, and external forces affecting the patient and treating team. Communication and interaction at all stages of treatment seem to be critical in guaranteeing post-treatment satisfaction, according to the study. If pre-treatment information and communication about the treatment process, as well as goals are absent, or the patient believes his or her concerns have not been heard or taken seriously, a technically good result does not ensure joy [12-13].

The aim of this study is to investigate the assessment, skeletal deformity and type of procedure of orthognathic surgery patients, as well as their functional needs, treated at the Jordanian Royal Medical Services.

2. Materials and Methods

Prior to the start of treatment, patients who were referred due to a significant skeleto-dental malocclusion and who could need orthognathic treatment were seen by an orthodontist in the Oral and Maxillofacial Unit for their

initial appointment. Patients were evaluated, given verbal information and given an information sheet outlining the general characteristics of the treatment. Following that, records were taken (impressions for research models, facial and dental pictures and imaging), and the individual treatment plan was discussed and consent obtained at the third appointment. Patients also had an appointment with an oral and maxillofacial surgeon at this time. There were no collaborative consultations with the professionals involved and the team did not include a psychologist. There was a desire to improve this procedure, as the relevance of the patient's engagement with the treatment became more apparent.

Statistical analysis:
Anonymous data were numerically coded and entered into an Excel spreadsheet (Microsoft® Office Excel). All statistical analyses were conducted using IBM SPSS software version 25 (Chicago, IL, USA). The frequency distribution for categorical variables was used to describe the demographic characteristics of the study participants, whereas the mean and standard deviation were used to describe the continuous variables. In addition, the cut-off level for statistical significance was P <.05.

3. Results

This study included 57 female patients and 43 male patients (Figure 1). Table 1 shows the demographic information of the patients. In all, 35% of included patients were 20 years old or less, while 65% of them were older than 20 years old. The distribution of skeletal deformities and the surgical procedures among the included patients is shown in Table 2. Bimaxillary surgery (Bimax) was the most common surgery performed among the patients (n=43), followed by BSSO (n=24), LeFortI (n=20), Wassmund (n=3), iliac bone graft for the maxilla (n=3), genioplasty (n=1), upper lip repositioning (n=1) and Surgically Assisted Rapid Palatal Expansion (SARPE) (n=1).

Figure 2 and Figure 3 show the distribution of the surgical procedures performed based on gender. The Bimax procedure was the most common surgery performed among both male and female patients, with a frequency of 21 participants and 23 participants, respectively.

Figure 4 and Figure 5 show the distribution of the skeletal deformities based on gender.

Most of the included male patients were classified as having Class III malocclusions, while most of the included female patients were classified as having Class II malocclusions.

4. Discussion

It is believed that about 30% of the general population has malocclusions that require extensive orthodontic treatment. However, the term dentofacial deformity refers to a wide range of dental and maxillomandibular abnormalities, sometimes accompanied by a malocclusion, that are not treatable by orthodontic therapy alone and require surgical alignment of the upper or lower jaw or both for definitive treatment (orthognathic surgery).

Individuals with dentofacial abnormalities frequently have a lower quality of life and impaired breathing, swallowing, chewing, speech articulation and lip closure/posture functions. Dentofacial abnormalities that are not susceptible to orthodontic treatment are estimated to affect roughly 5% of the general population.

When dealing with dentofacial skeletal deformities, there are some procedures that are employed, such as the Bimax procedure, which is a surgical treatment that involves the advancement of both jaws utilizing custom-engineered titanium plates and genioplasty to augment the chin. The upper jaw is moved forward using the LeFort I procedure, while the lower jaw is brought forward with the BSSO procedure. Following the Bimax procedure, the nasal tip turns upward, the lips are better supported, the lower facial height improves and the jawline becomes more defined, all of which contribute to a more harmonious facial proportionality. Most significantly, the tongue is pushed forward, removing any potential or existing airway obstruction that could lead to Obstructive sleep apnea (OSA). Adult patients who have had unsuccessful camouflage orthodontics are usually candidates for the Bimaxprocedure[14-15]. Another procedure is bilateral sagittal split osteotomy (BSSO), which is a type of jaw surgery that involves separating and repositioning the lower jaw from the face. The jaw can be moved forward (if it is too far back) or straightened (if it is too far in front or tilted to one side). There is no visible scar on the face because the operation is done entirely inside the mouth. A BSSO can be done alone or in conjunction with other procedures, such as upper jaw or chin surgery [16-18].

LeFort Iis one of the procedures that can be followed when dealing with orthognathic surgery. The upper jaw (or maxilla) is removed from the rest of the face and realigned during the LeFort I procedure. The upper jaw can be moved up, down, forward, backward, tilted, or twisted once it has been detached. A combination of these movements is also possible. A Le Fort I procedure can be done alone or in conjunction with chin or lower jaw surgery [19-20]. Genioplasty is seen to be a cosmetic surgery type in which the chin is repositioned or reshaped for improving facial harmony [21-22]. The iliac bone graft for the maxilla is a form of bone graft that can be used for a range of procedures, including periodontal surgery to replace missing jawbone [23-24]. The Wassmund procedure is implemented to tunnel the mucoperiosteum completely palatally, as well as labially and can be done through two labial vertical incisions. From the vertical osteotomy site to the contralateral side, the palatal bone is transversely sectioned [25-26]. Upper lip repositioning is a straightforward surgical treatment for correcting a "gummy smile". Such procedures or techniques are employed to reduce the gingival show while smiling by limiting the muscle pull of the elevator lip muscles [27-28]. SARPE is an orthodontic treatment enlarging the maxillary arch. In such procedures, treatments from both oral and maxillofacial surgery and orthodontics are combined. This treatment is primarily performed on adult patients who have fused maxillary sutures that cannot be extended with conventional methods [29-30]. In this study, 100 females and males had concurrent procedures with other orthognathic surgeries (i. e., Bimax, LeFort I, BSSO genioplasty, iliac

bone graft for the maxilla, or SARPE.). In the current sample, 44% of the included patients had the Bimax procedure, while 44% of the included patients had concurrent single jaw surgeries (LeFort I or BSSO). According to studies [31-33], patients with severe sagittal Class II deformities are more likely to seek orthodontic treatment rather than surgery; yet, as compared to those with severe mandibular deficiencies, a greater number of patients with severe Class III deformities seek orthognathic surgical treatment. In the current sample, we also found a higher percentage of Class III skeletal individuals, with a frequency of 58%. It has been indicated that more Class III people are seeking orthognathic surgery using the Bimax procedure than Class II people. This is in contrast to prior studies, which indicated that the Class II skeletal type was the most common, accounting for over half of all cases. In all, 95% of the patients were classified as having great or very great functional needs, according to the IOFTN (Appendix A). This is similar to recent findings in the UK, where 88–98% of people said they had a terrific time and functional requirements. We could not find a single patient who had orthognathic surgery just because of sleep apnoea. IOFTN appears to be a valid technique for identifying individuals in need of orthognathic surgery, assisting resource allocation for patients with the greatest functional demands, based on current findings and past studies [34-37]. It can also be utilized to link the orthognathic requirement to other health variables in the context of study. Referring dentists can use the IOFTN to see if their patients are candidates for orthognathic treatment, as previously stated. To increase the efficiency of scoring patients, Howard-Bowles et al. proposed the acronym "OOSGA (Overjet, Overbite, Scissors bite, Gingival exposure and Asymmetry) "; this is similar to the hierarchy allocation system of the IOTN (MOCDO) and would cover the majority of the subcategories within IOFTN, allowing the single worst feature of the patient's malocclusion to be identified. The IOFTN score should be used in conjunction with psychological and other clinical markers to identify patients who require orthognathic treatment, as previously proposed. As a result, the skeletal components of orthognathic surgery patients are not assessed. There are certain limitations to the current study. The retroactive nature of the data presented, as well as the elimination of participants with missing data, resulting in a very small sample, could lead to bias. Future research should be prospective and evaluate the performance of the IOFTN in a larger population. In prospective investigations, a larger sample with a wider range of malocclusions and dentofacial abnormalities should obviously be used. Patients with well-compensated malocclusions, such as those with a deficient chin or facial asymmetry but excellent occlusion who are not classified by IOFTN as having a high need for orthognathic surgery, must be included in future studies. The inclusion of a skeletal deformity evaluation measure to the index, such as the soft tissue facial profile angle, appears to be beneficial in detecting patients with good occlusion but severe underlying skeletal deformity. In addition, it based on the Pearson correlation analysis; it is found that there is a significant relationship between gender, skeletal deformity and procedure type (Appendix B).

5. Conclusion

It was found that males were less than females, as they represented 43% of all study participants. In addition, the most common procedure types were the Bimax and BSSO, with percentages of 68% in both males and females. In this sample, patients with Class III and Class II deformities were more numerous. The IOFTN assessment revealed 95% of patients had great or very great functional demands; however prospective trials employing IOFTN are needed to determine whether or not orthognathic surgery is required. In addition, it was also found that there was a significant relationship between gender, all of the skeletal deformities and procedure types.

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Appendix A

Index of Orthognathic Functional Treatment Need

This index applies to those malocclusions that are **not amenable to orthodontic treatment alone, due to skeletal deformity,** and will ordinarily apply to those patients who will have completed facial growth prior to surgery (commonly 18 years of age and older). It relates only to the **functional** need for treatment and should be used in combination with appropriate psychological and other clinical indicators.

5. Very Great Need for Treatment
5.1 Defects of cleft lip and palate and other craniofacial anomalies
5.2 Increased overjet greater than 9 mm
5.3 Reverse overjet ≥ 3 mm
5.4 Open bite ≥ 4 mm
5.5 Complete scissors bite affecting whole buccal segment(s) with signs of functional disturbance and or occlusal trauma
5.6 Sleep apnoea not amenable to other treatments such as MAD or CPAP (as determined by sleep studies)
5.7 Skeletal anomalies with occlusal disturbance as a result of trauma or pathology
4. Great Need for Treatment
4.2 Increased overjet ≥ 6 mm and ≤ 9 mm
4.3 Reverse overjet ≥ 0 mm and < 3 mm with functional difficulties
4.4 Open bite < 4 mm with functional difficulties
4.8 Increased overbite with evidence of dental or soft tissue trauma
4.9 Upper labial segment gingival exposure ≥ 3mm at rest
4.10 Facial asymmetry associated with occlusal disturbance
3. Moderate Need for Treatment
3.3 Reverse overjet ≥ 0 mm and < 3 mm with no functional difficulties
3.4 Open bite < 4 mm with no functional difficulties
3.9 Upper labial segment gingival exposure < 3mm at rest, but with evidence of gingival/periodontal effects
3.10 Facial asymmetry with no occlusal disturbance
2. Mild Need for Treatment
2.8 Increased overbite but no evidence of dental or soft tissue trauma
2.9 Upper labial segment gingival exposure < 3mm at rest with no evidence of gingival/periodontal effects
2.11 Marked occlusal cant with no effect on the occlusion
1. No Need for treatment
1.12 Speech difficulties
1.13 Treatment purely for TMD
1.14 Occlusal features not classified above

IOFTN					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Need for Treatment	1	1.0	1.0	1.0
	Mild Need for Treatment	1	1.0	1.0	2.0
	Moderate Need for Treatment	3	3.0	3.0	5.0
	Great Need for Treatment	57	57.0	57.0	62.0
	Very Great Need for Treatment	38	38.0	38.0	100.0
	Total	100	100.0	100.0	

Appendix B
Pearson Correlation Analysis

Correlations				
		Type of Procedure	Skeletal_Deformity	Gender
Type of Procedure	Pearson Correlation	1	.835**	.690**
	Sig. (2-tailed)		.000	.000
	N	100	100	100
Skeletal Deformity	Pearson Correlation	.835**	1	.683**
	Sig. (2-tailed)	.000		.000
	N	100	100	100
Gender	Pearson Correlation	.690**	.683**	1
	Sig. (2-tailed)	.000	.000	
	N	100	100	100
**-Correlation is significant at the.01 level (2-tailed).				