

EFFECTS OF MALOCCLUSION ON ORAL HEALTH RELATED QUALITY OF LIFE (OHRQoL): A CRITICAL REVIEW

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Abstract

Objectives: The purpose of this paper is to provide a useful critical review relating to the effects of malocclusion on the physical, social, and psychological aspects of the Quality of Life (QoL) of patients. **Methods:** The information presented in previous articles was reviewed. They include reviews, meta-analyses, cross-sectional studies, retrospective and prospective longitudinal studies, and randomized controlled trials. These full-text English-language papers were studied to determine the effects of malocclusion on QoL. **Results:** Recent studies have found that malocclusion is associated with higher levels of dissatisfaction with appearance, and have the potential to negatively impact Oral Health Related Quality of Life (OHRQoL). However, due to the differences in study designs, population demographics studied, and methods of assessment of physical, social, and psychological health, the evidence needs more analysis. **Conclusion:** In recent years, attention to patient-centered assessment has greatly increased. The orthodontist's point of view has expanded from dentofacial esthetics to the patient's overall OHRQoL. This leads to increase in dental practitioners comprehensively and rigorously, thus assessing the effects of malocclusion on QoL. The demand on standardized, valid, and reliable data collection instruments will increase as practices treat malocclusion issues to elevate patient's overall OHRQoL.

Keywords: Malocclusion, Psychology, Orthodontic treatment, OHRQoL

Introduction

Oral Health-related Quality of Life and Malocclusion

The concept of Oral health-related quality of life (OHRQoL) has multiple qualities and can be defined as “the absence of negative impacts of oral conditions on social life and positive sense of dentofacial self-confidence” (Inglehart *et al.*, 2002). Thus, the difficulty arises in the subjective evaluation of the patient’s perceived physical, psychological, and social aspects of oral health. It is difficult to utilize any one standard evaluation tool to determine how the patient feels about themselves (Locker and Allen, 2007; Silvola *et al.*, 2011). However, this concept of a patient’s view of OHRQoL means that the idea of a “good oral health” should include the patient’s self-esteem, psychological, and social well-being, as well as the absence of hard and soft tissue oral diseases (Inglehart *et al.*, 2002).

Malocclusion is a widespread oral condition that occurs worldwide. It differs from the majority of medical and dental conditions in that it is ‘a set of dental deviations’ rather than a disease. Therefore, its treatment is different from other conditions. Often, the “cure” for malocclusion involves an orthodontic procedure, designed to return occlusion to what is considered as an idealized state. If the occlusion is considered to be functional and esthetic, then the malocclusion is considered to be resolved (Masood *et al.*, 2013).

The etiology of malocclusion includes many causes from genetic, traumatic, and environmental factors. However, there are many chemical and teratogenic factors that can result in cleft lip/palate or other cranio-facial defects in utero (Proffit, WR., 2013). Literature has described a relatively high incidence of heritability of craniofacial dimensions and low incidence of the heritability of dental arch variations (Proffit, WR., 2013; Johannsdottir *et al.*, 2005). Research is ongoing to determine with clarity, the relationships between the heritability and the development of malocclusions that include both skeletal and dental components (Proffit, WR., 2013; Mossey *et al.*, 1999). Obviously, malocclusions may have a negative influence on the physical, psychological, and social development of young people. However, this is beyond the typically discussed problems of growth and occlusal development in malocclusive condition. Typically, the problems of malocclusions in relationship with tooth injuries or functional problems have been discussed (Järvinen, S. *et al.*, 1979; Forsberg *et al.*, 1993). However, these malocclusions have a long-lasting impact on an individual’s self-esteem, self-confidence, and social interactions. Hence, this is regarded as the concept of OHRQoL (de Oliveira and Sheiham, 2003).

At first, the research appears inconclusive. Many psychological tests and long-term follow-ups do not reveal a significant correlation between malocclusion and the symptoms of psychological distress (Taghavi Bayat *et*

al., 2013). Subsequently, more focused research metrics that are designed to directly investigate the physical, social, and psychological impact of malocclusion on OHRQoL have been developed. Therefore, these can better assess the effects of malocclusion on people's lives. A better understanding of the need for orthodontic treatment beyond the measurement of clinical parameters can be attained. Social and psychological effects are often the key motives for a patient to seek orthodontic treatment. Furthermore, patients are notorious for their ability to live with functional, rather than cosmetic issue. This reflects the importance of OHRQoL as the measurement for orthodontic treatment need, as well as patient's satisfaction of the outcome (Masood *et al.*, 2012).

Psychological, Social, and Physical Impacts in Relation to Malocclusion

It is now established that malocclusion and dento-facial deformities are prevalent enough to provide a large enough sample group to be studied. Also characterized in literature is the influence of malocclusion on the physical, social, and psychological "functioning" of the patient (Lee *et al.*, 2007; Rusanen *et al.*, 2010). Thus, it is important to understand the bi-psychosocial aspects of the malocclusion and its repercussion on the general QoL. This can be addressed especially in adolescent patients because this developmental period is a specific phase of the human development that is characterized by anatomical, physiological, psychological, and social transformations. Consequently, information about how malocclusion affects these patients may offer an evaluation of patient perceived need and priority for the treatment of those individuals that are acutely aware of deviations from norm. This should, in theory, enable better allocation of resources required to address the orthodontic treatment (Marques *et al.*, 2005, 2006; Oliveira *et al.*, 2004).

The oral cavity is an obvious contributor to HRQOL both biologically and psychologically. When the oral cavity is compromised in regards to disease, function or aesthetics, it can adversely affect HRQOL (Cunningham *et al.*, 2001). However, the particular concept of oral health with regards to its relationship to OHRQOL really involves the extent to which an individual believes that their oral and para-oral conditions affect his or her life. A study by Badran using the esthetic components of the IOTN and GSE scale, found that subjects with greater normative treatment need and high self-perceived treatment need demonstrated lower self-esteem. The subjects who had received orthodontic treatment had a higher self-esteem than those who had not been treated. Therefore, this study also reported subjects being teased about their teeth and that they were more likely to hide their smile if they had low self-esteem (Badran, 2010). All of this is obvious

intuitively, but it becomes more relative when the assumptions are backed by the study results.

Another study of intuitive issues found that lower self-esteem contributes to the development of depression resulting from negative self-image (Sun and Jiang *et al.*, 2004). Furthermore, the adolescents who maintain positive self-concepts with higher self-esteem reported a greater general wellness, more life satisfaction, and fewer depressive symptoms. In other words, they showed a generally improved QoL. A review of articles done by Lui *et al.* (2009), suggests an association between malocclusion, orthodontic treatment need, and poor quality of life. Also, Kvarme *et al.* (2009) also concluded that a strong relationship exists between self-esteem and quality of life (QoL) (Sun and Jiang *et al.*, 2004). Therefore, this research used malocclusion, according to Angle's and children self-esteem scales (CSES) for school children aged between 12 to 18 years. Hence, this was aimed to assess its relationship with self-esteem. They concluded that malocclusion negatively affects the self-esteem of the adolescents. Furthermore, the caveat is that CSES may not be applicable to young adults.

During the study review, it was clear that there was some associative link between an individual's self-image and QoL and the presence of malocclusions (Chu *et al.*, 2009). It is intuitive that occlusion disorder, especially those with obvious aesthetic complications, affects appearance and self-esteem (Chen *et al.*, 2000). Consequently, adolescent children report that issues that affect aesthetic in a highly visible manner, whether they be tooth related (anterior crowding that affects smile) or facial formation related (clefting), can be linked to bullying and low self-esteem (Trulsson *et al.*, 2002). Some malocclusions, such as arch abnormalities with incomplete lip closure are associated with a higher prevalence of dental trauma to the exposed teeth (SBU Report, 2005). Therefore, these conditions have the possibility of further affecting anterior aesthetics. Posterior issues can be an aesthetic concern as well. Untreated crossbites in the posterior oral cavity may not be directly visible, but can have the potential of causing facial asymmetries. Hence, this may have an impact on a person's QoL by affecting his speech, function, and facial symmetry (Talapaneni *et al.*, 2012).

Studies conducted had patients interviewed with an Orthographic QoL survey. Later, they were treated non-surgically for the correction of malocclusion. These patients had lower OHRQoL, in relation to their particular malocclusion, as compared with control individuals present with normal occlusions (Tajima *et al.*, 2007). Consequently, a systematic review did reveal a moderate association (Proffit, WR, 2013) between malocclusion/orthodontic treatment need and OHRQoL (Liu *et al.*, 2009). Other studies investigated surgical intervention with regard to QoL. Also, female patients were interviewed following surgical correction of Angle

Class III malocclusions. After surgery, the women reported that their depressive symptoms have reduced (Nicodemo *et al.*, 2008). In general, surgical correction of severe malocclusion improved patients' disease specific OHRQoL, and in many cases, anxiety (Azuma *et al.*, 2008). These studies seem to confirm anecdotal information gathered by practitioners speaking to their patients before and after treatment. Thus, visible or functional malocclusions can increase a patient's psychological stress. This stress can be reduced through the correction of the condition, especially through surgical operation. However, the differences between the severity (mild, moderate, or severe) malocclusion conditions and a patient's psychological stress have not been evaluated.

Malocclusion may also give rise to pain by causing gingival and mucosal trauma. Subsequently, the correlation between soft tissue swellings and occlusion issues can be a controversial subject (Blair *et al.*, 1997). Occlusal trauma as indicated by several studies, may be an important effector of periodontal disease. Nevertheless, some practitioners treat it as a cofactor in periodontal disease to avoid acceleration in new or preexisting periodontal disease (Davies *et al.*, 2001). Along similar lines, patients with overjets and overbites causing heavy tooth on tooth contact and wear are more likely to experience periodontal disease (Geiger *et al.*, 2001).

Studies of temporomandibular disorder (TMD) and pains have long treated malocclusion issues. Consequently, reviews of cross-sectional and specific studies dealing with control and TMD patient populations have suggested links between TMD and occlusion disorder/problems (Luther *et al.*, 1998; Hagag *et al.*, 2000; Gesch *et al.*, 2004). Thus, this is intuitive. Therefore, the caveat is that these studies do not necessarily suggest that a relationship exists. Longitudinal studies suggest that patients over a long period of time report a greater incidence of TMD if they have an existing malocclusion. However, it also seems intuitive that certain disorders such as open bite, large overjet and deep bite, unilateral crossbites, and posterior and/or lateral crossbites, may contribute to TMD (Henrikson and Nilner, 2003; Pahkala and Laine-Alava, 2002; Egermark *et al.*, 2003). However, statistical evidence of the association between TMD and different occlusion disorders is fairly weak (Egermark *et al.*, 2003).

Speech issues have been very important in many fields other than dentistry, and have therefore been investigated heavily. The consequences of dental problems and occlusion abnormalities have been the subject of strong research. Consequently, there is a significant association between the type of speech disorder and a particular dentofacial abnormalities (Vallino and Tompson, 1993; Pahkala *et al.*, 1995). Studies also suggest that there are strong associations between occlusion and speech disorders. Furthermore, it is important to keep in mind that the sample sizes studied were small in

number (Onyeaso and Aderinokun, 2003; Shue-Te *et al.*, 2003). Thus, only the weak-associated has been proven in some situations; in others, a stronger correlation exists. It is well established, for instance, that individuals with a pronounced deep bite and large overjet tend to pronounce the sibilant sounds differently than those with normal occlusion (Suzuki *et al.*, 1981; Laine, 1987; Lee *et al.*, 2002).

The effect of malocclusions on mastication is an interesting and well-researched field. Masticatory efficiency (usually assessed by laboratory tests) and ability (usually studied by population questionnaires about chewing ability) are two areas of study. Patient versus the general population control subjects studies have reported differences in masticatory efficiency and ability. Patients qualifies for this study if they presented one of many possible occlusion disorders which were evaluated with regard to control subjects with ‘normal’ occlusion (English *et al.*, 2002; Owens *et al.*, 2002; Onyeaso *et al.*, 2003). The literature seems to conclude that subjects with Class III malocclusions have the poorest masticatory efficiency and ability, followed by those with Class II and Class I malocclusions (English *et al.*, 2002).

Malocclusion Assessment in Relation to OHRQoL

Orthodontic treatment ‘need-indices’, as well as occlusion evaluation surveys, are available to assist in the classification of the anatomic, physiologic, and aesthetic parameters of occlusion and malocclusion. The best-known and most-used tools are the Dental Aesthetic Index (DAI) and the Index of Orthodontic Treatment Need (IOTN) (Brook and Shaw, 1989; Bellot-Arcís *et al.*, 2012). Thus, the problem with these tools is that they do not take into account the effects of malocclusion on the patient’s OHRQoL (de Oliveira *et al.*, 2005). Survey instruments that address the effects of a disorder upon a patient’s OHRQoL offer information about the patient’s perception of themselves in relation to the disorder that is under treatment (Klages *et al.*, 2006).

OHRQoL assessment questionnaires have been utilized to study the impact of malocclusion disorders on patient’s OHRQoL (de Oliveira *et al.*, 2002; Sardenberg *et al.*, 2013). OHRQoL research generally focused on adults with periodontal disease, tooth loss, or inadequate dentures (Locker and Jokovic, 1996). The subject of OHRQoL has been expanded to include children and adolescents (Jokovic *et al.*, 2002). Hence, this is mostly because of the concerns that adolescents show about their social groups and appearance. Obviously, it is useful to measure the adolescents’ perception of themselves with regards to appearance, since it plays an important role in their psychosocial growth (DiBiase and Sandler, 2001; Onyeaso and Sanu, 2005). However, this is really the core issue addressed by OHRQoL. In

order to study this correctly in adolescents, the Child Oral Health Quality of Life Questionnaire (COHQoL) was developed. This is a set of scales which measures the effects of oral and orofacial conditions on the functional, emotional, and social well-being of the children. Thus, it is an important evaluation tool for their families as well. The COHQoL consists of the Parental-Caregiver Perceptions Questionnaire (Jokovic *et al.*, 2003), the Family Impact Scale (Locker *et al.*, 2004), and three age specific questionnaires for children (CPQ's or Child Perceptions Questionnaires) (Jokovic *et al.*, 2004, 2002).

Orthodontic Treatment Role and OHRQoL

Traditionally, dental practitioners consider restored oral health, function, and aesthetics as the principal therapeutic goals (Bellot-Arcís *et al.*, 2013). Treating crowded teeth leads to a reduction of food impaction, interproximal caries (Hunt and Hepper, 2001), periodontal diseases (Ainamo, 1972; Sandali, 1973; Buckley, 1981), and the risk of trauma on protruded teeth (Todd and Dodd, 1983; Koroluk *et al.*, 2003). Recently, improved aesthetics with regard to its positive impact on patient self-esteem is being accepted as an equally important benefit of successful treatment (Bellot-Arcís *et al.*, 2013).

Clinical studies evaluating the needs and/or outcomes of orthodontic treatments are usually conducted through the assessment of comparisons to malocclusion models and cephalometric radiographs prior to and following treatment. These evaluations can be based on the orthodontist's clinical point of view, rather than that of the patient (Hamdan, 2004). Orthodontists and patients may very well have different perceptions of the need for orthodontic treatment, their assessment of dental or facial esthetics, and their level of satisfaction with orthodontic treatment. Furthermore, patient's perceptions are important indicators of treatment needs and may complement conventional clinical measurement (Phillips and Beal, 2009). Thus, they should be considered, although the good clinical judgment of practitioner should over-ride any unreasonable expectations or requests by patients. The World Health Organization (WHO) has recommended the inclusion of quality of life measurements in clinical studies (Petersen, 2003). Patients reported better body image and self-confidence related to appearance by following successful orthodontic treatments (Giddon, 1995; Varela and García-Camba, 1995). Supported by study results, orthodontic treatments increase self-esteem and reduce anxiety in social situations for many patients (Albino *et al.*, 1994; Birkeland *et al.*, 1997). Thus, these psychosocial effects of treatment are intuitive and important; hence, they have not yet been clearly defined in all regards by studies (Shaw *et al.*, 2007).

Conclusion

In summary, malocclusions play an important role in the OHRQoL. However, till date, there is conflicting evidence on the effects of malocclusion on quality of life. A better knowledge about the physical, social, and psychological effects of a malocclusion on patient's lives is important since it provides insights into the perceived impacts on individual patient's lives. This can be achieved through a more comprehensive and rigorous assessments, since there is no study that has explored the intensity or the extent (number of affected daily activities) of the effects associated with perceived malocclusions.

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