

Review Article

# Clinical Characteristics of Bimaxillary Protrusion in Different Population

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## Abstract

In this paper, we discussed the characteristic of bimaxillary protrusion in different population. We also incorporated about aetiology and management of bimaxillary protrusion. It is importance to understand the characteristics of skeletal and dental of bimaxillary protrusions in a specific population, in order to decide whether to treat by orthodontic camouflage only, or combination with orthognathic surgery and orthodontics.

**Keywords:** To provide the information regarding clinical characteristics of bimaxillary protrusion in different population

**Abbreviations:** SNA (Sella Nasion A point); SNB (Sella Nasion B point); ANB (A point Nasion B point)

## Introduction

Bimaxillary protrusion is a common dentofacial trait particularly predominant in Asian countries such as Malaysia and Indonesia while also present in African populations and in almost every ethnic group in the world (Chu, Bergeron, & Chen, 2009). Various ethnic groups and races have different facial patterns and facial types in terms of dental, skeletal and soft tissues parameters. This condition is commonly seen in Asian (Lamberton, Reichart, & Triratanimmit, 1980) as well as African–American populations (Farrow, Zarrinnla, & Azizi, 1993). Proffit (2007)

characterised bimaxillary protrusion as an increased protrusive and proclination of both upper and lower incisors, with mild Class II skeletal pattern and more prognathic maxilla and also increased procumbency of the lips. This features will produce procumbent lips, often resulting in lip incompetence, mentalis strain, excessive gingival display and convex profile (Solem et al., 2013). Patient with bimaxillary protrusion presented with normal overjet and overbite and also normal molar relationship. Some clinicians consider bimaxillary protrusion to be in perfect harmony and balance with their patients' physiognomy because most cases present with normal overjet, overbite and also Class I molar relationship. Although there is increased proclination upper and lower incisors in bimaxillary protrusion cases, there is relatively normal overbite and overjet leading most clinician to

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classify these as angle Class I cases (Keating, 1985). Bimaxillary protrusion is also commonly seen as a Class II skeletal pattern with a prognathic maxilla and normal mandible and increased protrusion of both upper and lower lips (Aldrees & Shamlan, 2010).

The term 'bimaxillary protrusion' is associations of bialveolar protrusion, bimaxillary dental protrusion, bimaxillary prognathism, bimaxillary dentoalveolar protrusion, and bidental protrusion (Sivakumar et al., 2014).

The aetiology of bimaxillary protrusion is complicated and multifactorial, involving environmental factors such as mouth breathing, genetic component, soft-tissue function, tongue volume and habit (Lamberton et al., 1980) (Bills, Handelman, & Begole, 2005). The specific features of bimaxillary protrusion in distinctive populations are important for orthodontic treatment planning. It is judicious to know the characteristics of skeletal and dental of clinically bimaxillary protrusions in a specific population, in order to decide whether to treat by orthodontic camouflage only, or combined with orthognathic surgery and orthodontics.

### **Bimaxillary Protrusion In Caucasian**

Just like any other malocclusion, there is a tendency for variant in the clinical features of bimaxillary protrusion among different ethnic groups. In a Caucasian population, bimaxillary protrusion is characterised with a mild Class II skeletal pattern and an average interincisal angle of  $115^{\circ}$  (Keating, 1985). Keating (1985) recently investigated bimaxillary protrusion in Caucasians, and revealed that this particular population possessed a shorter posterior cranial base with increased lower facial height, more prognathic maxilla and mandible in mild

Class II skeletal pattern. In Caucasians, they presented with a procumbent soft tissue profile with a low lip line. This study was compared between a control group and a bimaxillary protrusion case in Caucasians.

### **Bimaxillary Protrusion In Black Population**

Bimaxillary protrusion is not a mutual incidence in a white people, but it is mutual in black population. The major relative findings between white Americans and also black population can be recapitulated by the fact that the SNA angle in the black population is larger, but the SNB angle is equivalent in both whites and blacks, and causing increased ANB value in the black population. Compared to the white population, the incisor-mandibular plane angles and Frankfort-mandibular plane angles also increased and produced increased vertical proportion. In terms of dental characteristics, the blacks presented with a proclined incisors and acute interincisal angle with this: produces more bimaxillary protrusion in the black population compared to other population (Dandajena & Nanda, 2003). Farrow et al. (1993) found that black American patients presented with a flaccid lips with a strong tongue and large size, and that allow the teeth to be in harmonious and balance in a procumbent position. The lower face appears very full because of the thickness of the lips and also the position of the teeth. Farrow et al., (1993) did a study by using lateral photographs that were taken in every patient, and by using a computer he altered the different levels of bimaxillary protrusion into four different profile types, classified as BM3 (bimax three), S (straight) BM, (bimax one), BM2 (bimax two) and. In the study, they found that black Americans prefer the

BM (bimax one) profile, which is more protrusive and considered as a slight convex profile, compared to the white orthodontic norms. The result of the can be used as reference to the orthodontic treatment plans in black American patients (Farrow et al., 1993).

### **Bimaxillary Protrusion In Saudi Arabia**

There is a high incidence of bimaxillary protrusion among Saudis, however there is a deficiency of descriptive data of this type of malocclusion in the Saudi population. Aldrees and Shamlan (2010) used a sample of sixty patients in a group diagnosed with bimaxillary protrusion, and sixty patients in a control group, by utilizing a lateral cephalometric radiograph. Based on this study, both females and males of the bimaxillary protrusion group demonstrated a similar sagittal dimension and vertical skeletal patterns to the control group, because they wanted to eliminate skeletal discrepancy on the soft tissue values. Saudis with bimaxillary protrusion in both males and females showed more protrusive soft tissue features of upper and lower lips. Conversely, the female group presented with a less obtuse nasolabial angle. However, in terms of dental relationship, between male and female group, there were no significant differences were found in the bimaxillary protrusion group.

### **Bimaxillary Protrusion In Indian Population**

In another study in India, the bimaxillary protrusion was presented with merely proclined upper and lower incisors. Conversely, in the Indian population, they presented with normal skeletal bases, both anteroposteriorly and vertically and they are close to the Steiner's norm (Sivakumar et al., 2014). However, the study did not

discuss or evaluate the presence of soft tissue in bimaxillary protrusion. The author concludes that bimaxillary protrusion in the Indian population can be treated well with orthodontic mechanics only, due to the normal skeletal characteristics in the Indians population.

### **Bimaxillary Protrusion In Korean Population**

In Asian countries, bimaxillary protrusion can be seen in Korea, Thailand, and Philippines and also in Malaysia. In Korea, a cephalometric study on 18 year old Korean subjects was carried out with acceptable profiles and occlusions, and analyzed by using the several analysis such as Ricketts, Steiner, Downs and vertical analyses (Park et al., 1989). The skeletal pattern in Koreans in general is similarly to that of Caucasians. The anteroposterior skeletal pattern or ANB angle of Korean females is similar to that of Caucasian females, but the ANB angle in Korean males is significantly higher than Caucasian males. For the dental and soft tissue measurements, Koreans presented with protrusive upper and lower lips and increased proclination of upper and lower incisors.

### **Bimaxillary Protrusion In Thailand**

In Thailand, Thai people prefer the less convex profile so that they can close their lips. The protrusion was unstable and it continues with age, impairing functions. Another reason that Thai people prefer a less convex profile is because of their superstitious beliefs. A study by Lamberton (1980) on bimaxillary protrusion in Thailand found that the interincisal angle was below than  $124^\circ$  by using Steiner's analysis. The lips of Thai people are more protrusive in general.

## **Bimaxillary Protrusion In Malaysian Population**

Study in Malaysia on Malaysian Chinese adults (Purmal, Alam, & Zam, 2013), found both maxilla and mandible of the Chinese to be positioned forward, and giving a clinical impression of Class III skeletal pattern with the position of the mandible is more forward compared to maxilla. Both upper and lower incisors are also proclined. To maintain contact with the more forward mandible and also prognathic maxilla, the lower incisors tend to be proclined as a compensatory mechanism. However, compared to the African, the value of lower incisor proclination in Malaysian Chinese is still reduced, due to the forward position of the mandible (Purmal et al., 2013). The Malaysian Chinese seek the orthodontic/orthognathic treatment to pretend like the Caucasian profile because the position of the lips is protrusive and cause the exaggeration of the position of the nose and chin.

In another study in Malaysia by Mohammad, Abu Hassan and Hussain (2011), investigated cephalometric norms for Malaysian Malays by using Steiner's analysis. In their study, they found the SNA and SNB values of Malaysian Malays to be higher compared to Caucasians, which indicates that both the maxilla and mandible were prognathic. However, the ANB angle is similar to that of Caucasians, which indicates that Malays are presented with a class I skeletal pattern. In terms of dental measurements, the author found that Malaysian Malays exhibit more proclined upper and lower incisors in relation to both the Nasion-A point and Nasion B point planes, resulting a reduced interincisal angle of 121°. They concluded that Malays have a predominant bimaxillary dental proclination in class I malocclusion,

with protrusive upper and lower lips.

## **Treatment For Bimaxillary Protrusion**

Bimaxillary protrusion can be corrected either by surgery or orthodontic treatment. For severe cases of bimaxillary protrusion that involve the maxilla and mandible, surgery is indicated. Orthodontic treatment alone to correct the inclination of upper and lower incisors and to retract the anterior segment, which will then retract the lips and reduce the convexity of the face as an approach a straight or white facial profile. A case report by Langberg & Todd (2004) in 20-year-old woman from Nigeria showed a case of severe bimaxillary protrusion case corrected by extraction all first premolars. The patient presented with a extreme vermilion show of both upper and lower lips with an increased lower face height and also convex profile. She also presented with acute mentolabial sulcus, increased procumbency of upper and lower lips and excessive lip strain on closure. For the dentoalveolar, she presented with Class I malocclusion and severe dentoalveolar protrusion. The post-treatment showed a significant changes of patient's facial esthetics. With a significant retraction upper and lower incisor, both upper and lips also retracted back and improved her lip eversion and dentoalveolar protrusion. Retraction of upper and lower incisors improved her chin projection and reduced the mentalis strain (Langberg & Todd, 2004). Another case in Korea by Kook, Park, Bayome, & Laith (2015) did a correction of severe bimaxillary protrusion with severe soft tissue protrusion without surgery. The first treatment option of the case report describes the treatment of a young woman with a severe bimaxillary protrusion was to perform first premolar extractions with an anterior segmental osteotomy because of her thin anterior

alveolus. The operator proceed with the extraction of all first premolars because the patient refused the surgical treatment and distalization the entire maxillary dentition using a palatal plate appliance with three miniscrews (2.0 mm diameter, 8 mm length,; Jeil Medical, Seoul, Korea) in the palate. The post-treatment results showed an improvement of her smile and better profile esthetics. A combination of total arch distalization and extraction treatment and might be a achievable treatment alternative to the patient if the patient refused surgical treatment (Kook et al., 2015).

Surgery is one of the treatment options in bimaxillary protrusion cases. Surgery can be done by repositioning the jaw that will improve the patient's profile. Orthonagthic surgery in bimaxillary protrusion cases may include some combination of Le Fort I osteotomy, bilateral sagittal split ramus osteotomy (BSSO), and upper and lower anterior subapical osteotomies (Chu, Bergeron, & Chen, 2009). Anterior segmental osteotomies of the maxilla and mandible at the extraction sites with extraction of four first premolar can be done for minor cases of bimaxillary protrusion (Chu et al., 2009). The goal would be to as well as reduce the proclination of the incisors and to setback the segments.

Le Fort 1 osteotomy can be done by moving the entire maxilla in anteroposterior, vertical or transverse directions as a single unit and it involves disarticulating the maxilla from the skull by cutting along the lateral outer wall through the base of the zygomatic buttress, extending anteriorly to the piriform fossa and posteriorly to the pterygoid plates (Cobourne & DiBiase, 2009). The nasal septum and lateral wall of the nasal cavity

are freed internally, with the maxilla being finally mobilized by separating it from its attachment at the pterygoid plates. Le Fort I osteotomy with superiorly repositioning the maxilla with or without segmental osteotomies can be done in the patient with excessive gummy smile in bimaxillary protrusion cases due to vertical maxillary excess (Chu et al., 2009). If the maxilla moves superiorly without mandibular surgery, the mandible will auto-rotate itself to the new position of maxillary occlusal plane (Chu et al., 2009).

In the treatment of retrognathia, prognathia or asymmetry, the bilateral sagittal-split osteotomy (BSSO) is used to move the mandible forwards or backwards. In the region of the molar area, a laterally placed cut is fashioned through cortical bone of the body of mandible, and a medially positioned cut is placed into cortical bone of the ramus just above the lingula. These cuts are then joined together by splitting the mandible along a line extending through the cortex, which allows backward or forward movement of the body of mandible (Cobourne & DiBiase, 2009). In bimaxillary case with Class III skeletal pattern, BSSO setback can be done with the patient that undergo differential intrusion of anterior and posterior maxilla with clockwise rotation of the occlusal plane (Chu et al., 2009)

The anterior subapical osteotomy is occasionally used to alter the position of the lower labial segment in the mandible with a vertical cuts through the alveolus behind the canine teeth, and joined by a horizontal cut underneath the root apices to free the anterior segment (Cobourne & DiBiase, 2009). In bimaxillary proclination, anterior subapical osteotomy can be done for levelling an excessive curve of Spee if the leveling cannot be done orthodontically

and also to maintain the anterior face height (Chu et al., 2009).

Both treatments can improve the patient's profile and its aesthetics (Solem et al., 2013). The specific features of bimaxillary protrusion can determine the different treatment options either to do orthodontic treatment alone or combination with orthonagthic surgery (Sivakumar et al., 2014). Improvement of the soft tissue profile in bimaxillary protrusion cases depend on numerous variables related to the anatomy of the face including ethnicity, facial muscle activity and also lip thickness (Kusnoto & Kusnoto, 2001).

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