



Comparison of Orthodontic Techniques used for treating patients with severe form of scissor bite: a systematic review

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Comparison of Orthodontic Techniques used for treating patients with severe form of scissor bite: a systematic review

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Abstract

Background: Severe forms of scissor bite or Brodie syndrome is rare orthodontic malocclusion that occurs with a frequency of 0.01% in general population. Several methods have been described to obtain a correction from a dental, skeletal and soft tissutal points of view. In literature it was described: jaws osteotomies, surgery first approach, as the use of orthopedic-functional devices and extractions with the fixed multibrackets orthodontics combined with miniscrews for the skeletal anchorage. The aim of work is to compare all the treatment to evaluate their applicability, efficacy, effectiveness and relapsing risk in combination with the compliance of patients.

Results: The ortho-surgical correction remains the golden standard in severe dentofacial deformities because of its more applicability, lower risks of failure and rapidity, as it doesn't need patient compliance. However not all the patients accept to undergo surgery, so pure orthodontic approach is need. So the combination of fixed orthodontics with skeletal anchorage has proven the best effective and stable to 5 years from therapy. In young patient with mild form of malocclusion when it was intercepted early, a functional therapy should be attempted.

Conclusion: Each form of clinical case requires a proper evaluation considering the age of patient, the features of pathology as the presence of other complications. So there isn't a standard approach, but sure the orthognathic surgery as in recent times the combination of fixed orthodontics with skeletal anchorage could provide adequate skeletal and dento-alveolar changes useful to reduce the malocclusion.

Introduction

In orthodontics the most frequent type of malocclusion is the Class II. It can be classified into three forms: the skeletal type, the dento-alveolar type, and the pure dental type. These alterations require dental or skeletal effects depending on the kind of treatment.¹

When the problems of this malocclusion are predominantly skeletal, they will be corrected by functional or mechanical orthopedic appliances, requiring much patient compliance²⁻⁴, as they could require a surgical-orthodontic treatment. If this doesn't occur the treatment time will increase and the risk of a failure of the orthodontic therapy too³.

The Class II malocclusion, in particular the first division type, with a proclination of the upper central incisors, can sometimes relate with a scissor bite. It can be partial or total, unilateral or bilateral as in the Brodie bite⁵, also called buccal nonocclusion or telescopic bite. It's a rare form of malocclusion with a prevalence of 0.01% in the general population⁶, but when it occurs it can be extremely difficult to correct, even with surgery⁷ and orthodontic treatment. Total scissor bite eliminates the lateral and the protrusive excursions as it determines significant alterations in the eruptive sequence of permanent teeth in the form that maxillary teeth erupt past their maxillary antagonists. This particular bite was defined by Barrett⁸ an "X occlusion". This malocclusion seems to originate from a discrepancy between the transverse diameters of maxilla and mandible. However, the orthodontic problems spread also in the other spatial planes as the unopposed teeth in each arch sopraerupt. In this way the posterior teeth need to be intruded and repositioned laterally.

In general, the total scissor bite recognizes a dento-alveolar discrepancy, because the mandibular alveolar process is narrow whereas the maxilla is normally developed. Many clinicians reported severe articular problems to TMJ (temporo-mandibular joint). These could be due to the alterations of mouth functions and in particular of the mastication⁹. The great vertical overlap of the two arches represent the handicap of positioning the orthodontic brackets on the surfaces of mandibular teeth.

Till now, no studies have been performed to analyse all the orthodontic problems related to the treatment of severe forms of scissor bite. So the aim of this work is to lead a systematic review of literature to select all the articles focused on the therapy of severe scissor bite and to collect all data about the treatment time, efficacy as the risk of relapsing to the malocclusion.

Materials and Methods

There are few articles on international literature about this topic so all the possible synonyms for this malocclusion have been searched. The systematic review of literature has been performed on the principal medical databases: PubMed (Medline), Lilacs and Scopus. The keywords used were: *Class II malocclusion, Brodie syndrome, Brodie bite, scissor bite, buccal bite* and *telescopic bite* to identify all articles reporting on the treatment of Class II malocclusion with scissor bite until September 2016. No restrictions of time and languages have been fixed. The results have been filtered and valued following our eligibility criteria and then organized following the PRISMA method¹⁰.

The search identified 15,329 abstracts, which were reviewed manually and each article of interest was marked for further review. The full text of the marked studies was retrieved and studies that satisfied our eligibility criteria were included in this review. The eligibility criteria were: availability of abstracts; accurate description of clinical case with clinical finds; inclusion of treatment plan; evaluation of treatment results with radiographic records, at least radiographic pantograms and lateral cephalometric radiograms; accurate description of follow up of at least five years. At the end of the selection, we identified nineteen articles.

Results

All the data reported in literature have been collected in Microsoft Excel 2013 and have been classified according to the steps of the orthodontic clinical protocol.

Diagnosis

Patients reported in literature with severe forms of scissor bite have a great variability in age at the moment of the diagnosis and of the planning of the treatment. So this could be interpreted as a significant grade of variability in all the phases of treatment, but in particular of diagnosis, therapy and maintenance.

All the patients reported in literature with severe forms of scissor bite can show a great dento-alveolar discrepancy or skeletal class II malocclusion with an important mandibular hypoplasia. Generally, they have a convex profile, lip incompetence and sometimes they show a gummy smile. At the intraoral examinations all patients revealed an overjet greater

than normal patients, ranging between +3 and +16 mm, as the overbite is also increased from +4 to +11 mm. All the cases have Angle class II malocclusion for the molar and canine occlusion, but a small group shows a subdivision with a I class relationship on one side, generally the left side.

The literature reported a wide variability in the cephalometric landmarks: the SNA angle ranges from 78.5 to 85 degrees, while SNB angle shows a greater variability with a range from 69.5 to 80 degrees, ANB angle has values comprised between 5.0 to 10.6 degree. Some patients at the Tweed analysis show to be iperdivergent with a FMA angle higher than 29.5 degrees (ranges from 29.5 to 35 degrees), while a small group has serious form of deepbite. All the patients show a considerable proclination of the upper central incisors, with the angle between these teeth and Frankfurt plane comprises between 118 and 134 degrees.

Etiology

This malocclusion can result from either excessive width of the maxilla, deficient width of the mandible or a combination of both with variable expression. So except for rare form related to bad habits as swallowing, finger sucking or pacifier sucking, that have been early intercepted in children, all the other cases don't show a relation with functional alterations. So the skeletal relationship of malocclusion is probably related to hereditary influences. This consideration is proven by the observation that many patients reported other forms of scissor bite or Class II malocclusion in I division, that can present variable expressivity.

Treatment objective

Analysing only the orthodontic problems of the severe scissor bite combined with a Class II malocclusion the treatment plan must take in account: the establishing of normal skeletal relationship, narrowing the maxilla, advancing the mandible, and reducing the maxillary vertical excess; correct the dental relationships and improve occlusal function, improving overbite and overjet, archiving class I relationships bilaterally, at least at the canine occlusion, aligning dental midline; and finally the treatment must improve facial aesthetics, reducing the gingival display when smiling, reducing the mandibular asymmetry which sometimes relate with a severe scissor bite and improving the prominence of chin.

Treatment alternatives

Considering the great variability of the patient as the age of diagnosis, the presence of articular problems, but also the different grade of scissor bite that can be partial or total, several therapeutic approaches have

been proposed during the years. Two groups of treatments can be considered: the surgical-orthodontic approach and the pure orthodontic method.

The orthognathic surgery was the first kind of treatment to be used in the past, because of the prevalent idea was that only the simple form of scissor bite could be efficacy treated with only orthodontics¹¹. Many cases reported in literature were treated with a Le Fort I osteotomy of the maxilla that was retracted and rotated, while the mandible were performed with bilateral sagittal osteotomies. This approach is undoubtedly faster than orthodontic one and it let possible to solve all forms of Brodie bite, but not all the patients would accept it with its sequelae. So, during the time different orthodontic approaches have been proposed as alternatives to the surgery. If the patient is young and he has not yet reached the peak of pubertal growth, the orthopedic devices can be applied to stimulate the growing of mandible, advancing its spatial position. The other orthodontic possibilities are: the use of fixed multibrackets appliances, eventually in combination with surgery as genioplasty to correct the retrusive chin; the extractions of four premolars to solve the Angle class II malocclusion (pure or subdivision) using intraoral elastics and, finally the combination of fixed orthodontics with miniscrews to retract the maxilla and to advance the mandible. The last method was proposed in Korean works¹² only in recent times and it has demonstrated a great efficacy comparable to the ortho-surgical treatment in adult patients.

DISCUSSION

Each clinical case is unique and different from the others, so establishing the treatment planning it's really important to consider the initial condition of the patient and evaluate the severity of malocclusion. Generally, if the patient is adult and/or the malocclusion is severe the gold standard is the surgical-orthodontic correction, that in recent times may provide a surgery first approach¹³. If cases relate to a narrow lower dental arch, the surgical expansion of this arch will be the preferred option.^{14,15} However, other surgical procedures have been developed to reduce the maxillary width,¹⁶⁻¹⁸ including a midline split after Le Fort I osteotomy.

In recent time the straight-wire technique, which is based on sliding mechanics, assisted by miniscrews anchorage, has been proposed in alternative to the orthognathic surgery to correct severe scissor bite accompanied by important deep bite and gummy smile in an adult patient with a very high mandibular plane angle¹². The great advantages of this procedure is the combination of posterior and anterior vertical control to

the sagittal skeletal anchorage. This simplifies the orthodontic treatment procedure as it minimizes the need for patient compliance.¹⁹ The anchorage control in fixed orthodontics is considered one of the most important factors capable to influence the outcomes in particular for hyperdivergent adult.²⁰ The use of miniscrews for correcting class II malocclusion has proved effective in retracting upper incisors and improving the convex facial profile and gummy smile. There was an increase in crownroot ratio for central incisors, referred to the possibility of apical root resorption during intrusion and long-distance retraction. The application of 5-years follow-up demonstrated a stable, well-aligned dentition with ideal intercuspation and harmonious facial.

According to literature, mild malocclusions in young patients could be treated with a pure orthodontic method, through the application of orthopedic-functional devices. In particular, Yogosawa²¹ describes the efficacy of biteplane to advance the mandible, correct the TMJ position and rotate the occlusal plane in clock-wise direction. The mandible grew down and forward in relation to the cranial base and there was a good control of the vertical dimension. The real limits of using orthopedic devices are the necessity of early interception of the malocclusion that has to be mild and not severe, as the compliance of patient because of the wide lasting of treatment (12-18 months).

CONCLUSIONS

Different approaches have been proposed to solve severe scissor bite combined with class II malocclusion. The surgery remains the fastest and the most effective treatment because of its applicability also in severe malocclusions, but it's also the most challenging for the patient that has to support a convalescence period. So a valid alternative is the fixed orthodontics combined with skeletal anchorage, that makes possible the modification of dental arches in all the three dimensions with important effects on the position and dimensions of the alveolar bone.

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