Collaboration between orthodontics and maxillofacial surgery in the treatment of dentofacial deformities

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Abstract This paper deals with the occurrence of cranio-dentofacial deformities and the difficulties encountered in their correction. The surgical goal is to correct or improve the dentofacial deformity and create an esthetically pleasing face; while orthodontic treatment seeks to align the teeth in a good functional occlusion and thereby also improve the facial appearance. Orthognathic surgery has, therefore, become unthinkable without proper planning and assessment by both the orthodontist and maxillofacial surgeon in a teamwork situation.

The objective of this paper is, therefore, to emphasize the desirable collaboration between the two specialties, orthodontics and maxillofacial surgery.

The positive result of such teamwork has been illustrated with one clinical case.

Keywords: Cranio-dentofacial deformities, orthognathic surgery, orthodontics, teamwork

Cranio-dentofacial deformities produce abnormal function and appearance with distortions of the facial skeleton that are not amenable to orthodontic treatment alone. Furthermore, such deformities and abnormalities of jaw-to-face size and shape may include excessive or deficient bone-to-bone and bone-to-soft tissue relationships that have a functional and psychosocial impact on the affected person.1

Almost in every case, malocclusions are associated with skeletal malformations of the jaw, and it is difficult to correct one without addressing the other. The goals of surgical intervention, therefore, include the correction or improvement of the dentofacial deformity, the alleviation of the objective and subjective signs and symptoms, and elimination of the psychosocial problems of those patients afflicted with these deformities.

In recent times there has been increased co-operation between maxillofacial surgeons and orthodontists in the treatment of these deformities.2,4,6 Orthognathic surgery has, therefore, become unthinkable without proper planning and assessments by both orthodontics and maxillofacial surgery, although traditionally those two specialities are considered to be separate units. The primary goal is to achieve the best results for the benefit of the patient.

Clinical experience of the orthodontist plays a role in determining the need for surgical treatment. Certain aids should be available before starting the discussion,4 these include models, intraoral radiograph, cephalometric radiograph with teeth in occlusion and intraoral and extraoral photographs.

The objectives of presurgical orthodontics are alignment of the teeth, relief of crowding, correction of upper and lower incisor inclination to "ideal" values and to remove any dentoalveolar compensations which have occurred during growth.7 This enables the surgeon to achieve maximum surgical correction of the dental base relationship.

Among the few complications encountered in orthognathic surgery, skeletal relapse has become a frustrating condition which is often reported.7,9 Some of the causes of skeletal relapse may be due to improper planning, incomplete mobilization of muscle attachments and the subsequent retraction and overstretching of soft tissues both in the
sagittal and vertical planes. The involvement of the orthodontist in the pre-surgical and post-surgical phases should ensure a methodical approach and smooth progression through the various stages of the treatment.

There have been numerous publications on various surgical procedures employed to correct dentofacial deformities,\textsuperscript{1,2} but very little indeed has been written on the collaboration between maxillofacial surgeons and orthodontists. In this paper, we present the collaborative efforts of orthodontists and oral and maxillofacial surgery in the diagnosis, planning and accomplished treatment for patients with dentofacial deformities, and especially the problems of pre- and post-operative orthodontics, and of permanent retention. Our results are illustrated with one case.

**Case Report** An 18-year old girl presented with a skeletal class III malocclusion. On examination, she was found to have gross open bite, a slight mandibular prognathism, and flat malar bones with maxillary compensation. This would appropriately be defined as retromaxillism (Fig. 1). Mastication was difficult and her speech was impaired. Esthetically the nasal tip was short and tilted upward.

A combined orthodontic-surgical treatment plan, supported with videoimaging analysis ("DENTOFACIAL PLANNER") showed that the best result would be achieved by maxillary advancement and bone grafting followed by orthodontic alignment of the teeth. Medically the patient was in a fit condition. The investigations including HB, WBC, PT, PT and blood chemistry were within normal range. The patient was prepared for surgery and the surgical procedure carried out as planned. The intermaxillary fixation was removed after 6 weeks, and intermaxillary elastics inserted. The operation, as well as the postoperative course, were without complications. The patient was referred back to the orthodontist for post-surgical treatment. The patient and the relatives were exceedingly pleased with the result achieved (Fig. 2), with satisfactory improvement of the facial appearance and the mouth area (Fig. 3).

**Discussion** Surgical correction of dentofacial deformities has more than a century-long tradition.\textsuperscript{3} This paper has presented the possibilities and limitations of independent specialties of surgery and orthodontics, and has highlighted the excellent results which can be obtained by collaborative work.

Koole and Egged\textsuperscript{1} favor post-operative orthodontics since it should be easier for an orthodontist to go ahead with his treatment after the uncertainties of post-surgical changes have been eliminated. On the other hand, Hoyle\textsuperscript{4} outlines the advantages of pre- and post-surgical orthodontics. He summarizes the objectives of presurgical orthodontics as relief of over-crowding, correction of major rotations and alignment of the arches; correction of upper and lower incisor inclinations to ideal values; arch levelling, as well as arch co-ordination. Post-surgical orthodontics would include monitoring of postoperative skeletal relapse and retention. The surgeon, on his part, may have to deal more with the psychological problems related to the patient's appearance, which in many cases forms the chief complaint of the patient. These aspects are inter-related and therefore the responsibilities of specialists may overlap.

The surgeon and the orthodontist must agree on how the occlusion should be after surgery, and the surgeon can hereupon bring in his surgical experience, as no one method is right for all cases. The simplest surgical approach that carries with it least complications and yet brings the best acceptable result is, in our opinion, the method of choice. The teamwork must be based on a thorough analysis of every case before orthodontic/surgical treatment. If this is done, it also becomes easier to convince patients who are reluctant or unwilling to undergo orthodontic treatment before surgery, and to let them know that orthodontic treatment is an absolutely necessary part of the treatment to improve their facial esthetics. Thus, the bands and brackets fitted in the pre-operative phase can be utilized during surgery, and also remain in place for the postoperative phase.

Once the presurgical orthodontic phase is completed rectangular archwires of 0.018 x 0.025 inch of similar gauge are placed in the mouth. Ball-ended surgical hooks are inserted on to the arch wire and fixed in position by pinching with utility pliers. Ball-ended surgical hooks can be easily fixed by the surgeon, and fixed accurately in occlusion. Intermaxillary fixation can be removed after 6 weeks,\textsuperscript{3} then intermaxillary elastics (Class II or III vector) should be inserted into the arch to maintain the antero-posterior surgical correction while settling the teeth into intercuspidation. In cases where the anterior open
Fig. 1a - before operation
Photograph showing the postoperative result of the case:
Note the enhanced middle face.

Fig. 1b - before operation

Fig. 2a - before operation
Photograph showing the mouth area of the patient's lower lip.

Fig. 2b - after operation
Note the upper lip in esthetically satisfactory antero-position to the lower lip.
bite has been corrected, a box elastics between the upper and lower incisors will prevent the relapse and maintain the overbite (Fig. 3).

Once good occlusion has been established, the retainers should be delivered after the fixed appliances are removed. Different types of retainers commonly used are removable or fixed retainers. We prefer to use upper removable retainers and lower fixed retainers from canine to canine which is more stable. The retainers should be used full time for a period of 6 months and thereafter at night only until the correction seems to be stable. A tooth positioner may be used made of flexible acrylic; this leads to good settling of the teeth in good occlusion and helps to improve gingival condition.

In agreement with Epker and Fish, it appears to us that there are three basic questions that must be answered in the team effort for combined orthodontic-surgical treatment of dentofacial deformities. Firstly, it must be decided what surgical procedure or procedures are most appropriate for the patient. Secondly, the specific orthodontic treatment necessary in conjunction with the proposed surgery must be addressed; and finally, the sequence in combining the orthodontic treatment and surgery will need to be agreed upon. None of these questions can be answered independently, but rather, the answer to each is predicated on consideration of the other two. In the case presented here, the above principles have been adhered to, and our results have been most satisfactory both to the patient and to us. We have found increasing benefits in this team-work between our two specialties. The authors feel that the co-operation between orthodontists and maxillofacial surgeons is very important and would not only lead to improved results but also to a reduction in the number of relapses.

Based on the experience gained in the team-work between orthodontics and oral and maxillofacial surgery we can state that:

* The cumulative experience results in significant improvement in the quality of patient care.
* The team approach brings out vividly the details of treatment planning and treatment techniques which are most suitable for the individual case of dentofacial deformity.
* As a result of systematic evaluation of the patient with dentofacial deformity from orthodontic and surgical perspectives, the various problems related to the patient’s treatment are clearly identified. This reduces post-operative relapse to a minimum.

Acknowledgment We express our grateful thanks to Ms. Gina C. Palaganas and Ms. Mary Ann E. Rodriguez for typing the manuscript.

References