Minimally Invasive Tooth-Borne Midline Symphyseal Distraction Osteogenesis: A Case Report

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Abstract

This case report presents the successful non-extraction treatment of transverse mandibular deficiency with midline symphyseal distraction osteogenesis. A 9-year old male with main complaint of his upper front teeth too far forward presented for orthodontic consultation. He had incompetent lips which were protruding and closing with a lot of strain . There is prominent upper incisor display, increased over-jet and narrow mandibular arch leading to scissor bite on examination. A 2-phase treatment comprising expansion of the lower jaw with MSDO to normalize jaw development and orthodontic correction of dental protrusion after eruption of permanent teeth. Mandibular expansion was achieved with a tooth-borne distractor resulting in normal arch width and space creation for relief of anterior crowding.

Key words: Midline symphyseal distraction osteogenesis, case report.

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Introduction

The principal indication for mandibular widening is transverse mandibular deficiency TMD. TMD is characterized by narrow and tapered arch form, tooth arch discrepancy, dental crowding, tipped and congenitally missing teeth.The principle of treatment is to correct the deficiency in the transverse plane and restore function, stability and balance[1,2].

Traditional means of creating space in the dental arch such as air rotor stripping, dento-alveolar expansion (Schwarz plates) and tooth extractions produce limited dimensional change with questionable long-term stability with potential undesirable side effects[1]. When the magnitude of skeletal and dento-alveolar deficiency is beyond orthodontic compensation alone, osteo-distraction technique may offer a better alternative.

Since its introduction by Guerrero[3] in 1997, MSDO has provided a new paradigm for patients whose treatment alternatives and results were previously limited. MSDO is a new method for the management of TMD. It involves gradual and incremental callus distraction of osteotomized segments to lengthen bone[2].

Commonly used distraction devices are classified as bone- and tooth- borne distraction systems. Each system has different location of insertion points into the mandibular arch with peculiar advantages, disadvantages and different indications. To combine advantages of both systems, hybrid appliances have been developed[4]. These are available as commercial or custom made devices.

We report the first successful case of non-extraction treatment of TMD with MSDO in Nigeria with emphasis on the importance of specialty collaboration in patient selection and appliance design..

Case Report

A healthy 9-year old male presented with a chief complaint of his upper front teeth too far forward (Fig 1). Clinical examination revealed incompetent lips which were protruding and closing with a lot of strain . There is prominent upper incisor display, increased over-jet and narrow mandibular arch leading to scissor bite on examination. Panoramic and cephalometric radiographs showed early mixed dentition with no missing teeth. There is upper incisor protrusion with hyper-divergent mandible. The treatment goals were to expand the lower jaw with MSDO to normalize jaw development and orthodontic correction of dental protrusion after eruption of permanent teeth.

Pre-surgical orthodontics and Appliance design

Pre-distraction orthodontic care included fixed orthodontic appliance in the lower arch to diverge the roots of the central incisors. This served to avoid damage to the roots in the ideal location for interdental osteotomy. A custom made tooth borne distractor was cemented to the molars prior to surgery and this was well tolerated by the patient.

Surgical procedure

The protocol described by Nadjmi et al[5] was adopted. Under general anesthesia (GA), a short vertical incision was made in the frenulum of the lower lip inferior to the muco-gingival junction followed by sharp muco-periosteal dissection to expose the bony symphysis at the midline.The osteotomy was made with a bur under copious normal saline irrigation from the lower cortex to the apices of central incisors and completed with an osteotome. The appliance was activated to ascertain complete and symmetric mobilization of bone segments followed by deactivation and careful soft tissue closure. Duration of surgery was 45minutes. Wound dehiscence was noticed in the immediate post operated period which was successfully managed with local measures (warm saline mouth wash WSMW) and antibiotics. Patient was discharged on post operative day POD[2].

Distraction Protocol and Treatment Outcome.

After a 7 day latency period, the appliance used was set at 0.25mm per activation and was activated four times a day i.e 1 mm per day for 7 days until enough space (about 7mm) had been created for alignment of teeth after which the appliance was sealed to ensure bone consolidation (Fig 2).

Discussion

Success depends on good collaboration between the orthodontist and the surgeon; and on strict patient selection. It is important to accurately determine the magnitude and location of any tooth-arch discrepancy prior to commencement of treatment. This is because MSDO is particularly effective at resolving anterior crowding due to the proximity of the osteotomy to the space deficiency[1].

In our patient, MSDO was chosen because the patient had no stable occlusion and the magnitude of TMD was deemed not to be amenable to orthodontic

Figure 1: Pre-treatment Intra-oral Photographs

Figure 2: Post Treatment Intra-oral Photographs

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correction alone with a potential to deteriorate further. Early surgical intervention serve primarily to put patient back in normal growth pattern and to normalize arch with in relation to the upper arch. Distraction has the added advantage of corresponding soft tissue expansion in addition to space creation thus ensuring long term stability[3]. Furthermore, MSDO can be applied at an earlier age than traditional orthognathic surgery because the technique is relatively simple[2].

A common concern about surgically assisted orthodontics is the need for GA and additional cost. Minimally invasive procedure was employed in our patient which significantly reduced operation time and postoperative period. Wound dehiscence noticed after surgery responded to local measures. Sedation is a equally good alternative to GA especially in older patient[5].

The choice and design of the distractor appliance has a bearing on the magnitude and location of expansion as well as the incidence of complications. All appliance designs have been shown to be effective in widening the mandible however, custom made tooth borne appliances have added advantages of limited surgery, less discomfort and complications, relatively easier maintenance and limited amount of hardware at distraction site[4].

Seeberger et al6 reported tilting of the anchorage teeth with tooth-borne devices however no severe effect on the condyles was observed[6,7].
Indirect application of force from tooth-borne devices may result in a disproportionate pattern of distraction7, characterized by significantly greater dental than skeletal widening. However, sufficiently rigid appliance applied to completely separated and mobilized bone segments ensures that force applied to the teeth is directly transferred to the bone and only permit skeletal changes to occur[7].

Conclusion

MSDO increased mandibular arch width thus permitting movement of teeth into the distraction regenerate to correct dental crowding. Need for GA and added cost notwithstanding, MSDO provides an efficient and stable non extraction treatment alternative when the magnitude and location of tooth-arch discrepancy cannot be managed by orthodontic care alone.

Contributors

OOK was responsible for concept and design, article drafting and revision as well as final approval.
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