Surgical Correction of Brodie Bite in Adults: A Novel Surgical Splint

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Received: 15 March 2016 / Accepted: 16 September 2016 / Published online: 23 September 2016
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Abstract

Introduction The incidence of telescopic bite is a rare occurrence. Brodie bite malocclusions manifest with severe skeletal and dental transverse, sagittal and vertical problems.

Materials and methods A patient presenting with a telescopic bite and mandibular retrognathism was treated by orthognathic approach. A unique surgical splint was used as an aid in performing the maxillary constriction and segmental osteotomy.

Conclusion The telescopic bite was corrected successfully and occlusal rehabilitation was achieved.

Keywords Brodie bite · Maxillary constriction · Surgical splint

Introduction

Brodie bite or telescopic bite is prevalent in 1–1.5 % of the population [1]. Brodie bite presents a challenge to the orthodontist as well as the oral surgeon when surgery is indicated for the transverse correction. Constricting the maxilla surgically has been the treatment of choice in these clinical scenarios [2]. The surgeons often encounter difficulty in positioning and maintaining the angulation the segments as they are free from the jaw base. Lapp et al. [3] have projected the disadvantages in using conventional

splints which include inaccuracies during recording, dimensional distortions, lack of flexibility in placing the jaw in the most stable bony interface position. Hence, to achieve high level of accuracy in jaw positioning, 3D splint fabrications are recommended [4].

Plating without a splint in segmented osteotomies can result in palatal or buccal inclination of posterior alveolar segments and untoward vertical discrepancies which pose a problem during finishing the occlusion. These problems could be overcome by a splint which enables the operator to position the segments in a precise and predictable manner [5]. This article describes fabrication of one such novel design in surgical splint which has been used to perform three-piece segmental maxillary osteotomy for surgical maxillary constriction combined with set back and intrusion of the anterior maxilla, to a great level of accuracy.

Splint Design and Fabrication

The splint was designed using a 9 mm HYRAX screw (Leone, Italy) which enabled predictable amount of constriction of the maxilla during the surgery (Fig. 1). Orientation lines were drawn on the cast to mimic the osteotomy design. The cast was then cut depicting an anterior maxillary osteotomy with first premolar extraction and a mid-palatal cut for the narrowing of the maxilla. Clinically 5 mm of constriction was needed to correct the scissor bite bilaterally. To enable replication of the maxillary movement with the hyrax in activated and deactivated positions, the dental model of the patient was augmented with a plaster base with separating media to enable its easy detachment during the mock surgery. A cut was made and 5 mm plaster was trimmed along the midline in the posterior segment (second premolar to molar). The anterior

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Fig. 1 Surgical splint

canine to canine region was separated at the first premolar region which simulated the maxillary osteotomy intraoperatively. To reproduce the pre-constricted occlusion in the patient the cast was reassembled on the same base in the same relationship.

The inter-molar and inter-premolar widths were checked in the reassembled cast and verified with the original pretreatment cast. Bonded hyrax was subsequently fabricated using the reassembled cast. The 9 mm HYRAX device was opened to its full extent and embedded into the right and left acrylic occlusal bite blocks and the unique splint was constructed. The telescopic sliding struts of the posterior bite blocks was prepared by embedding a 1 cm length metallic plate in the anterior portion of right and left posterior bite blocks.

The segments along with the splint was removed from the base and the HYRAX screw was closed by 20 turns i.e. measuring to 5 mm constriction and secured back onto the base with sticky wax. This maneuver helped to constrict the maxilla to the desired post-operative position. The anterior maxillary segment was then repositioned along with the constricted posterior segments to obtain the final occlusion. With this dental relationship the anterior maxillary splint was integrated with the posterior maxillary splint through two telescoping sliding struts. The anterior pre-maxillary section of the splint was fabricated with a slot in the distal portion so that the struts in the posterior bite block can be slide to fit as single final splint This two-

piece splint with the intermediate connecting arms formed the final occlusal splint. After confirming the fit, the cast was then mounted onto a SAM III articulator and the vertical adjustments were made.

Case Report

A 25 year old female patient presented with a severe Class II malocclusion with discrepancies in vertical, sagittal and transverse planes. Her primary complaint was inability to chew and poor esthetics. Intraoral examination illustrated lack of visibility of the lower arch which was contained within the maxillary arch most often referred to as Brodie's syndrome (Fig. 2).

Anteriorly there was complete deep bite and an increased overjet of 9 mm. There were multiple missing posterior teeth in upper and lower arch with severe attrition and periodontal problems which made pre surgical orthodontics a difficult proposition. There were no clinical symptoms of temporomandibular joint disorder.

Evaluation of the pretreatment cast revealed a very wide maxillary arch with increased inter-canine and inter-molar width. Owing to the severe nature of the Skeletal Class II malocclusion which also presented a telescopic bite in the posteriors, a three-piece maxillary osteotomy was considered. Pre-surgical orthodontic correction was avoided since orthodontic expansion would decompensate the transverse

Fig. 2 Pre and post-treatment outcome after correction of Brodie bite

compensations thus resulting in a wider maxillary arch worsening the existing transverse discrepancy. The posterior portion of the splint was cemented prior to surgery on to the maxillary arch. During the surgical procedure osteotomy cuts were placed in the respective portions of the maxilla and it was down fractured.

Consequently, approaching from the roof aspect about 5 mm of bone was removed in the midline region and the anterior maxillary osteotomy cut was made at the first bicuspid extraction site thus facilitating constriction of the osteotomised segments of the maxilla.

Intra orally the HYRAX screw was closed to bring about the estimated constriction and the lateral segments of the maxilla were plated. Then the anterior alveolar segment was placed onto the anterior splint and was slide into the metallic strut of the posterior bite block and then anterior segment was plated. The splint facilitated the osteotomy and resulted in a predictable outcome.

After the first phase of surgery, orthodontic therapy was initiated which was followed by a bilateral sagittal split osteotomy for mandibular advancement and rhinoplasty to achieve a functional and aesthetic outcome (Fig. 2). The post-operative occlusion was rehabilitated using crown and bridge prosthesis in the maxillary and mandibular posterior segments.

Discussion

Patients with Brodie bite often require surgical intervention and the surgical procedure is further complicated by difficulty in positioning and plating without a good splint.

Traditionally the maxilla was segmented and splint was fabricated orienting the segments with sticky wax. This splint is uniquely designed by incorporating HYRAX screw which enabled the maxillary segments to be oriented in precise and predicted manner.

The unique custom fabricated telescopic splint offered the following advantages.

1. It controlled the posterior torquing of the osteotomised maxillary segments and also provided precise activation for constriction of the wide maxilla during the surgery.
2. Rigidly cemented splint facilitated stable fixation of the osteotomised segments.
3. Wire hooks provided in the splint gave provision for rigid inter maxillary fixation
4. The same splint can be used as a post-surgical retention splint for a period of 6 weeks which was more beneficial.
5. Finally, this splint considerably reduced the duration of the complex surgical procedure. Surgical correction of transverse malocclusions sometimes required innovative procedures catering to specific patient needs. This splint is one such design to make the procedure easier and scientific rather than arbitrarily constricting the maxilla.

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