

Clinical Report

Procedure for fabrication of a modified Kingsley splint for maxillary distraction osteogenesis

S. Venkat Aditya, Anil Kumar Gujjari

Department of Prosthodontics, Crown and Bridge, J.S.S. Dental College and Hospital, Mysore, Karnataka, India

For correspondence

Dr S. Venkat Aditya, Department of Prosthodontics Crown and Bridge, J.S.S. Dental College and Hospital, Mysore, Karnataka, India.
E-mail: aditya_dent@yahoo.com

Splints and stents are two broad descriptive terms which often overlap in their meaning and usage. A particular appliance may be a splint or a stent or both depending on the function it is to fulfill. A splint may be defined as an appliance for the fixation of a displaced or movable part. A stent is an appliance that maintains tissue in a predetermined position. Splints are often used to hold fractured segments and skin graft, protect healthy tissue during radiotherapy, control hemorrhage, hold periodontal packing and help in drainage of periodontal infection. Uses of splints are extended to special circumstances as in the field of cranio-facial surgeries, orthognathic surgeries and distraction osteogenesis. This article describes the procedure for the fabrication of a modified Kingsley splint for a 20-year-old patient who was undergoing maxillary distraction osteogenesis. This splint was used as an active appliance which would act as a link between maxillary skeleton and distraction appliance and transfer the traction force from the distracter to the fractured segment.

Key words: Distraction osteogenesis, Kingsley splint

DOI: 10.4103/0972-4052.49191

INTRODUCTION

Splints and stents are two broad descriptive terms which often overlap in meaning and usage. A particular appliance may be a splint or a stent or both depending on the function it is to fulfill. A splint may be defined as an appliance for the fixation of a displaced or movable part. A stent is an appliance that maintains tissue in a predetermined position.^[1]

Splints are often used to hold fractured segments and skin graft, protect healthy tissue during radiotherapy, control hemorrhage, hold periodontal packing, and help drainage of periodontal infection. Uses of splints are extended to special circumstances as in the field of cranio-facial surgeries, orthognathic surgeries and distraction osteogenesis.^[1]

Distraction osteogenesis is creation of new bone and adjacent soft tissue between two intentionally fractured bony segments by application of gradual and controlled tensile stress across the bone gap.^[2]

CASE REPORT

A 20-year-old male patient reported to JSS Dental College, Mysore complaining of small upper jaw which was backwardly placed in relation to lower jaw. Past history revealed that he was operated for

cleft lip at the age of 3 months and cleft palate at the age of 9 years. After examination the patient was provisionally diagnosed with hypoplastic retro positioned maxilla. Cephalometric analysis further revealed that maxilla was deficient horizontally by 11 mm for which distraction of maxilla by 11 mm was planned, and he was referred to the department of prosthodontics for a splint. Yje treatment plan was discussed with the oral surgeon and a custom made intra oral modified Kingsley splint was planned which would act as a link between the maxillary skeleton and the distraction appliance.

Armamentarium used was: [Figure 1]

- Irreversible hydrocolloid
- Type III Dental Stone
- Pumice and plaster mix
- Tin foil substitute
- Auto polymerizing clear acrylic resin
- Two rigid aluminum spokes
- Universal pliers
- Wire cutter
- Sticky wax

Procedure for Splint fabrication:

An impression of maxillary arch was made using irreversible hydrocolloid and poured using Type III



Figure 1: Armamentarium



Figure 2: Initial splint with grooves



Figure 3: Splint with bent spokes



Figure 4: Splint after acrylisation

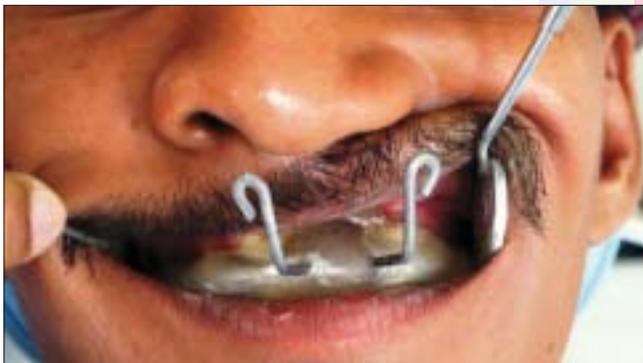


Figure 5: Splint tried in-patient



Figure 6: Splint attached to the distracter

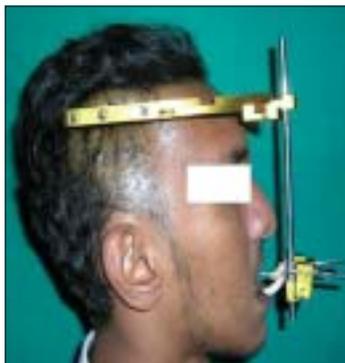


Figure 7: Splint with distracter

Stone. The model was surveyed, and undercuts were blocked using pumice and plaster mixed in 50:50 ratio with water. Tin foil substitute was applied over the blocked cast.

Initially a 2 mm thick acrylic base plate splint was made using auto polymerizing clear acrylic resin covering the palate and extending on to the occlusal thirds of facial surfaces of all teeth. Grooves 1.5mm deep were cut along the facial surface of the acrylic splint [Figure 2]. Two aluminum spokes were bent along the arch perimeter using the universal pliers and were adapted into the grooves. An acute bend

was given at the canine region so that the spokes protruded out of the oral cavity. At this stage the spokes were at the level of occlusal plane but the traction force applied by the distracter is at the osteotomy plane, which is at the palatal plane level^[3] [Figure 3]. Hence an obtuse bend upwards at a distance of 3 inches from the first bend was given so that the traction force would be applied at the palatal plane level^[3] [Figure 3].

The excess lengths of the spokes were cut at the palatal height and were bent downwards in front of the upper lip to form external traction tags [Figure 3]. Bent spokes were stabilized using sticky wax and tried on the patient for the confirmation of the fit and level of the traction tags. Once the try-in was confirmed, the splint was acrylicized using auto polymerizing acrylic resin and kept in a water bath at 35° C in pressure pot; at 20 lb for 20 min [Figure 4]. The splint was recovered after polymerization, trimmed and polished, disinfected and delivered to the surgeon [Figure 5].

Insertion of the splint: Lefort I osteotomy was done and the splint was cemented using glass ionomer cement to the lower segment. The splint was connected to the extra oral distracter using 19 gauge ligature wires [Figure 6]. The patient was instructed on oral hygiene maintenance and was kept on soft diet during the course of distraction treatment [Figure 7].

DISCUSSION

A modified Kingsley splint was used in this case, as it served to hold the fractured segment in the desired position after osteotomy without rigid fixation. It was also used as a link between distraction appliance and maxillary skeleton. Moreover it can be used as an active appliance where the traction force is applied to the whole arch rather than a particular segment. It was an economical and easy method for

fabrication when compared to the orthodontic splints and anchor plates.

A modified Kingsley splint is indicated in cleft palate patients, where it prevents the collapse of the lesser cleft segment and differential distraction of the segments. It overcomes the resistance offered by the soft palate muscles and fibrous scar tissue formed secondary to palatal repair.

Alternatively orthodontic splints or anchor plates can be used instead of modified Kingsley splint. But orthodontic splints lead to stress and strain effect, extrusion and buccal flaring of the teeth, which are absolutely absent in prosthodontic splint. Anchor plates extend percutaneously leading to scar formation after treatment and a second surgery is mandatory to remove the anchor plates.

CONCLUSION

Limitations of this splint were that an auto polymerizing resin was used for the fabrication of an active splint; there was difficulty in speech and oral hygiene maintenance for the patient. These limitations in the splint can be improved by using heat polymerized acrylic resin but for this a special flask is needed to accommodate the spokes.

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Source of Support: Nil, **Conflict of Interest:** None declared.

Obituary

With deep regret we inform about the sad demise of Dr Aman Arora, post graduate student of Meenakshi Amal Dental College, Chennai. May his soul rest in peace.