

A Nonsurgical Approach in Management of Burns Induced Microstomia: A Review Article

Abstract:

Burns of head and neck region causes skin contracture which will result in microstomia and loss of skin flaccidity. The prevention and management of microstomia contracture is an important aspect of facial burn. The goal of microstomia repair include the reconstruction of orbicularis sphincter for adequate lip functioning, obtaining lip symmetry and well positioned scar and adequate mouth opening. The standard treatment for the prevention and management of contracture includes compression therapy, grafting, mouth splinting, scar massage, exercise, patient education. These types of maxillofacial prosthetic appliances may be indicated, in conjunction with or without surgery these appliances can be use to improve the reduced mouth opening caused by burns or other traumatic injuries With proper education and motivation of operator and the patient use of these appliances will not only improve the reduced mouth opening but also improve form, function, esthetics, and also enhance the patient's quality of life.

Key-words: Microstomia, Burn

Introduction:

Burns of head and neck region causes skin contracture, amongst which the microstomia is one of the most difficult complication to be treated.[1] Microstomia is the term used to describe a small oral aperture. Microstomia occurs because of perioral contraction caused by the sphincter action of orbicularis oris muscle. Because of this muscle activity the treatment of facial burns becomes a complicated one. This facial disfigurement due to facial burns causes psychological distress and the restricted movements affects normal food intake, articulation, speech, maintenance of oral hygiene and psychosocial wellbeing.[2] Most important point to be considered in the treatment of facial burns is the prevention and treatment of microstomia.[3] The standard treatment for the prevention and management of burn induced microstomia includes compression therapy, mouth splinting, scar massage, exercise, patient education. Treatment considerations come under the following two sections:

- i. Surgical and
- ii. Non-surgical.

Different surgical methods have been presented to reconstruct microstomia. Nonsurgical methods comprises of use of orthotic appliances. These appliances maintain the symmetrical position of oral commissures and stabilize the orbicularis oris by means of two point fixation. These orthotic appliances are further divided into static and dynamic appliances which may be tooth supported or tissue supported. The dynamic appliances use springs or elastics for action, whereas static appliances are those that do not have movable parts once in place and act through serial splinting or basic structural alterations. The splint has to be used in the early periods.[4,5] These splints acts by providing resistance to contraction of wound during healing.

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From clinical point of view an important point of consideration is the selection of appliance whether it is tooth supported or tissue supported. They may be either removable or fixed. The appliances are presented in three major categories based on the type of stretch provided (horizontal, vertical, and circumoral) and then grouped based on whether the device is intraoral or extraoral. The majority of the devices are custom-made.

I. Vertical stretching device

A. Intraoral

1. Dynamic mouth splint

Devised by Von Straten.⁶ Thermoplastic material was used for the fabrication. Patient has to use appliance 4 times a day with 10 active closures on splint with subsequent slow release of bite. The main advantages of this appliance are it is less expensive, easy to fabricate. It minimises the risk of skin breakdown. Disadvantages are the thermoplastic material is not suitable for the intraoral use, needs minimum mouth opening of 25mm and also there is increased risk of oral infection.^[6]



Fig. 1 Dynamic Mouth Splint

2. Modified dynamic mouth splint

In order to overcome the problems associated with dynamic mouth splint modified dynamic mouth splint was introduced. Modified dynamic mouth splint was made with two design grades. Grade I was made from Neocryl, which is a firm and strong and used when mouth opening is limited to 10-20mm. Grade II was made from

Vertex Soft. It is a softer material allowing teeth plate to support more of the dental and gum structures and more comfortable. Used when mouth opening reached 20mm. The appliance was used 4-6 times a day with 10 slow opening and closing movements. This appliance provides passive stretch. The main advantages of using this splint are its ease to use, comfortable and provide horizontal, vertical and circumferential stretch.^[7]



Fig. 2 Modified Dynamic Mouth Splint

3. Molt mouth prop

First discussed by Williams and Baker. This is commercially available. The silicone tips of mouth prop are placed on upper and lower teeth. Position is maintained by the locking mechanism. The device is used for 5 minutes interval several times a day.^[8] The advantages of this appliance are no fabrication time and its ease of use.



Fig. 3 Molt Mouth Prop

A. Extraoral

Presented by Sela and Tubiana. Extraoral wide prosthesis has been devised to overcome the difficulty of insertion and removal of the prosthesis. It applies forces on the lip commissures. It uses a hyrax screw at the angles of the mouth and thus it creates the stretch.^[9]

It provides the continuous pressure. Hyrax screw is activated every other day. The advantages of using this splint is it provides uniform distribution of forces easy construction^[10], minimal pain during insertion and is cheaper.^[8]



Fig. 4 Extraoral vertical stretch appliance

I. Horizontal stretching device

A. Intraoral

1. Intraoral device with commissural posts

Was first designed and fabricated by Colcleugh and Ryan[11] in 1976, and Wright et al. In 1977. It is a tooth borne appliance. They provide symmetrical support to commissures. It consists of static acrylic posts protruding from commissures. After each recall more resin is added to the commissures. This appliance can be removable or fixed.

Modifications of this splints can be fabricated by the use of chrome crowns, elastic bands and/ balls or Adams clasp.[10] It can be either cemented to tooth or secured with sutures or wires.



Fig. 5 Intraoral device with commissural posts

2. Tooth borne removable splint

This appliance was presented by Silverglade and Ruberg. It is made up of acrylic with the protruding tusks. Retention is provided by the teeth. Stretch is provided by the commissures of the tusks[13].

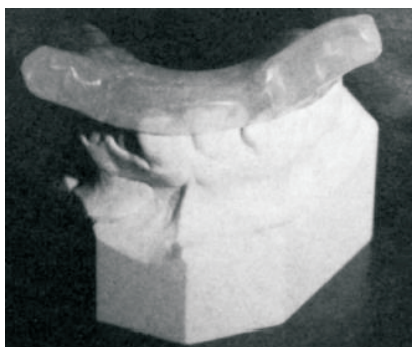


Fig. 6 Tooth borne removable splint

3. Dynamic intraoral device

This device was described by Jackson. This is the only appliance that provides dynamic stretch. It can be used in children. Its advantages are it can be used even in the absence of teeth and patient compliance is not needed. Disadvantages are the increased expense, fabrication time and requirement of general anesthesia for insertion.[14]

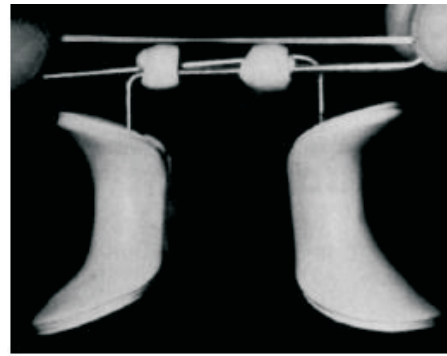


Fig. 7 Dynamic intraoral device

B. Extraoral device

1. Microstomia prevention appliance(mpa)

Was developed by Hartford.[15] Used in the patients with burns of the lower two-thirds of the face. The device is worn continuously throughout the day and removed only during eating, oral care and visitations. It consists of two acrylic sections with the stainless steel bars and the screws in between.

The advantages of this appliance are its cost effectiveness and ease of insertion and removal. Disadvantages are the inability to maintain the oral secretions in the mouth, potential for skin breakdown, and difficulty in insertion and removal.[10]

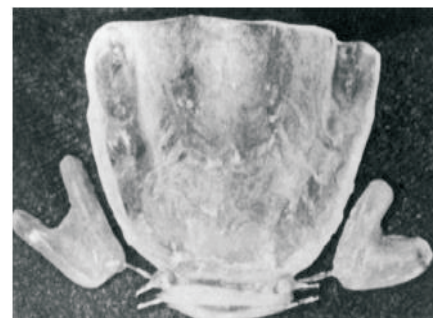


Fig. 8 Microstomia prevention appliance

2. Modified microstomia prevention appliance

This device was created to overcome the disadvantages of MPA.[10] The device consists of two parts made of thermoplastic material with the Kirschner wire in between. The most distal part of wire is bent into hooks. The distance between these hooks is used as guide for positioning. It is applied for 2 hours then removed for 2 hours, day and night. It is increased to all-night wear with the day schedule of 2 hours on and 2 hours off.[16] Advantages are the ease of use and reduced discomfort. Disadvantages include the potential for breakdown at commissures and eversion of lips.



Fig. 9 Modified Microstomia Prevention Appliance

3. Orthodontic headgear strap prosthesis

Was described by Reisberg et al. It consists of orthodontic headgear strap with the custom made retractors for each commissure. These retractors are attached to strap by hooks. The advantages of this prosthesis are ease of fabrication and ease of adjustment. The device is worn continuously except during meals for initial 4 to 6 months and then only during night for next 4 to 6 months.[17]



Fig. 10 Orthodontic headgear strap prosthesis



Fig. 11 Orthodontic headgear strap prosthesis

4. Jossell's directional force headgear and wire prosthesis

Was presented by Jossell.[18] This appliance consists of directional force headgear and covered headgear. This appliance is worn as long as possible except during meals. The advantages of this appliance are it is easy to use, can be premade and can be easily adjusted.[10]

5. Oral commissure expansion prosthesis

Was described by Khan and Banis. Stretch is provided by an expansion screw. This appliance consists of denture base material at commissures and expansion screw in between. The appliance is worn daily for 6 to 8 hours. As patient controls the forces applied to commissures pressure wounds can be avoided.[19]

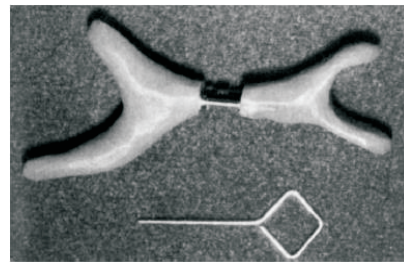


Fig. 12 Oral commissure expansion prosthesis

6. Oral splint of thermoplastic material

Was presented by Yotsuyanagi and Sawada. This appliance is made up of thermoplastic material. It consists of two pieces placed at angle of the mouth with other piece bent at centre like a frame. The advantages of this appliance are its ease of fabrication and modification.[20]



Fig. 13 Oral splint of thermoplastic material

7. Expansile removable appliance

Was presented by Silverglade and Ruberg.[13,19] It consists of two commissural pieces connected by a Hyrax screw. Hyrax screw is expanded until appropriate stretch is provided. It provides horizontal stretch and a slight vertical stretch as well. There is a larger area of contact thus decreasing the development of pressure areas.[10]

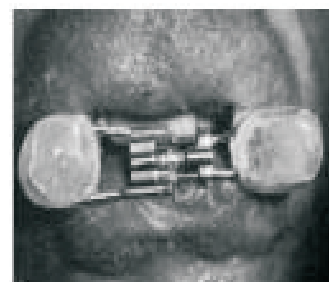


Fig. 14 Expansile removable appliance

8. Tissue borne removable splint

Was presented by Silverglade and Ruberg.[13,19] This appliance consists of the acrylic tusks connected by acrylic bar. The tusks are held in place by cheeks. The acrylic bar rests outside the mouth and acrylic tusks are in the mouth. The advantages of this appliance are easy fabrication and ease of use.[10]



Fig. 15 Tissue borne removable splint

I. Circumoral stretching device

A. Intraoral

1. Intraoral circumoral stretching device

This device was created by macmillan et al. This appliance is similar to the mouthguard. It is kept in mouth initially for 2 days. After this initial period it is worn throughout the night and 2 hours a day. The advantages of this appliance are it can be easily modified by adding material as the condition improves. It is easy to use and well tolerated by the patients[21]

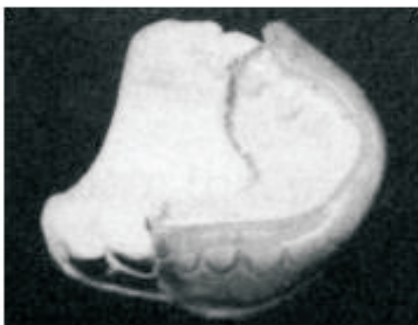


Fig. 16 Intraoral circumoral stretching device

2. Therabite jaw positioner

They are available in two different forms. First device was described by Costa et al.[22] These are commercially available. The second one is described by Ridgway and Warden[23]. It consists of biteplates moving vertically along with bases. They are available in adult and pediatric sizes. They are made up of high density nylon and foam cushions are also available to be used with this. Its advantages are its ease of use and does not cause lip eversion.[10]

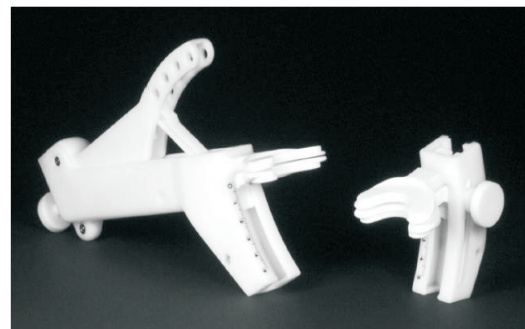


Fig. 17 Therabite jaw positioner

3. Thermoplastic mouth stretcher

This appliance was presented by Dougherty et al.[24] This device is made up of thermoplastic material. It consists of two pieces of thermoplastic material over foam is placed. Thus the teeth will be placed on the foam. And then in between these sheets tongue blades are inserted. Tongue blades are inserted after placing the appliance in the mouth. This device is used 3 times a day until the scar matures. The advantages are the device is inexpensive and distributes the pressure over a wider area.[10]

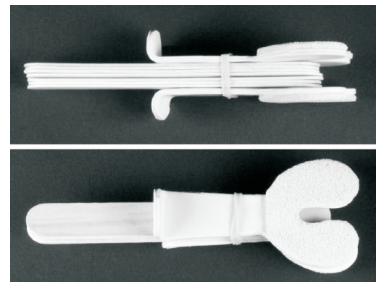


Fig. 18 Thermoplastic mouth stretcher



Fig. 19 Oral Split of thermoplastic material

A. Extraoral

1. McGowans appliance

Mcgowan was the first to present a circumoral appliance.[25] This is a custom made appliance. It consists of two acrylic pieces connected with a screw. The device provides both horizontal and vertical stretch. It is worn for the entire day and night except meals.

Disadvantages of this appliance is the uncomfortable patient when appliance is worn for longer times.



Fig. 20 Vancouver Microstomia Orthosis

2. Vancouver Microstomia Orthosis (VMO)

This appliance was presented by Conine et al.[12] This appliance is made up of thermoplastic material. This can be used both as a static or dynamic device. This device is worn initially only for 10 minutes every 2 hours. But later on this time is increased to 30 minutes every hour.

Appliance can be discontinued once the mouth opening is improved but if the condition is not improved it is used for 2 to 3 hours daily.

The advantage of this appliance is it can be easily removed by the patient thus helps in maintenance of oral hygiene. The method of fabrication is cheaper, less time consuming and is uncomplicated. The changes can be easily made in the appliance to accommodate range of motion of the oral aperture.[12]



Fig. 21 One piece cheek retractor and limiting straps

3. One piece cheek retractor and limiting straps

Presented by Shehan and Medford.[26] The appliance consists of limiting straps wired to retractors. The device is worn for entire night and during day time after 3 hours of use it is removed for 1 hour. The advantages of this appliance are inexpensive, easy to use, wider pressure distribution. The disadvantages are appliance may break due to prolonged stress.[10]

4. Buccal paddles appliance

This device was presented by Clark and mcdade.[27] This is a custom made appliance. The device consists of two halves of clear lip retractor. The end of the retractor is curved over which vertical bars are placed and are tied with wires and acrylic. Two halves of the appliance are connected together by horizontal bar and joints.

The device is worn for as long as possible. The advantages of this appliance are wider distribution of forces and instrument can be gas sterilized thus allowing usage for multiple patients. The disadvantages are inability to control eversion of lips and lack of manual dexterity for patient use.

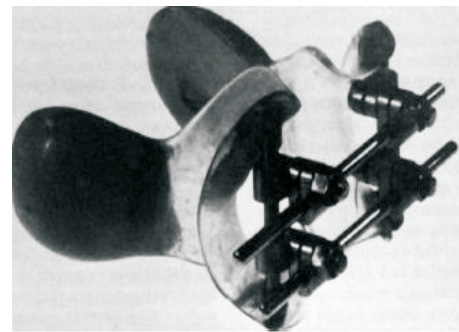


Fig. 22 Buccal paddles appliance

5. Cheek retractor prosthesis

This appliance provides circumoral stretch. This appliance consists of commercially available lip and cheek retractors mounted on heavy gauge wrought wire frames. This appliance is indicated in less severe burns. The tension can be increased or decreased by bending the frame. These provide a positive stenting effect.[28]

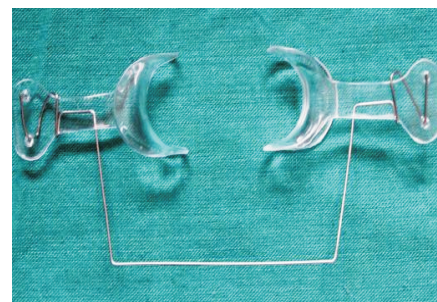


Fig. 23 Cheek retractor prosthesis

Discussion:

Various splints have been described for splinting oral commissures. Nonsurgical appliances are mostly based on the principle of opposing the contracture forces by soft tissue distraction. The decision as to which microstomia splint to choose for a particular patient is dependent on many factors –

presence or absence of teeth, patients ability to comply with recommendations, type and extent of injury and the cost[12].

The prevention and treatment of microstomia is difficult because of the aggressiveness of the contracting tissues and the poor patient compliance. Effective microstomia splints need to provide opposing forces horizontally, vertically, and circumferentially but should be also comfortable for the patient.[29] Thus this stretch is more effectively provided by Modified Dynamic Mouth Splint.

The use of this appliance fits well into the existing regime. Time of splint commencement is an important factor for quality of life and thus in addition to splint therapy scar massage and exercises are the other modalities which should be also used.

Conclusion:

Thus with the use of the splints good results in functional mouth opening can be obtained. This improved mouth opening has a positive impact on the patients quality of life and psychosocial well-being. Early use of these appliances prevents severe microstomia.

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