

## Restricted Mouth Opening And Its Preventive Therapy - A Literature Review

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### **Abstract:**

*Statement of problem: Patients with restricted mouth opening are unable to perform normal functions like; mastication, deglutition, and speech. Normal oral opening is also essential for facial expressions and social interaction. Caries and periodontal problems are also common as oral hygiene maintenance is very difficult due to limited access. Furthermore, performing dental procedures become challenging in such patients.*

*Purpose: The purpose of this systematic review was to discuss preventive therapies involved in management of restricted mouth opening.*

*Material and methods: Searches performed in MEDLINE related to restricted mouth opening and a systematic review was carried out regarding various preventive treatment options for such patients.*

*Results: Reviewed literature revealed that the management of restricted mouth opening is a challenge for dental professionals. In order to prevent the occurrence of limited opening of mouth, various non-surgical treatment modalities have been suggested. If there is existing limited mouth opening; different intraoral and extraoral stretching devices which are static or dynamic in nature, along with different exercise programme have been suggested to increase the oral opening.*

*Conclusion: In order to prevent or reduce the occurrence of limited mouth opening, various approaches have been suggested. These approaches can be either pharmacological or non-pharmacological. Non-pharmacological involves physiotherapy and splint therapy. Oral hygiene maintenance is difficult for patients with limited mouth opening, so an extensive oral health care should be given in form of preventive or restorative measures.*

**Keywords:** *Microstomia, reduced mouth opening, oral splints.*

**Key Messages:** *an early intervention for patients in conditions causing reduced mouth opening can not only prevent the problem but also improve the entire life of the affected person and this further necessitate the knowledge about problem and its preventive and corrective measures.*

### I. INTRODUCTION

Microstomia is a term used to describe a small oral aperture, which is different from micrognathia in which patients have small jaws. The term microstomia may be better defined as any restriction in the range of motion of the

mandible, so it is functionally reduced mouth opening. Normal maximum mouth opening ranges from 36-77mm in healthy individual with average value of 40-50mm.

## II. MATERIALS AND METHODS

A search for literature began with the use of MEDLINE. The articles related to causes, management of restricted mouth opening were obtained. The majority of articles were case reports for individual condition concentrating on that particular aspect. All articles describing causes and preventive approach for management of restricted mouth opening were collected and analyzed for this review.

Based on extent of mouth opening Posselt classified microstomia into 3 categories; slight (41-50mm), moderate (31-40mm), and severe microstomia (30mm or below). He measured distance between upper/lower centrals incisal edges whereas this could be measured between vermilion borders of upper and lower lip as suggested by Wood et al and Bedard et al.

## III. CAUSES

Limited mouth opening in itself is not a disease but manifests as a consequence of certain conditions, like, cleft lip & palate, micrognathia, craniocarpotarsal dysplasia, epidermolysis bullosa, scleroderma, oral submucous fibrosis, Plummer Vinson syndrome, Hallerman-Strieff syndrome, Treacher-Collin syndrome etc, and some other conditions like burns, trauma, post-radiation therapy for facial cancer, surgically induced after treatment for cleft lip & palate, facial tumor or facial trauma and trismus. Conditions like tooth decay/ dental pain, mumps, oral space infections, trismus/temporomandibular dysfunction syndrome cause transient microstomia for a limited time.

## CONSIDERATIONS FOR CERTAIN CONDITIONS

Variations in the range of mouth opening could serve as an essential tool to diagnosis and etiology should be known for deciding treatment plan during rehabilitation. Like for micrognathia, orthodontic functional appliances are advisable before growth cessation and orthognathic surgery after growth period is over. Patients with Epidermolysis bullosa, tissues should be handled with care during check-up and treatment because mucosa is fragile and prone for frictional damage. Treatments like restoration or prosthesis should also be aimed with no pressure on mucosa and patient should be advised for gentle tooth brushing for home care to avoid mechanical trauma. Mouth washes are most beneficial for such cases. Some conditions where patients have lost manual dexterity (like scleroderma, Craniocarpotarsal dysplasia/Freeman-Sheldom syndrome) and conditions where microstomia also associated with xerostomia (like Oral submucous fibrosis); dental decay and periodontal problems are even more prevalent, so they need preventive care like pit and fissure sealants and regular follow up visits. For oral cancer patients; preoperative prosthodontic involvement is essential to minimize surgical induced fibrosis and microstomia by using conformer placed immediately after surgery. In burn patients preventive or corrective splint therapy can be given based on time of intervention. The cause of the burn may be chemical,

thermal or electrical burn, but the scar contracture is a common sequel of each.

*MANAGEMENT:* Management could be preventive and definitive.

## PREVENTIVE APPROACH

It can be divided into pharmacological management, preventive and restorative care, physiotherapy and splint therapy.

## IV. PHARMACOLOGICAL MANAGEMENT

Oral submucous fibrosis can be treated by vitamin therapy along with local or systemic steroid. Patient has to discontinue the habit (eating betel nut, tobacco, chillies etc). For scleroderma, drug D-penicillamine is given which causes interference with cross linking of collagen and also immunosuppressant to low down severity of disease. Infectious conditions like transient trismus/tetanus/cancrum oris/oral space infections can be treated by use of antibiotics. If pus is associated with infection, needs little surgical intervention for drainage.

## V. PREVENTIVE AND RESTORATIVE CARE

As oral hygiene maintenance is a problem either due to restricted mouth opening or due to decreased manual dexterity; dentist should concentrate on preventive and restorative aspect along with periodic recall visits. Diet can be assessed for diet counseling to reduce cariogenic diet. Preventive fluoride therapy can be given either by fluoride tablets/drops/topical gel/or varnish to increase resistance of tooth enamel against decay; but for epidermolysis bullosa patients even tablets can cause injury to fragile mucosa so drops are advisable. Pit and fissure sealants can be applied as a preventive measure. On oral hygiene instructions patient can be advised to use specially designed brushes (Collis Curve tooth brush or electric/powerd brushes) along with fluoride containing tooth paste and mouth rinses (0.2% chlorhexidine). Use of less bulky instruments like small headed mirrors, pedodontic microhandpiece, T-band or pediatric matrices for amalgam or composite fillings, artery forceps to hold files during endodontic instrumentation to prevent slippage during procedure and fiber optic light source to increase perception; helps in restorative treatment for such patients.

## VI. PHYSIOTHERAPY

Various exercises have been advised for such patients like; oral-facial muscle exercise, facial grimacing exercises to stretch muscles without any assistance (external help) and these can also be done with assistance like placing thumbs to opposite mouth corners to stretch them apart or use of tongue blades between occlusal surfaces to keep mouth open to maximum for long time. For edentulous patients, Naylor and Manor introduced a temporary flexible mandibular exercise

prosthesis which is similar to occlusal rim and helps to place tongue blades during exercise. Variability in results may be attributed to cause and extent of microstomia and patient compliance for exercise. More frequently and aggressively one exercise, greater the improvement can be seen. Relapse to pre-treatment levels may occur if exercise is not performed daily for 3 months period and followed by at least 2-3 times per week. Discomfort in the facial region does occur, but it is transient and comparable to that which accompanies physical therapy.

## VII. SPLINT THERAPY

These are commonly used for burn patients, and sometimes for patients suffering from scleroderma. Based on design and types of force; they can be Static or Dynamic splints. They can also be classified as removable and fixed splints, commissural and circumoral splints, or tooth supported and tissue supported splints. Their main aim is to hold two commissures at a desired distance. Almost in all designs, two commissure hooks or retractors are attached with some locking/holding/or stretching mechanisms for functioning of splint. There are several designs published by authors for these splints.

Static splints (*also known as Conformers / passive splints*): they hold tissues passively at a desired distance either to provide resistance/physical barrier to contraction of scar tissue during healing phase or to stretch already formed scar against resistance. They can be tissue supported and tooth supported. In tissue supported, MPA (microstomia prevention appliance) is an adjustable splint consisting of small commissural retractors attached to a connecting bar that traverses the oral cavity. This transverse connecting bar is given with a *set screw* to adjust distance between two commissures. In similar designs *thumb screws, orthodontic screws* were used on connecting bar instead of set screw. Silverglade and Ruberg eliminated this transverse bar and joined two retractors with single *hyrax screw* in midline; however Zafrulla Khan fabricated commissure hooks in light cure acrylic and attached a 7mm *expansion screw* directly on mouth. The main disadvantage of above designs is that they can put forces in horizontal direction only; while in extensive burn damage, fibrotic bands appear both vertically and horizontally, so McGowan did modification in MPA by incorporating *vertical sliding bar with screws* to open in vertical direction. Sela and Tubiana prepared two lip plates for upper and lower extending up to desired horizontal separation and then attached with *hyrax screw vertically* at each corner. So, it stretches lips in both directions. It is simple to fabricate and easy to use. Clark-McDade incorporated two horizontal and two vertical sliding bars arranged in square form having locking mechanism at each corner to open in both planes but design is very difficult to fabricate, expensive and need manual dexterity to use. Silverglade and Ruberg have described a static tissue born splint covering oral opening completely like a screen and also having acrylic tusk extending into vestibules bilaterally for retention for splint. But these are not advised in children as they can cause chocking, if dislodged. Flexible or semiflexible orthosis was

designed for the *edentulous* patients having *chemical burns* covering upper and lower vestibules up to borders like an oral screen and are attached with lip retractors. Extensions into vestibules are to maintain separation between injured mucosa. Richardson and Holt et al have described the use of an extraoral acrylic facemask with commissural posts which is anchored in place with an orthodontic headgear cap. Reisberg et al anchored custom made retractors with orthodontic head gear with cervical strap. The retractors are attached with hooks that can be placed in one of several holes in strap to adjust tension.

In tooth supported splints, Colcleugh and Ryan in 1976, Wright et al. in 1977, were the first to propose an orthosis that is anchored to teeth. These orthosis consist of a palatal retainer (similar to orthodontic retainer), and static acrylic posts which protrudes extraorally at the commissures. River and Silverglade and Ruberg have modified this acrylic posts device. They have described a removable tooth-borne appliance similar to a mouthguard, with lateral projections or prongs at the commissures. Gorham has described the fabrication of a simple thermoplastic device. The *thermoplastic* material is contoured to spread at the *angles* of the mouth and lips and is held in place by *bite plate* molded between the upper and lower teeth. Splint described by Ampil is also made of surgical tray material/ thermoplastic resin sheet adapted on *occlusal surfaces* of all remaining teeth and palate for retention and is attached with plastic *cheek retractors* instead of thermoplastic material. Fixed splint is documented in literature where *buccal tubes* are joined to orthodontic bands, or to chrome or stainless steel crowns, and to a *labial arch wire to which acrylic resin prongs* are attached. These tooth supported splints have an advantage of good patients compliance especially fixed orthosis but a good compliment of remaining teeth is essential for retention.

Dynamic splints (*also known as active/ Corrective splints*): Their general advantage over static appliances is that the pressure exerted by the device is adjustable and will permit progressive controlled tension. They can be given after healing completion or before surgery to increase tissue mass at the site. SANSPLINT XR A pair of hook-shaped *Kirschner wires* wrapped in two small pieces of the thermoplastic material (Sansplint XR) are secured between the two commissural portions in a parallel position and allowed to slide over one another. *Orthodontic elastics* are placed between the wires' hooks to supply the required pressure against the commissures. Circumoral retractor is made from two photographic cheek retractors mounted on an *acrylic resin frame*. *Screws* are placed through slots in the retractors. *Elastic bands* of various sizes are used over the screws to produce a dynamic force against the tissues. Two retractors can also be attached to orthodontic wires bend in form of frame, helical spring, and triple helical spring. Opening at bends can increase or decrease tension on the circumoral tissues. Microstomia prevention appliance or MPA is commonly used as a static source of force; but it may be adapted as a dynamic device. This is accomplished by loosening the *set screw* and placing *orthodontic elastics* in the grooves. The diameter and number of the elastics determines the amount of pressure applied against the commissures. Splints which are extraorally anchored can take support from

occipital region or cervical. Their orthodontic straps can be attached to retractors by either wire hooks or metal lugs. Cheek retractors made in thermoplastic material wrapped with orthodontic wire can be attached with neck strap with the help of elastics<sup>31</sup>. Instead of strap even elastic tourniquet can also be used for taking cervical anchorage. Tension can be adjusted by shortening the tourniquet or by tying knots on it. Vancouver Microstomia Orthosis is a *U shaped (160° of both arms with base) Kirshner wire (10cm length and 1.1mm diameter) wrapped in thermoplastic material*. Thermoplastic materials shaped in cheek retractor form are attached to both the ends at an angle of 140°. On both the arms of U, holes are drilled to hold horizontal bar. Length of this bar can be increased or decreased to adjust force. Nair described a Dynamic Commissural splint having disposable *plastic syringe (2ml)* as the principal component. The nozzle of the barrel and the rubber stop of the plunger are removed. The *stainless steel spring (0.3N)* is placed inside the barrel and plunger placed over it so that the spring can be compressed. On both the ends of this unit acrylic rods with retaining hooks are attached; the spring keeps the hooks apart.

Guidelines while using splint therapy: It is postulated that the fibroblasts may initiate contraction during their transition from the irregular to the nodular pattern; therefore splint traction should be started during this phase for best results. While a mature scar, because of the cross-linking of collagen fibers, is less responsive. During fabrication process, vector of force and its direction is very important. The major component of scar contracture in cheek occurs in a direction nearly parallel to the occlusal plane and accordingly the splint must exert a resistance in the horizontal direction. However, due to sphincter like nature of the orbicularis oris muscle, even vertical fibrotic bands are common. In such condition forces should have both horizontal and vertical components. Most of extraoral splints and removable intraoral splints can be adjusted easily; however patient's compliance is a problem. Extraoral splints are bulky and may limit access to the oral cavity while functioning like eating, drinking, speaking etc. With intraoral fixed splints, patient's compliance is not a problem but it requires adequate dentition for retention purpose like in infants/children/old edentulous patients and fabrication of such splints is time consuming and difficult too. The circumoral types eliminate the connecting bars that run across the mouth are appropriate for young children with few or no teeth, but they do not apply differential pressure for maintaining ideal positioning of the affected commissure. Time of wear is key to success in splint therapy and these should be used continuously (<18 hours) for first 3- 6 months then continued for a period of 6 months with shorter duration of use (6-8hours a day).

#### VIII. CONCLUSION

For preventive aspect while managing patients with restricted mouth opening, the cause of restricted mouth opening should be known before as some conditions can even aggravate due to dental treatment. Preventive measures have very crucial role in maintaining oral health and some conditions can be managed pharmacologically so this aspect

should be considered before deciding final treatment plan. Even restorative care is difficult to carry out, so some innovations and modifications from conventional procedures are needed. Physiotherapy in form of exercise programme is beneficial but regular observation and motivation is needed for good results and patient compliance. Splint therapy is an excellent way of minimizing fibrosis in healing stage. Even in cases with developed fibrosis their results are appreciable by patients and are helpful in their functional rehabilitation.

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