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Prosthetic Treatment of Edentulous Patients with Microstomia: A Narrative Literature Review

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Abstract: ***This narrative review examines prosthetic treatment strategies for edentulous patients with microstomia. A literature search was conducted in Scopus, PubMed, and Web of Science to identify clinical reports and methodological studies addressing impression techniques, occlusal registration, and denture design modifications. The evidence indicates that sectional, collapsible, and flexible denture concepts improve clinical feasibility, although long-term comparative data remain limited. Digital workflows combined with conventional prosthodontic techniques demonstrate emerging clinical potential. Despite multiple reported solutions, no standardized protocol exists, emphasizing the need for controlled clinical studies evaluating functional outcomes and patient satisfaction.***

Keywords: prosthodontics, restricted mouth opening, sectional dentures, collapsible dentures, impression techniques.

1. Introduction

In the case of some patients there are diseases or conditions that necessitate specific approach and selection of nonconventional methods and solutions during prosthetic treatment. These are the cases of patients with microstomia where we have decreased size of the mouth aperture [1]. Microstomia does not result from the effect of a single particular etiological factor. It could be genetically predefined in the cases of micrognathia. The surgical treatment of various conditions such as burn injuries or oncological diseases in the facial-mandibular area, congenital cleft palate and cleft lip could also result in decreased size of the mouth opening [2], [3]. Microstomia could be consequence of various diseases, such as scleroderma, Burton skeletal dyslplasia, Plummer–Vinson syndrome, Hallermann–Streiff syndrome, Freeman-Sheldon (whistling face) syndrome, Treacher-Collin syndrome, Hallopeau-Siemens-type recessive dystrophic epidermolysis bullosa, trismus [4]. Together with the lowered dimensions of the mouth aperture, limed muscle movements and soft tissues mobility is observe in some cases. These patients frequently have difficulties when performing the masticatory function and swallowing [5], [6]. In dental literature, many authors share the opinion that microstomia, irrespective of the reasons behind its occurrence significantly hinder the prosthetic treatment with removable denture constructions [2], [5], [7], [8], [9]. This problem is vital in the case of completely edentulous patients. The elaboration of complete dentures with good functional fitness requires free access to the prosthetic field that includes the complete alveolar ridges of the maxilla and mandible and the hard palate. In the case of presence of microstomia, the performance of each and every of the clinical manipulations – taking impressions, defining the jaw relations, trial and adjustment of dentures could be complicated [5], [7].

The objective of the present review is to analyze the opportunities for prosthetic treatment of edentulous patients with microstomia.

For this purpose we have searched for an answer to two target questions:

What are the difficulties that occur during each and every clinical stage of complete dentures' elaboration in the case of patients with microstomia?

What are the solutions proposed to overcome the issue?

2. Material and Method

A literature search was conducted in databases: Scopus, PuBmed and Web of Science in the period November - December 2025.

Search strategy: As key words for search were used "microstomia" and: "edentulous patients", "restricted mouth opening", "prosthetic treatment methods", "impression techniques", "impression tray modification", "complete dentures design".

Including criteria: case reports and review articles in English that presented prosthetic treatment of edentulous patients with microstomia, published at any time until the end of 2025.

Excluding criteria: articles that are: presented only as abstract; discussed prosthetic treatment of patients with microstomia by methods including surgical correction; in language different of English.

Hard copies of journals were manually searched for those of the articles that meet the selection criteria but are not available in full text online.

It was performed screening of the extracted articles based on the selection criteria. The methods and means for prosthetic treatment of edentulous patient with microstomia were grouped according to the proposed modifications and its application in the clinical stages.

3. Results and Discussion

The selection of approach towards prosthetic treatment of edentulous patients with microstomia depends on the degree of its expression. The analysis of the changes in oral cavity

structures predefines the choice of clinical methods when elaborating the complete dentures.

In some cases, we could overcome the difficulties with preprosthetic surgical preparation [10]. In cases of moderate microstomia, for example, induced by scleroderma, an effective assistant could be patient's preparation with physiotherapeutical procedures in order to improve the muscle mobility and facilitate the access to oral cavity [11]. Pizzo et al. [12] examine the effect of implementing the exercise program for improving mouth opening of patients with systemic scleroderma. The program includes stretching the oral muscles and was run for 18 weeks. It is reported improvement in mouth opening on the average with 10.7+/-2.06 mm, without significant differences between the edentulous patients and the ones with preserved dentition. The regular application of the proposed exercises could be useful for facilitating the prosthetic treatment.

In the cases of moderate expressed microstomia it is also applied treatment with complete dentures and reduced edge length and bases elaboration with digital methods (CAD/CAM). However, this approach could compromise the retention and stability of dentures.

In the cases of severely restricted mouth opening we have to implement individualized approach that includes modification of the routine means and methods to elaborate denture constructions.

3.1 Preliminary and final impressions

The retention and stability of complete dentures directly depend on the quality of the taken impressions. Beyond doubt taking impressions is among the greatest challenges in the case of patients with microstomia. The decreased dimensions of mouth aperture oftentimes do not allow insertion of standard trays in the oral cavity which makes it impossible to take preliminary impression by routine methods. In order to overcome the problem there has suggested two approaches: taking impressions without trays and with the assistance of modified trays that have been turned into sectional ones via separation. McCord et al. [13] suggest in the case of previous dentures to use these for taking preliminary impression and to take the final impression with modified sectional custom trays.

There are described methods for manual adaptation of dough-like silicon directly onto the denture field inside patient mouth without using the impression tray [14], [15], [16]. The resulting impression would be used as "custom tray" for taking the final impression with low-viscosity silicone [14]. In other cases it is used for molding of gypsum model according to which is prepared the sectional custom trays [15], [16].

Another proposed method is the use of material for occlusal registration that is being manually adapted to the denture field and serves as a custom tray. The final impression is taken with silicon of low viscosity. Before molding the gypsum model, along the external side of the resulting impression it is prepared plastic key for prevention of deformations [17], [18].

Some clinicians have tried taking a preliminary impression with horseshoe-shaped perforated flexible tray whose original use is for fluoride application. In order to successfully impress the hard palate of the maxilla, the authors suggest placing in advance manually dough-like silicone in this area [19]. Solid support, with the use of bed for tongue, is recommended by other authors [17], [20].

All the methods that do not include using trays for taking impressions bring the inherent risk of significant deformations that could compromise the accurate dentures fit to the denture field and the adequate reflection of the dynamic ratios of soft tissues compared to the denture edges. Such an approach is prerequisite for the elaboration of dentures with deteriorated retention and stability. In order to overcome this issue, numerous studies report on taking impressions with standard and custom trays that have been modified in different manners.

The modifications are mainly about separating the standard trays or elaborating custom trays that are most often separated into two or three segments. This makes it possible to take the segments in and out of the mouth individually and significantly facilitates the procedure [2], [21].

In order to prevent the relocation of individual tray parts the segments should be fixed towards each other both inside patient mouth, as well as after taking them out. There are described a lot of opportunities to "assemble" and "disassemble" the trays via various connecting elements. Some of them are custom-made and others are standard means used in prosthetic dental medicine (Table 1).

In a 2023 study Colvenkar et al. [38] describe the elaboration of sectional impression trays with separated handle that have two parts – male and female and use magnets for connection. The standard trays should be separated in the middle and the factory handles should be eliminated. The female part of the handle should be connected to the first part of the tray in the anterior region via auto-polymerizing acrylic resin. After that, the male part of the handle should be connected to the second part of the tray so that both parts are accurately assembled. The proposed handles design is made of metal. The advantage of this method is that handles could be sterilized and could be used for multiple cases. The authors believe that these trays could turn into the standardized design applicable for taking impression for denture treatment of all patients with microstomia.

The main advantage of sectional impression trays is that they facilitate taking an impression of the denture area in patients with microstomia. Most of the proposed modifications allow precise assembly of the tray segments [7], [16], [22], [29], [31], [33], [36]. Some types of attachements are preferred because they are easily implementable in clinical settings [23], [24], [25]. Modifications that include pins and various types of locks prevents segments relocation during the procedure and ensure very good stability of the trays [7], [16], [28], [30], [33], [34]. Bachhav et al. [30] offer a solution for reliably assemble of the tray segments without increasing its volume. Al-Hadi and Abbas [27] recommend their method of taking an impression with a three-part tray as very suitable in the case of a severely restricted mouth opening.

Table 1: Modifications in impression trays

Author	Modifications in impression tray	Type of assembly of tray segments
Satpathy et al. [22]	two factory trays of one and the same size, separated in two, whereas the cutting lines in one tray are more on the left and in the other – more on the right	overlapping area in the middle
Luebke [23] Suzuki Y et al. [24] Kunusoth R et al. [25]	standard trays, separated aside off the middle line so the tray handle remains in one half	three Lego blocks – two are fixed over every segment and the third element serves for assembling them
Mirfazaelian A. [26]	two-part custom trays	orthodontic expansion screws
Al-Hadi and Abbas [27]	sectional custom trays in three segments: one from canine to canine and two in the areas from canines to the retromolar space	plastic keys in the area of connection along the external surface of segments
		Pins
Sharma et al. [28]	two-part custom trays, three openings - one in the centre of the tray handle and two in premolars area on the left and on the right	pins were placed vertically inside the openings and acrylic plate is positioned over the lateral pins
Geckili et al. [4]	two-part maxillary tray, three pins have been placed: two in the lateral areas of the alveolar ridge and one – in the middle of the palate area	second tray part that has three openings making it possible to be slid onto the three pins of the first tray
Cura et al. [29]	sectional trays with vertically positioned pins along the external surface of the both parts	blocks made of acrylic resin with openings that engage the pins
Kumar et al. [16]	two-part trays with 4 parallel pins of different length The long pins are placed close to the distal edge and the short ones close to the middle line	acrylic block, placed onto the pins, serves as locking mechanism
Bachhav et al. [30]	two-part maxillary tray with two locking device – in the anterior area and in the distal area two-part mandibular tray with one locking device in the anterior area	double molded pins as locking device
		Press-buttons
Colvenkar SS. [31]	two-part maxillary and mandibular custom trays	press-buttons
Dewan et al. [32]	factory trays, separated in halves, little bit aside of the middle line	Press-buttons were placed onto trays handles
		Various types of locks
Shams et al. [33]	two-part custom trays made of photo-polymerization resin	locking elements (key–key ways) located along the middle line
Givan DA et al. [34]	two-part maxillary custom tray	custom interlocking device
Fernandes AS et al. [35]	two-part maxillary and mandibular custom trays	lock similar to hinge with female and male part in the tray handle additionally, press-button placed in the posterior part of the maxillary tray
Yenisey et al. [7]	two-part maxillary and mandibular trays	4 metal locks – two female parts of the locks are fixed in canines' area and two in the molars' area. Blocks have been created that contain the male parts: a single block is needed for the mandibular tray and two for the maxillary tray.
Patel et al. [36]	two-part maxillary custom tray, made of auto-polymerization resin	four needle-like hubs with needle-like caps onto them. Hubs are cross-like connected from the canine in one half to the molars of the other.
		Hinges
Samet et al. [37]	two-part custom tray	hinge located in the center and additional connection via elastic dental floss

The final impressions were taken by routine methods that include border molding with functional impression materials in most of the reported clinical cases.

Some authors prefer zinc-oxide-eugenol paste [16]. When using hard impression materials, during taking the segment trays out of the mouth, we have to break the material. This has inherent risks of imprecision in the breaking area in the case of subsequent connection of the impression segments for molding the gypsum model. We have not found in dental literature comments on the impression precision in the area of sectional line when reassembling the segments after taking out the trays of the mouth. The additional research could clarify if with these methods we get deformations of clinical significance which could impact the quality of the complete denture.

3.1.1. Combined methods – digital and conventional

New approach is proposed for treatment of edentulous patients with microstomia that combine digital and conventional methods [39], [40], [41], [42]. In summary, these clinical protocols could be presented in the following manner:

In order to overcome the difficulties when taking impressions we implement intraoral scanning to get a digital impression. With the assistance of software we elaborate digital model and create prototypes of sectional custom trays. The trays could be fabricated using CAD/CAM technology or 3D-printing. With these, were taken the final impressions according to the routine methods. The bases of occlusal rims could also be fabricated using digital technologies. After the stage for defining the jaw relations, the dentures could be completed according to the conventional methods, via CAD/CAM technology or 3D-printing.

Saygili et al. [39] use intraoral scanning for taking preliminary impression. There were elaborated models via 3D-printing. Onto them are elaborated two-part custom trays for taking the final impressions. Onto the maxilla a two-part collapsible denture is made and onto the mandible – conventional complete denture. The authors note that intraoral scanning is applicable method for taking preliminary impressions in patients with microstomia.

Moslemian et al. [40] make the preliminary digital impressions for maxilla via intraoral scanning with TRIOS 3 Basic; 3shape in retracted cheeks, lips and vestibular area. According to the digitally created virtual model a two-part custom tray was made for taking final impression. Final impression was taken according to the routine methods with border molding. The occlusal rims are made of two parts – left and right segment being connected via magnet.

Jagielska et al. [41] present similar combined protocol. A prototype of sectional custom tray with an original design was created via the CAD/CAM technology and the tray was fabricated using 3D printing. It was used for taking final functional impression according to which were made a flexible mandibular denture. The authors note that with this approach was encountered some difficulties in order to reflect the vestibular sulcus because of the great number of images to be integrated in order to get digital impression of the maxilla. Nevertheless, in some complicated cases this is useful method that simplifies the clinical and laboratory procedures for elaboration of complete dentures.

3.2 Definition of jaw relations

In this clinical stage the occlusal rims should be easily inserted and taken out of patient's mouth and remain stable during the procedure. Hence it is recommended to use sectional occlusal rims that allow easy reorientation of the pattern parts [24].

Satpathy et al. [22] use two-part occlusal rims. Onto the maxillary rim push-buttons are placed of both parts and anterior telescopic section are elaborated of auto-polymerization resin for their connection via the buttons. For the mandiblar occlusal rim is used cross pin, key-key way mechanism. Half the lock is fixed onto one side via auto-polymerization resin and onto the other – the second half covered with housing. Then opening has been made in these in which has been positioned a pin of suitable dimensions in order to stabilize the connection. Dewan et al. [32] also use sectional occlusal rims- three-segments for maxilla and two-segments for the mandible. The separate parts of occlusal patterns are assembled via buttons.

Shams et al. [33] define the jaw relations via assemblable occlusal rims with locking elements located along the middle line.
Kumar et al. [16] define the jaw relations with occlusal rims separated into two segments which are assembled via overlapping in the middle line area.

3.3. Design of complete dentures

The prosthetic treatment of edentulous patients with microstomia is performed with denture constructions that could be presented in three main groups:

- Sectional dentures made of two or three segments that could be assembled inside the mouth after their consecutive input and positioning over the denture field.
- Collapsible dentures that are usually made of two segments connected in-between by special connective means that make it possible for the dentures to be folded during its insertion in the mouth and unfolded when positioning these onto the denture field.
- Flexible dentures – single-part dentures made of flexible materials that allow certain deformation that results in decreasing their volume and facilitate their insertion in the oral cavity. These are used mainly in prosthetic treatment of the mandible.

3.3.1. Sectional dentures

The so-called "sectional" dentures are among the first solutions proposed for overcoming the difficulties in cases of patients with microstomia (Table 2).

Patel [37] suggests an interesting manner to modify the maxillary denture. One part of the trial denture is modeled over the final model. In the middle area of the anterior-posterior direction groves were made in three locations for placement of press-buttons. This part is completed with acrylic resin. After thermal polymerization of the resin the denture should not be taken out of the package but it should be doubled with agar-agar. The second part of the denture should be placed onto the doubled section and the female part of the buttons should be placed onto the doubled male parts. The second denture part is modeled so that it overlaps the first part. Then the second part is finalized with resin.

Table 2: Sectional complete dentures design

Sectional dentures		
Author	Type of dentures	Type of assembly of denture segments
McCord et al. [13]	two-part maxillary complete denture	steel pins with diameter 1 mm, positioned behind the central incisors
Satpathy et al. [22]	two-part maxillary complete denture two-part mandibular complete denture	buttons cross pin, key-key way mechanism
Al-Hadi et al. [27]	three-part complete dentures	two of denture parts are connected via vertically or horizontally precise attachments, the third segment is connected to the two parts via pins

Dewan et al. [32]	two-part maxillary and mandibular complete denture	two small circular magnets in the front sections of both dentures + two press-buttons in the posterior part of the mandibular denture
Shams et al. [33]	maxillary denture separated horizontally, into two segments – anterior and posterior	metal molded micro-spherical connective elements
Lee [43]	two -part complete dentures	miniature bolts
L'Estrange and Pullen-Warner [44]	two- part complete dentures	split-pin and sleeve device
Walter [45]	two-part removable dentures	anchor attachments as locking devices
Sun et al. [48]	two-part maxillary complete denture which includes metal plaque in the palate area	the plate contains two overlapping parts in the area of the middle line that are individually elaborated inlay structure

Sometimes, patients have difficulty to use their sectional complete dentures, because they require assembly of the individual elements directly onto the denture field. This issue occurs more often when placing the maxillary denture because of relief and configuration of the hard palate that make the situation even more complicated.

3.3.2 Collapsible dentures

The advantage of the collapsible dentures is the fact that after its insertion in patient's mouth these are unfolded and positioned over the denture field without necessitating assembly of the individual elements inside the mouth which significantly facilitates their usage by the patients (Table 3).

Table 3: Collapsible complete dentures design

Collapsible dentures		
Author	Type of dentures	Type of attachment of denture segments
Benetti et al. [5]	maxillary complete dentures	metal pin positioned in palatal area to the central incisors that serves as hinge for collapsing the dentures
Yenisey et al. [7]	mandibular complete denture	hinge with individual design molded of metal, lingual located
Wahle et al. [9]	mandibular denture that includes part of cobalt-chromium dental alloy	lingual located hinge and conventional labial located lock
Sharma A et al. [28]	maxillary complete denture separated in two parts along the middle mandibular denture separated into three parts	two hinges in the area of hard palate hinge in the area of the middle line the anterior teeth are arranged onto separate segment that is connected to the other denture part
Givan et al. [34]	maxillary complete denture	custom hinge and needle-like mechanism that locks the denture in open position
Watanabe et al. [50]	maxillary and mandibular complete dentures	hinges located along the middle line, on the palate and onto the lingual surface of the mandible The connection is supported by steel-platinum magnetic element.
Dikbas et al. [51]	maxillary and mandibular complete dentures	hinge connection along the middle line and stud attachments
Rathi N et al. [52]	mandibular complete denture	custom hinge connected to cobalt-chromium base
Srinivasan et al. [54]	mandibular complete denture	metal hinges inside the lingual denture flanges

Most of the collapsible dentures described in the dental literature are divided into two parts that are interconnected with a hinge [29], [39], [49], [52], [53]. This kind of collapsible denture demonstrates good retention and satisfactory stability especially in prosthetic treatment of mandible. However, some authors note that hinge connection could increases denture thickness and decreases the space for the tongue [28].

Dentures' stability is ensured also by various means that prevent the relocation of their two parts. To this end, were used pins, locking devices, buttons, magnets, etc. [5], [9], [46]. [47]. [50].

3.3.3 Flexible dentures

Alternative to the collapsible dentures are the so-called "flexible" dentures [55]. Their dimensions could be decreased via manual material deformation to significantly lesser degree compared to the two-part collapsible dentures. They are acceptable option for patients with small or medium restricted mouth opening.

Jivanescu A et al. [21] report treatment of patient with microstomia caused by scleroderma. A flexible complete denture is made of thermoplastic material. In the particular case, the limited denture flexibility is sufficient for the successful insertion and taking out from patient mouth.

Jagielska et al. [41] applied combined clinical approach that includes digital and conventional methods for elaborated of flexible mandibular denture in prosthetic treatment of the patient with microstomia caused by scleroderma.

Additional comparative clinical studies are needed to determine the advantages and disadvantages of different modifications of complete dentures in the prosthetic treatment of patients with microstomia. It would also be useful to study the achieved masticatory efficiency, the duration of functional suitability of this type of prosthetic treatment, as well as the patients satisfaction. The results of such studies would facilitate clinicians in choosing a method depending on the specific clinical case.

4. Conclusion

Prosthetic rehabilitation of edentulous patients with microstomia requires individualized strategies integrating sectional, collapsible, or flexible denture designs. Evidence suggests that digital technologies may enhance clinical precision and workflow efficiency; however, comparative outcome studies remain scarce. Future research should focus on standardized protocols, functional performance metrics, and patient-reported outcomes to guide clinical decision-making.

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