International Journal of Medicine Research
ISSN: 2455-7404; Impact Factor: RJIF 5.42
www.medicinesjournal.com
Volume 1; Issue 5; November 2016; Page No. 45-48

Prosthetic rehabilitation in mouth opening limitation

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Abstract
The limitation of mouth opening, which can appear during irradiation, could impede the prosthetic treatment in particular when taking an impression. Thus, we are usually induced to choose a modified impression procedure such as: the technique of flexible impression tray, the sectorial system of the commercial impression tray with securing screws, the individual dental tray with pins and the locking latch technique.
The dental occlusion registration can also be impeded by the limitation of mouth opening leading to teeth setting errors. In this context, we refer to the Sears technique based on occlusion release allowing to have a more or less wide occlusion field.
Lately, newly developed sectioned denture showed some improvement in the treatment of patients with limitation of mouth opening. In addition, recent developments in the field of dental materials have overcome certain disadvantages of the acrylic resin by the appearance of new forms of denture materials such as thermoplastic resin.

Keywords: impression, mouth opening limitation, radiotherapy, prosthetic rehabilitation

1. Introduction
In the prosthetic practice, we are confronted with patients with permanent limitation of the mouth opening, often disabling to the maxillofacial rehabilitation processes. It is difficult to design a prosthetic treatment for these patients, especially when the limitation of mouth opening is severe. Taking the impression and insertion or removal of dentures constitute an obstacle to prosthetic management. To work around these problems, various techniques using trays with special designs have been proposed.
The aim of this article is to report clinical case through a therapeutic approach that seeks to facilitate the prosthetic management in a complete edentulous patient with limited mouth opening [3].

2. Case report
The patient, 72 years old, is referred to the complete prosthodontics department of Dental Medicine Clinic of Monastir for a prosthetic rehabilitation.
The medical history revealed that the patient underwent an excision surgery and radiotherapy (64 Gy) over 2 years ago, at Charles Nicolle Hospital in Tunis, following maxillary squamous cell carcinoma classified T2N1M0.
The extra oral examination showed as lump of the lower part of the face, angular stomatitis, an accentuation of the side grooves and severe limitation of mouth opening (fig. 1).
The intraoral examination revealed total edentulous maxillary ridges, an oral dryness, wide spread of mucosal atrophy, loss of maxillary substance of small extent involving communication between oral cavity and right maxillary sinus and scar stretched between the palate and the right side of the cheek nearby the loss of substance.
The prosthetic decision was a bimaxillary conventional denture with a rigid obturator fixed to the upper denture.
The primary maxillary impression was taken with a schreinmakers impression tray and alginate. On the mandible, given the severe limitation of mouth opening, we opted for a fragmented primary impression. Two half dental trays were made with thermoplastic material (Kerr paste) after softening and modeling in the mouth (fig. 2).
The impression was taken with alginate. A plaster key was performed at the end to take the exact position of the two half impression trays (fig. 3, fig. 4).
After molding the impressions, an individual maxillary impression tray and two half mandibular impression trays were made with the self-curing resin.
Attention was paid during tray's fitting, in particular above the maxilla, opposite the scar (fig. 5).
After performing border molding with kerr paste, secondary impressions were taken with medium viscosity polysulfide. The mandibular secondary impression was performed according to the same principle as the primary impression (fig. 6).
Secondary models were obtained after casting secondary impressions with hard plaster. These models were destined to achieve occlusion bases which were used for recording centric relation and correcting vertical dimension.
The teeth mounting was made according to the Sears method, tried and validated in the mouth from the perspective of occlusion and aesthetics (fig. 7, 8, 9, 10).
At the placement of the prosthesis, those were adjusted to have sufficient stability. Occlusal equilibration was performed to ensure optimal occlusal setting in order to improve insufficient retention due to oral dryness (fig. 11; 12).
After prostheses delivery and equilibration, appointments were scheduled weekly during the first month to monitor and facilitate the physical and psychological integration of the prosthesis.

Fig 1: Severe limitation of the mouth opening

Fig 2: Two half dental trays

Fig 3: the plaster key

Fig 4: fragmented mandibular primary impression

Fig 5: maxillary costume impression tray (Attention was paid during tray's fitting, opposite the scar)

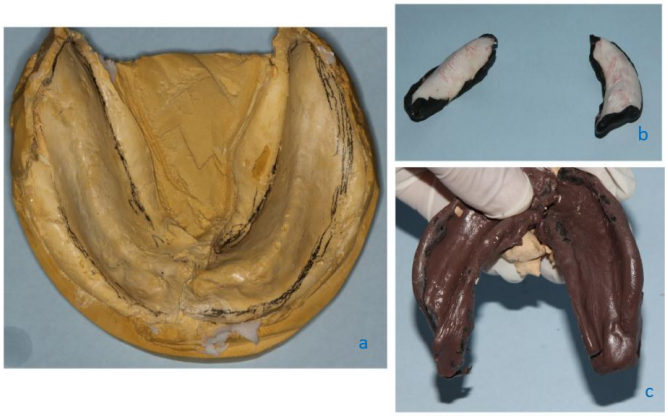

Fig 6: the mandibular secondary impression; 6a: primary cast; 6b: two half custom trays; 6c: fragmented mandibular secondary impression

Fig 7: the teeth mounting made according to the Sears method

Fig 8: occlusion (left side)

Fig 9: occlusion (right side)

Fig 10: the teeth mounting trying

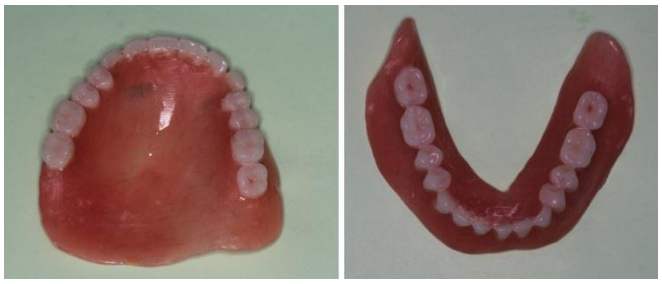

Fig 11: definitive removable complete dentures

Fig 12: prosthesis placement

4. Discussion

The limitation of mouth opening can be an annoying consequence of radiotherapy [1]. Its prevalence is 5% to 38% depending on the series after therapeutic management of an aerodigestive tract cancer [2]. It can exist during irradiation, simply translating an analgesic attitude in the context of a reactional mucositis, but usually this limitation of mouth opening will be established in the months following radiation therapy [3]. The discomfort is felt when the mouth opening is below 35 mm [4]. Some data suggest that radiation therapy of the head and neck is at the root of a limited mouth opening more marked when the radiation dose is high [5]. Myopathy is shown by abnormal fibroblast proliferation responsible for muscle fibroatrophy which concerns mainly pterygoid and masseter muscles [6].

The limitation of mouthopening is a handicap for dental treatment, but also for the prosthetic treatment [4]. In some cases, it is sometimes very difficult to rehabilitate these patients. Therefore, the therapeutic approach will depend on these situations and on the degree of limitation of mouthopening [7].

Taking an impression is a key step in the prosthetic chain and the insertion of a loaded dental tray requires an average mouthopening of 3 cm [8]. Thus, we are usually induced to a modification of the classic impression procedure [9].

The technique of flexible impression tray describes the production of diagnostic cast with a non-rigid dental tray [10]. The material used is the high viscosity silicone which can be inserted and molded in the mouth before intake. Because of its flexible character, the silicone impression tray can be inserted and easily removed [11].

The sectoral system of the commercial impression tray with securing screws. This system includes right and left hemi impression trays with different forms and sizes connected at the handle by a screw to form an anatomically suitable impression tray [12].

Although further improvements are required to make the handle's structure more convenient to connect, the preliminary impression can be easier to realize with this system of sectoral commercial impression tray [5].

In addition, this dental trayis versatile for taking an impression for patients with limited mouthopening or microstomia [1]. The advantages of this system compared to conventional dental tray are: The impression of a hemi-arch or full arch, several combinations of size and shape can be obtained and the impression material needed could be reduced [4]. The disadvantage of this system is that the dental tray tends to become unbalanced while taking the impression because the handle is heavier than the conventional dental tray [3].

Using an individual dental tray with pins has the advantage of making the technical implementation easier [9]. The tight adaptation of the acrylic resin block on pins ensures appropriate lock. The use of pins makes the bending and the insertion of the mandibular individual dental tray in one piece possible [2].

The locking latch technique has also been described: the individual dental tray incorporates a locking mechanism that is easily separated and gathered in the mouth after taking the second impression [11].

The dental occlusion registration can also be impeded by the limitation of mouthopening and / or the mastication muscles constriction. To compensate for dental occlusion registration and teeth setting errors relative to these conditions, we can refer to Sears technique. This could be interesting when having serious difficulties in determining and recording centric relation because it is based on the release of the occlusion which offers the possibility of having an occlusion field more or less wide and not limited to a precise centric relation [11]. This original design of occlusal surfaces is intended to ensure the prosthesis masticatory efficiency, comfort and stability. For this purpose, we have to remove all the inclined cusps lopes responsible for harmful horizontal components and prostheses movements. We give each segment of the occlusal surface, called occlusal unit, a suitable morphology for its position in the arch. Each occlusal unit has its unique and specific function depending on its location [11, 13].

The tritural occlusal units' unique function is to grind. They

are characterized by the loss of the cusps and the location of the working part. The working part matches the lingual half of the 1st molar and the 2nd premolar regarding the mandibular units. Those ones are mounted first. Sears technique is always performed based on the lowest peak. The more it is deficient, the more masticating platform is reduced to enable it to maintain the necessary pressure to the unit area [11].

The balancing occlusal propulsion units: each unit is composed of the 2nd lower molar. During propulsion, its occlusal surface must articulate permanently with the distal angle of the upper occlusal masticating unit [11, 2].

The balancing occlusal units of lateral excursion: Sears insists that with well-designed tritural units there is no need to make an equilibration during lateral excursion [11].

The subocclusal units oppose to other subocclusal surfaces. They do not articulate with them or articulate only at some points, ridges or very limited extents, they are intended for simple aesthetic filling of a void between canine tooth and tritural units. In addition, they are also intended to cheek's biting. Every first mandibular premolar and every subocclusal unit is mounted so that we obtain the most aesthetic appearance while its occlusal surface remains far from its antagonist [11, 8].

Lately, some improvement in the treatment of patients with a limitation of mouth opening was developed with sectioned prostheses, but these ones can be problematic when mouthopening is very limited [2].

Recent developments in the field of dental materials have overcome certain disadvantages of the acrylic resin by the appearance of new forms of denture materials such as thermoplastic resins. Polyamide (nylon) is one of new materials that can be used as an alternative to the conventional resin, it has been introduced in dentistry since 1950 as a material intended for dentures (Valplast®, Flexiplast®, Sunflex ®) [3].

The polyamide's form has some disadvantages such as deterioration of the base's color, high water absorption, surface roughness with time and difficulty in handling [8].

Nowadays, these polyamides are improved by reinforcement with short fiberglass allowing mechanical and physical material properties improvement [12].

The flexibility and low elasticity modulus of the polyamide allow its use when having undercuts or limited mouth opening, but with this low bending strength, polyamide risk of permanent plastic deformation during insertion and chewing movements can cause a permanent change in dimensions [11].

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