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Review Article

Suction in Dentures: A Review Article

Renu Gupta[1], R.P. Luthra[2], Abhay Sharma[3]

[1]Professor and Head, [2]Professor, [3]Junior resident, Department of Prosthodontics, HPGDC, Shimla, Himachal Pradesh, India

ABSTRACT:

Aim: To review the scientific literature on the methods and techniques involved in suction mechanism in complete dentures. **Materials and Methods:** Data Sources: Original reports and reviews obtained through internet searches from 1998 to 2018 using the headings of "Suction dentures," "ultra-suction dentures," "suction device in complete denture", "history of suction devices in complete dentures"," retention in complete dentures." Articles frequently cited in reference lists were also included. All data was reviewed, tabulated, and summarized. **Data Extraction:** Criteria for extraction included data quality and validity, statistical treatment of the data, venue of publication, and relevance to clinical care.

Key words: Suction dentures, ultra-suction dentures, suction device in complete denture, history of suction devices in complete dentures, retention in complete dentures.

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Correspondence to: Dr. Abhay Sharma, Junior resident, Department of Prosthodontics, HPGDC, Shimla, Himachal Pradesh, India

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INTRODUCTION

India is having a large geriatric population of 77 million comprising 7.7% of its total population. More than fifty percent of the population is uneducated and never sees a dentist in their lifetime. A significant number of these patients have dentures with reduced or poor function for various reasons. The commonest problem associated with the management of edentulous patients is the severely resorbed ridges, especially in older age when adaptive capacities are reduced. This compromised situation consequently results in the fabrication of unsatisfactory dentures with poor retention and stability which can further precipitate psychosocial problems.[1] Majority of elderly patients have to suffer a lot of discomfort because of unretentive or maladaptive dentures, many denture wearers simply withdraw from any type of social engagement as a result of being compelled to wear.

The enhanced stability and retention allow denture wearer patients to increase the force they can apply during mastication. Improving retention and stability of denture is of a considerable interest in prosthetic dentistry.[2]

Denture technology is steadily moving forward and providing denture wearers with better and better options for denture comfort and fit. There are many products and systems in the market that will raise the denture retention through suction like commercially available or custom made suction devices, multiple suction cups and suction dentures. This article aims to review all the relevant articles on products and methods which help in improved suction in complete dentures.

Historical background

Contribution	Year	Results
J.Spyer and R.S.Ingalls[3]	1885	Patents on suction These patents covered multiple projections on the tissue (basal) surface of dentures n cup dentures.
G.W. Morgan	1907	A patent was issued for suction cavities in a soft rubber sheet.
Dr.Arthur C Jermyn	1967	Resurrected the idea of suction cup retained dentures with research that began in 1952.
Mr. David Block		EZ Suction cup (Aesthetic Porcelain Studios)
Biomedics NZ[4]		Ultra-Suction Dentures use a valve system to create suction against the gums, keeping the dentures in place.
Abe J	1999	Complete denture suction concept.

DISCUSSION

Achieving effective suction in a complete denture especially mandibular complete denture has always been one of the most difficult clinical techniques that no one has ever been able to achieve so far and this issue has received much attention in recent years. The word suction itself suggests that it enhances denture retention and support by forming negative pressure temporarily at the intaglio surface of denture base at times of swallowing and chewing because the areas surrounding the denture flanges are sealed by mobile mucosa. This builds confidence in patient and creates a secured sense of chewing.

The sealing mechanism of the denture is comprised with the interior, exterior doubled closure and the close contact closure.[5]

Numerous devices and techniques have been devised since long time to increase the retention of old dentures, but they have their own advantages and disadvantages

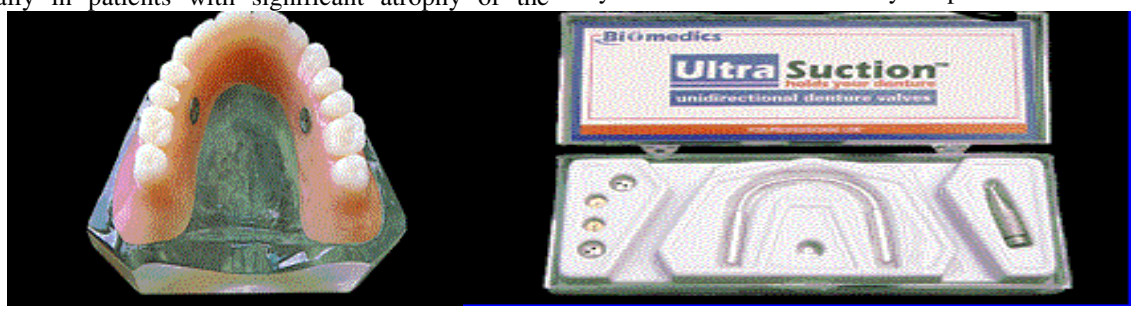
Single Suction cup- The use of a single suction cup for maxillary denture retention is an obsolete concept as its long term usage has causes pathological changes (mucosal ulceration and pathological perforations) in the tissues denture. Studies have revealed no demonstrable cell changes as long as suction cups are not too deep. The field of concern here is performance of Molloplast -B. A six-year retrospective follow-up study on complete dentures with Molloplast- B linings showed that common problems were fracture, bleach deterioration, liner separation and yeast deterioration .A laboratory study has shown sodium hypochlorite to be the most effective disinfectant, being more effective than either microwave radiation or leaving the denture dry overnight. A study by Gedik and Kulak demonstrated that alkaline peroxide-type denture cleaners have been found effective in the disinfection of silicone based soft liners contaminated with C.albicans. Molloplast B would need to be replaced on a 3-5 year average cycle. There was no demonstrable cell change, as long as the cups were not too deep. Where the cups were too deep, they caused a sore spot to develop.[3]

Denture mini cups –Suction cups dentures are small suction cups made with a soft rubber that attaches gently inside the mouth without irritation. This type of denture can be used for various types of tooth replacement in patients with flat ridges.

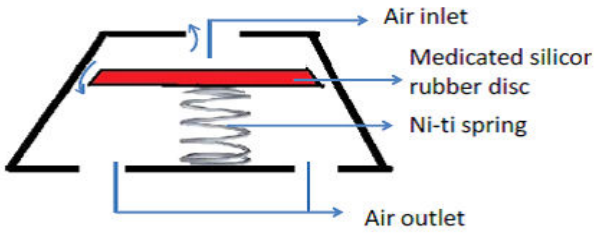
The multi-suction chambers were used to enhance the retention, stability and comfort of the complete denture, especially in patients with significant atrophy of the residual alveolar ridges. The multiple suction chambers creates a vacuum between the mucosa and the denture base and thus providing additional retention of the denture. The tissues assume the negative form of these chambers but they do not cause any pathology and return to their original form once the dentures are discontinued for some time. This technique solves many of the physiologic and psychological problems associated with long-term denture wearer patients but this is no panacea for all denture problems. This presents as a viable alternative to increase denture retention when patient is reluctant for other treatment modalities. But it is difficult to clean due to multiple mini rubber cups. Also complications like fibrosis have been reported.

Ultra-suction device: Because the amount of retention provided by suction cup adhesion is proportionate to the area covered by the denture, mandibular dentures are subjected to a lower magnitude of adhesive retentive forces, a problem better solved by the ultra-suction system. Their recent use in patients unable or unwilling to undergo surgery to improve their denture foundation has shown a successful, economic and non-invasive way for enhancing denture retention Ultra-suction system is supplied in a kit consisting of; two ultra-suction valves, a specially designed profiled bar (spacer) used to create a suction chamber at the ridge level, two processing caps, service key and spare diaphragms The specially designed profile bar was stabilized on the master cast (b) using 2-3 drops of cyanoacrylate. It stopped about 1 cm short of the end of the denture.

On receiving dentures patient is instructed to run water through the visible orifices of the suction chamber on a daily basis, otherwise the valves would be blocked and would lose their efficiency. Ultra-suction system increases the retention of mandibular complete dentures. Their retentive capacity in comparison to conventional dentures has been positively claimed. But the costof this system cannot be afforded by the patient.[4]



A custom made device can be fabricated for the same purpose. This device is an unidirectional suction device consisting of two auto polymerizing (self-cure) acrylic plates of 7mm and 5mm diameter. Ni-Ti (Nickel-titanium) spring(4mm diameter and 4mm length) and silicone rubber disc of 5mm diameter enclosed between two acrylic plates. 4mm length of Ni-Ti spring was attached to lower 7mm of acrylic plate and other end is attached to silicon rubber disc. Another auto-polymerizing acrylic plate placed on top of it enclosed the assembly. This custom made suction device of 5mm thickness. Two small holes of approximately 1mm diameter were prepared on top and bottom plates. Holes were provided to escape the excess air between the tissue and denture. Silicon rubber and spring allows the escape of air in one direction only. When this custom made suction device is attached to the denture it evaluates the retention of maxillary complete denture. Cross sectional diagram of the suction device shown below.[2]



Suction effective Dentures- The popularity of suction effective mandibular complete dentures has risen globally with the introduction of the suction effective denture concept by Abe in 1999. This can be attributed to the fact that now mandibular dentures that do not lift during function using suction concept can be reliably fabricated eliminating the use of commercially available denture adhesives or implants .There is a generation strong negative pressure between the denture border and the alveolar mucosa by creating an effective seal around the entire denture border with mobile oral mucosa.

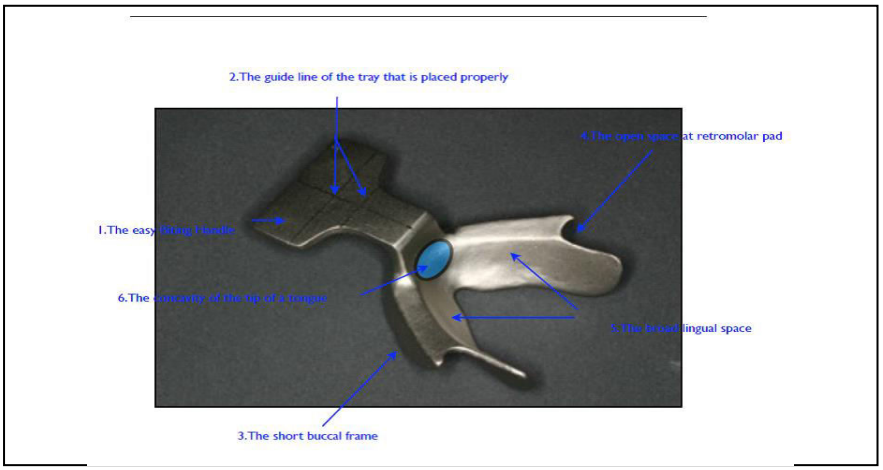
This effective seal comprises 4 types of closure:

1) Inner/outer double closure in the labiobuccal area.
2) Inner/outer double closure in thesublingual fold region.
3) Compensatory closure between the ventrolateral aspect of the tongue and the cameo lingual surface of the denture base in the retromylohyoid fossa region.
4) Contact closure between the inner denture surface and the mucosal surface of the retromolar pad (interior seal), and contact closure created by the lateral surface of the tongue and the buccal mucosa above the retromolar pad (exterior seal).[7]

Frameless tray is fabricated by modifying a dentulous tray by removing the frame of the buccal posterior area and the retromolar pad area so that it does not impinge or deform the buccal mucosa and alter the natural shape of the retromolar pad during the preliminary impression.

To achieve effective suction in this bio-functional prosthetic system the retromolar pad is covered thinly. It is advised to avoid Someya's sinew string at the buccal base of the retromolar pad.[8] The buccal shelf is modeled in concavity progressively toward the retromolar pad. The occlusal plate rests slightly in the center of the ridge width. Wax-up of denture is done to keep out of the way of the tongue. The lateral incisor areas are shaped in concavity.

There should be a complete sealing of the denture borders. The purpose of this denture procedure is to limit the amount of movement of the denture by making a good impression, a precise occlusion and achieving suction with closed mouth, having a close contact of the buccal mucous membrane and tongue on the denture base in the retromolar pad area.This contact is named as BTC Point (Buccal mucosa, Tongue side wall and Contact).[6]



CONCLUSION:

The use of various methods of creating suction under the denture is the patient's desire for extra retention, stability and comfort of the complete denture, especially in patients with significant atrophy of the residual alveolar ridges. Many such patients cannot master the use of dentures, let alone retain the prosthetic appliances in their mouths. The use of these methods creates a vacuum between the mucosa and the denture base and thus providing additional retention of the denture. The tissues assume the negative form but there is no pathologic change and the tissues return to their original form once the dentures are discontinued. These techniques solves many of the physiologic and psychological problems associated with long-term denture wearer patients but this is no panacea for all denture problems. Many of these techniques are mentioned in the literature they are technique sensitive but offer a viable alternative to enhance denture retention when patient is unwilling for other treatment modalities.

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