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Rehabilitation of Labially Inclined Mandibular Ridge with Two Labially Inclined Implants Retaining Mandibular Over-Denture by Stern-Snap Angled Attachment: A Clinical Report



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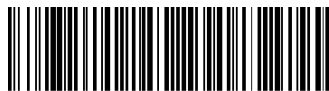
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ABSTRACT

Mandibular Implant overdenture with two inter-foraminally placed implants has been presented as a minimum standard of care for mandibular edentulous patient. Problems related to the compromised morphology of the edentulous mandible may present, thus deviations from the proposed perpendicular implant axis are required for implant placement. As a consequence, complications of prosthetic restoration; wear and deformation were found for all attachment systems. The problem can be solved by using the new stern snap angled attachment to correct the inclined implants angulation, so the attachments will be parallel to each other. This article reports on stern-snap angled attachment managing labially inclined implant.



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INTRODUCTION

Implant overdenture has become a popular treatment modality and has a good impact on patient's quality of life, clinically successful, economically advantageous to the patients and structurally sufficient for retention. ¹⁻³ for the edentulous mandible, utilization of two inter-foraminally placed implants to support such overdentures is the minimum standard of care. ¹

Several anatomic constraints make it obligatory to insert the implants at angles that are not favorable for prosthetic restorations such as the width and height of the residual alveolar ridge, existence of bony undercuts, presence of bone inclination, the arch shape, and the relationships between maxillo-mandibular arches. Other factors that may affect implant position and inclination are the location of the mandibular canal and ridge approximation to the paranasal sinuses. ^{4,5}

According to anatomic findings, deviations from the proposed perpendicular implant axis are required for implant placement. The off-axis loading are expected Complications. When the angulation increases, the load increase around the implant body and so the amount of crestal bone stresses, transforms a greater amount of the force to tensile and shear stress, reducing the bone strength which lead to the break of the interface between bone and implant, bone resorption, prosthetic screw loosening, and restoration fracture. ^{6,7} Wear and deformation were found for all attachment systems ^{6,8} and where the inclination increases, the retention of the attachments over time decreases. ^{9,10}

To solve the problem: First: use attachment with retention means that compensate for the angulation but not correcting it. Attachment are still not parallel to each other, ex: locator shave different sets of inserts for different implant inclinations ^{7, 10, 11}, so its rely on the elasticity of the insert to solve the problem. ¹¹ Second: correcting the angulation of the inclined implant so the attachment will be parallel to each other ex: stern snap angled attachment correct the implant axial angulation through reclining the head of the attachment to a proper axial direction to attain parallelism. ¹²

The Stern Snap attachment is a modified ball screwed into an abutment base. The retention cap engages the outer surface of the modified ball and permits retention of the prosthesis to the implant. Its novel two piece design permits the snap angled attachment to correct variable

implants divergence up to 20°. There is no need to depend on a hinging attachment. The abutments in this design concept become parallel to each other regardless the direction of the implant angulation. This system features a new maximum durability that does not need a housing, which give a low profile of 2.5mm and less space required in the denture.¹²In contrast to the locator, the stern snap angled attachment did not have different sets of inserts for different implant angulation. The inappropriate implant axial inclination is corrected by reclining the attachment's head to a proper axial position to realize parallelism; so, the same insert could be used in all different implant inclination. It differs from the pre-angled locator as its use did not need measuring the angle of implant inclination as it can be modified direct intraoral before fixing it.^{12, 13} The aim of this work is to manage angulated implant placement by correcting the angulation with the attachment.

Clinical report

The presenting clinical problem

Four patients came to the Department of Removable Prosthodontics, Faculty of Dentistry Mansoura University (Mansoura, Egypt). They presented wearing a complete denture. Their chief complaints were poor retention of the lower denture, and mucosal soreness in the labial ridge area, they asked for more stable, comfortable and painless prostheses.

Treatment plan

Clinical examination of the lower ridge revealed anterior labially inclined bone with limited bone width. The treatment options were discussed with the patients, and they refused any surgical procedure to manage the labially inclined ridge. They asked for simpler solution.

First; new conventional maxillary and mandibular complete dentures (CDs) were constructed. Patients were instructed to function with the dentures for 3months to enhance neuromuscular adaptation. After 3 months, patients still require a more stable, comfortable and retentive prosthesis.

Patients accepted flapless implant surgery and the treatment plan was done. A new maxillary conventional denture and mandibular implant overdenture with two inter-foraminal implant placed using stereolithographic stent were considered for the treatment.

The mandibular dentures were duplicated to have a transparent acrylic denture. Gutta percha markers were placed in the duplicated mandibular dentures; four markers in the buccal and labial surfaces, four markers in the lingual flanges (canines and first molar area bilaterally) and two in the fitting surface (**fig.1**). A dual scan cone-beam computed tomography (CBCT) ¹ was made for each patient with the maxillary complete denture and the transparent mandibular denture while the patient was closing in centric relation. A second scan was made for the duplicated mandibular denture.

Guided by the cone beam softwareⁱ, the data of the double scans were overlapped then the acquired images were loaded into 3-D image to be used in the treatment plan. By using the software, dental implants of 12mm length and 3.3 mm diameter were selected from a database of commercially available implants to be placed in the inter-foraminal area. The angle of anterior bone inclination labially in relation to the occlusal plane was about 15°-20° in the canine area. With limited bone width, the bone inclination was followed to avoid bone perforation or the need for bone grafting. (**fig.2**).

A stereolithographic template was made by CAD/CAM technique for each patient to ensure precise placement of the two implants into their positions which need 17 ° labial inclinations from occlusal plane. Under local anesthesiaⁱⁱ, a mucosal supported stereolithographic surgical template was seated directly on the mucosa. Universal surgical kitⁱⁱⁱ was provided for using it during osteotomy preparation. The template was secured with three screws made by osteotomy drills (**fig3**).

Once the template was seated, tissue punch was used first then the osteotomies were carried out through successive sleeves. The final drill used for osteotomy was (2.8 drill for 3.3 implant diameter) according to implant system used. A manual surgical torque wrench was used to check the final torque of the implant (35Ncm), followed by application of the cover screws. Post-operative panoramic x-rays were carried out (**fig4**).

¹OnDemand3DApp

The mandibular denture was relieved above the implants and relined with chairside auto polymerized silicone soft lineriv. Patients were instructed for proper oral hygiene measures and periodic follow up recall.

After the three months of the osseointegration period, a second stage was made to expose and remove the cover screws. 2 mm height healing abutmentv were screwed into the fixtures for two weeks. The denture was relived in the areas of the healing abutments and tested to seat against the abutments without rocking or interference. The denture was relined with soft liner and the patient was instructed to wear the denture for two weeks.

Proper abutment base height (2.5mm)^{vi}was selected to match the type and the width of the implants being restored. The abutment base screwed into each implant and tightened to 30 Ncm using the flat bladed Screwdriver (**fig5**). The Stern SNAP modified ball part was held by specific handle that control the movement of the stern-snap attachment^{vii}and can change the angle of the head to 20 degree (**fig6A**), the .050 hex driver was inserted through the slot in the Stern SNAP and engage the head of the second screw.

Using the Stern SNAP Handle, the attachment moved until reaching the desired path of insertion moving the head lingually to correct the labial inclination. While holding the handle to prevent movement, the screw was torqued to 20 Ncm (**fig6B**) then the Stern SNAP handle unscrewed.

A white blocking ring was placed over the head of each attachment to block out the area immediately surrounding the abutment and create a space around the abutments to prevent contact of acrylic resin to it. The green female plastic house was placed onto each stern-snap attachment (**fig7A**).

The female housing is determined by using pressure indicating past² on the fitting surface of lower denture over the male part. Relief was done on the marked areas and vents on the lingual surface to allow escape of excess auto polymerized acrylic resin during pickup of female housing.

The female housing of the implants were picked up to the mandibular overdenture using auto polymerized acrylic resin while patient was closing in centric occlusion. After removal of excess self-cure acrylic resin from the polished surface of mandibular denture, finishing and polishing were completed (**fig7B**).

Patient satisfaction (VAS)

Patient satisfaction was evaluated using a questionnaire based on visual analog scale (VAS). Patients were asked to give their answers as a crossed mark on a scale from 0 to 100 mm (low/worst to high/best). The questionnaire was given to the patients in Arabic according to Elsyad¹⁴ criteria (Table 1). The participants filled out the questionnaire by themselves in one visit only without repeated responses.

The VAS scores were recorded twice- once, prior to surgery while wearing conventional dentures and 3 months after wearing IOD. The 3-month period was considered enough to enhance neuromuscular adaptation to each prosthesis.¹⁵

The total scores before and after treatment with IOD was calculated. A marked improvement was noted in masticatory efficiency, retention, stability and overall comfort with the use of the stern snap attachment retaining overdenture. HUMAN

DISCUSSION

The selected treatment plan depend on clinical examination, patient needs, and scientific basics.¹⁶ To eliminate complications, most recommended concept of implant positioning is the restoration driven implant placement depending on prosthetic and esthetic requirements.¹⁷ However, several anatomic limitations make it necessary to insert implants at angles, which are challenging for prosthetic restorations.⁷ Insertion of labially inclined implants needs accurate planning that put in mind anatomic limitations and restorative objectives. With the assistance of CT scanning diagnosis can be done, and transferring the design to the surgical field using the computer-aided surgical guides, which are more precise than the open flap method for implant insertion .¹⁶

In the midst of the various options available to prosthetically restore the inclined implants, there is no single ideal solution. The decision for the selection of the type of attachment for a specific

case with inclined implants lies on practitioner based on his assessment of case in terms of the severity of the angulations, esthetic requirements, and axial load distribution.⁷ It was shown that the labially inclined implant negatively affect retention and anterior/lateral stability, so using regular attachment would not be adequate with labial inclined implant.⁸

The new stern snap angled attachment is suitable with all common implant systems. It's novel two piece design permits true angle correction for divergent implants up to 20 degrees. The System has a highly durable cap, (available in 1lb, 2lb, and 3lb,) that does not need a metal housing, leading to the low profile of only 2.5mm. In case of inclined implant, the stern snap is a novel, predictable, and economical treatment option for stabilizing over-denture.¹²

The VAS questionnaire was selected as it covers many items of patient satisfaction.¹⁸ All dimensions of this instrument are highly correlated with the items of general satisfaction (Awad&Feine, 1998).

CONCLUSION

The angled stern snap overdenture attachment can be considered a promising solution for inclined implant. It can provide patient satisfaction regarding function and esthetics. It has a range of movement (0°-20°) as the case require. It must be adjusted intraoral which need two operators to be adequate fixed.

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Table No. 1:

	CD <i>M(min-max)</i>	IOD <i>M(min-max)</i>
1. Describe the extent of comfort with your mandibular over/denture	50	90
4 How would you rate the fit (stability/retention) of your mandibular overdenture?	50	95
5 Do you have difficulties speaking with your prosthesis?	90	95
6 How often does your prosthesis affect your socializing?	80	90
7 Are there activities you avoid because of the possibility of being embarrassed by your prosthesis?	80	90
8 How would you rate the ease of handling of your dentures (insertion/removal)?	90	80
9 How difficult is it for you to bite off soft foods?	80	90
10 How difficult is it for you to bite off hard foods?	50	90
11 How difficult is it for you to chew soft foods?	70	80
12 How difficult is it for you to chew hard foods?	50	80
13- How would you rate the ease of hygiene procedure?	90	80
	780	960

Figures



Figure No. 1: Guttapercha markers placed in the duplicated mandibular denture

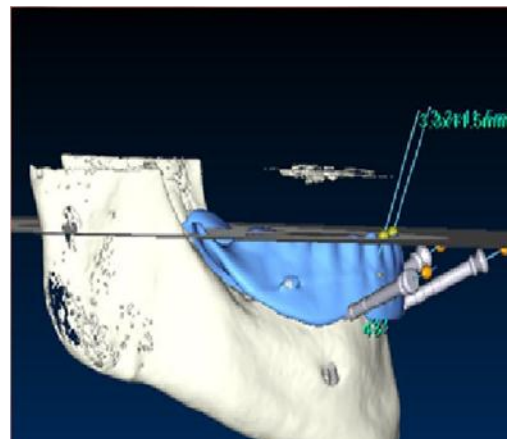
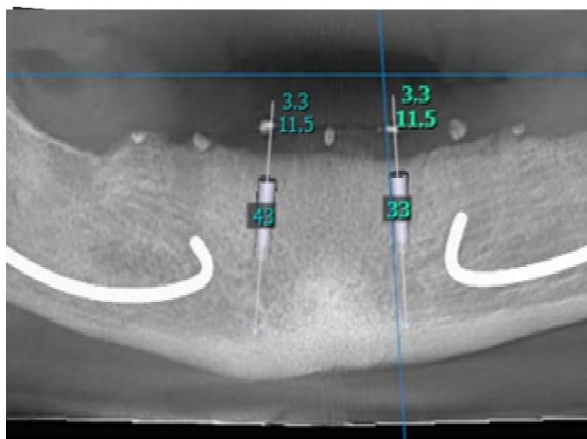


Figure No. 2: Implant of specific lengths and diameters was selected (12mm, 3.3 mm)



Figure No. 3: The unique surface topography of the template is secured with three screws made by osteotomy drills prior to surgery



Figure No. 4: Post-operative panoramic x-rays



Figure No. 5: The abutment base screwed into each implant and tightened to 30 Ncm using the flat bladed Screwdriver

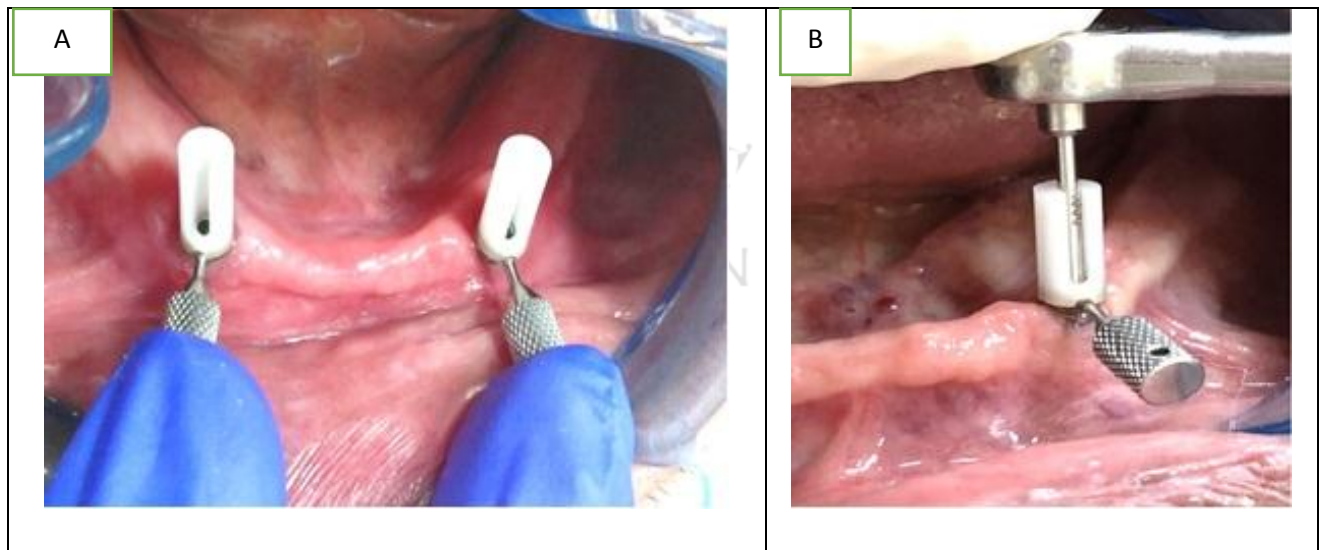


Figure No. 6: A-the Stern SNAP Handle, move the attachment until reaching the desired path of insertion.

B- While holding the handle to prevent movement, the screw torqued to 20 Ncm then the Stern SNAP handle unscrewed.

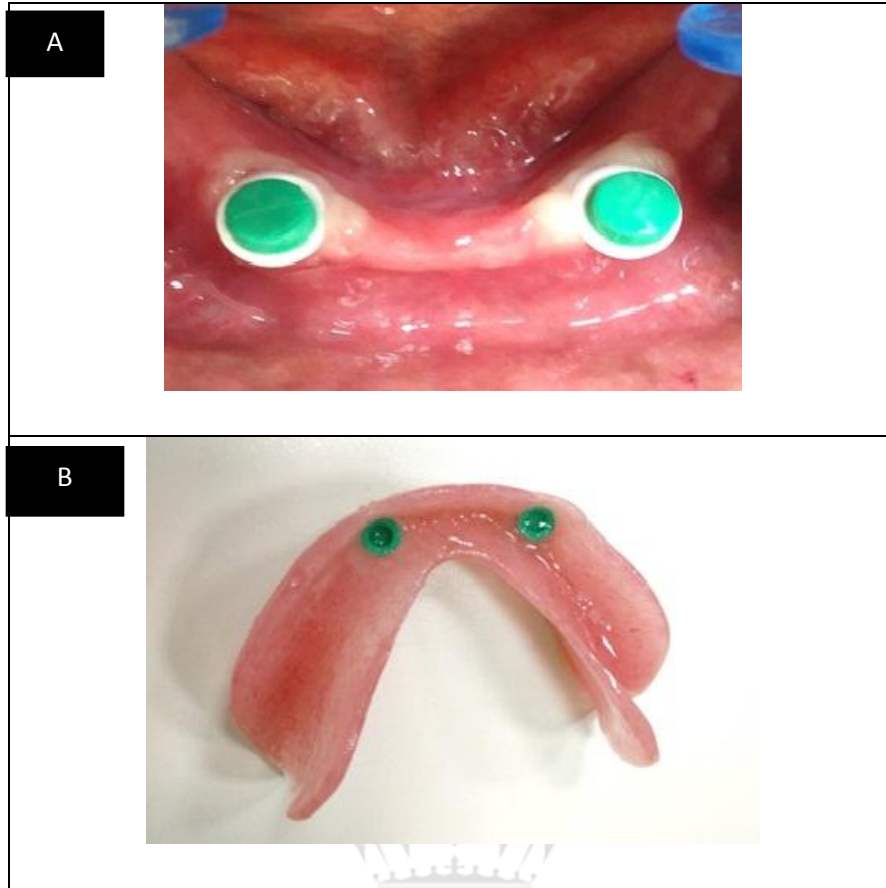


Figure No. 7: A- A white locator blocking ring was placed over the head of each attachment. The green female plastic house (no metal house) was placed onto each stern-snap attachment

B-Finishing of the fitting surface of lower denture was completed.

i OnDemand3DApp 1.0.9.3223

ii Mepecaine-L 1.8ml Alexandria Pharmaceuticals. Egypt

iii in 2 guide universal kit

iv Soft denture relining material. Promedica Dental Material GmbH

v InterActive / Swish Active 2mmL Healing Collar 3.0mmD PlatformSKU:6530-12

vi 904925abutment base, Sterngold® Dental, LLC

vii stern snap angled attachemengt, Sterngold® Dental, LLC