Submandibular fossa depth – Clinical Prosthodontic implications

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Abstract: Besides having the knowledge of oral anatomy, a dental clinician must also have a very good idea about the possibility and extent of their variance. Submandibular fossa is an essential anatomical landmark for prosthodontist, since its functional form can affect the outcome of removable and fixed prosthesis. Palpation of this anatomical landmark should be routine and compulsory, since the depth of the fossa can be subdued due to the presence of the gland. Normally the depth is considered to be in the range of 5 to 6 mm (average 2 mm), we present a unique case of an elderly completely edentulous male patient, who presented with a depth of 11.5 mm and the width of 12.7 mm. Fabrication of the complete denture prosthesis was modified for both maxillary and mandibular arches, including the design of the complete denture prosthesis.

Keywords: submandibular gland, mylohyoid ridge, floor of the mouth, pterygoid muscle

Introduction

Across most species, most of the bones are nearly similar except the mandible. Because the mandibular bone possesses many variations, it is thus considered as one of the most unique bone of the human body. Other significant features like being the only movable bone of the cranium and the only bone that has two joints which function as one further add to its uniqueness. Anatomical variations of the mandible are either due to the function or due to the presence of certain vital oral structures that grow essentially while the mandible is growing or ossifying [1]. Structures like salivary glands, nerves, vessels and muscles play significant role in mandibular development. The submandibular fossa (Synonym: fovea submandibularis, fossa submandibularis, fovea submaxillaris, submaxillary fossa) is a surface concavity within the mandible that is situated linguually on mandibular body, in the molar region. It is a landmark that houses the greater part of the submandibular gland. The fossa is an oblong depression (oval in shape) between the mylohyoid ridge and the inferior border of the medial surface of the body of the mandible [2]. It extends from the anterior border of the medial pterygoid muscle below the mylohyoid muscle to the anterior border of the latter. Anatomical variations in size and shape also depend on the overall size and shape of the skull. The extent of the lingual concavity or lingual undercut has clinical implications in the extraction of teeth, implant bed preparation and Prostodontic construction of removable dentures [3]. In surgery, lingual perforation can cause damage to vascular structures that run close to the medial aspect of the mandible [4]. Radiographic studies have demonstrated that the average depth of the submandibular fossa ranges up to a maximum value of 6.6 mm. Clinically, such width may vary. We present a unique case of an elderly completely edentulous patient whose clinical depth of the submandibular fossa as measured on the primary and final impression was 11.5 mm depth.

Case report

An elderly male patient aged 70 years reported to the male section of SDS 541 course (Clinical removable Prosthodontics), run under the supervision of Department of Prosthetic dental sciences. The patient’s chief complaint was inability to chew, as he had got his remaining natural teeth extracted about 8-10 months back. Patients medical, social and drug history were non contributory. Dental history revealed that he had few maxillary anterior teeth present, which were extracted due to mobility. The patient had never worn any oral prosthesis in the past and used to clean his natural teeth using bark wood (Miswak) throughout his life. Extra oral examination revealed an ovoid face that was relatively more in length than width. Patient had a small unilateral swelling on the left side of the alae of the nose, which was present since his birth. The patient maxillary lip was long in relative proportion to lower third of the face. Intra oral examination revealed well-formed maxillary and mandibular completely edentulous residual alveolar ridges with no abnormality of soft

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Palpation of the mandibular residual alveolar ridge revealed sudden, abrupt bilateral depressions in the submandibular fossa which created an impression of the presence of a severe undercut (Fig 1A). Close and detailed analysis (measurement) of both undercut areas disclosed that there may be no need for surgical intervention since the undercuts could be either negotiated by changing the path of insertion of the denture or using an elastomeric impression material for final impression making. However, all the options were kept open, based on which different treatment options were presented to the patient. These included implant supported fixed prosthesis, implant supported removable overdenture, conventional complete denture prosthesis with or without surgical intervention or complete denture prosthesis without surgical intervention but with balanced occlusion.

Figure 1. (A) Intra oral examination showing depression, along the posterior lingual contour of the residual alveolar mandibular ridge (B) Preliminary impression with submandibular fossa space recorded bilaterally (C) Diagnostic casts (D) Final impressions showing bilateral submandibular fossa dimensions (11.5 mm by 12.7 mm by 5 mm)

The patient consented for conventional complete denture with balanced occlusion and was open to any surgical intervention if needed. To assess the need for surgical intervention, a diagnostic primary impression was made using impression compound (Stent, UK) (Fig 1B) on a stock metal completely edentulous tray. Initially, the impression material was removed before it could harden inside the mouth. Two paths of removals were tried. One path used a direct vertical approach for removal while the other path used posterior displacement of the stock tray and then removal in vertical direction. For the first path, early (soft impression compound) removal resulted in distortion of impression material. Same did not happen when the impression was removed posteriorly first and then vertically. The measurement of the fossa was done on the diagnostic cast that was poured in dental plaster (Elite Model; Zhermack, Badia Polesine, Rovigo, Italy) (Fig 1C). Measurement for depth was done from the center of the vestibule (marked on primary impression lingual flanges) to the maximum depth of the fossa. The width of the fossa (anterio-posterior) was measured from the areas where there was a change in the lingual contours on either sides. Average of both sides was calculated and the same was then verified by taking another measurement on the final impression (Zinc Oxide Eugenol; Cavex outline BV, Holland). All clinical and laboratory procedures that are routinely done for conventional complete denture fabrication were done. All denture bases were selectively relieved in the area of submandibular fossa. This was done to prevent trauma to the tissues in case the student forgot to remove the

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denture base in the already planned direction. At the stage of denture insertion, the patient was educated regarding the direction of denture insertion, which he did it with ease. No special instructions were required other than that are given customarily.

**Discussion**

An unusual and rare dimension of submandibular fossa has been presented in this article. The anatomy and depth of the submandibular fossa in recent times, has found to generate attention from specialists especially those who practice implant dentistry. It is also significant in the field of radiology related diagnosis, oral surgeons, prosthodontists and orthodontist. The average depth in a study measuring submandibular fossa depth using CT scan has been found to be 0.4 to 6.6 mm with 80% of the studied subjects showing a depth of ≥2mm. However, our method of measurement is purely clinical and was recorded from the middle of the vestibular flange which in itself is variable from person to person and from impression to impression. On the cast, the depth of the fossa was the length of the perpendicular that was drawn from the highest point of the notch on the impression to the middle of the thickness of the labial vestibule (Fig 1D). The maximum average depth when taken from beginning of a change of lingual contour was 8 mm, which actually coincides with the one used in a CT scan. The depth of the fossa is significant for selection of implant length. Perforation of the submandibular fossa has been found with an implant length of 5 × 12 mm. The problem associated with this landmark is that it cannot be visualized on routine radiographs, where such depressions are masked by overlying compact bone. Increased concavity increases the chances of perforation of lingual cortex in the region.

Besides the implication in implant bed preparation, deeper submandibular fossa are also significant during surgical removal of teeth in the region. Mandibular posterior teeth are removed invariably with buccal traction, which pushes the apices of the molars more lingually. A thin lingual cortical plate due to deep submandibular fossa increases the chances of perforation and damage to vascular structures in the areas. Deep submandibular fossa that is bilateral creates an undercut which causes difficulties during complete denture fabrication procedures as well as the final prosthesis. Utilising undercuts enhances denture retention. However, during fabrication of complete denture, the use of rigid impression materials may distort the impression in the area which may reflect as discomfort during denture insertion and removal. A unilateral undercut is easily negotiated by changing the path of insertion (placing the denture, first in the undercut and then rotating the denture to the opposite side to engage the area where undercut is not present). Bilateral undercuts can however be negotiated by first placing the denture posterior to the undercut towards the retromylohyoid area, after which the denture is brought anteriorly to engage both undercuts simultaneously as was achieved in this case. Such technique is especially beneficial when undercuts are placed close together, for example, in the maxillary anterior region. In case the undercuts are non-negotiable, different treatment options like sectioning of a denture or use of flexible materials (soft liners) have been suggested.

**Conclusion**

Dimensions of submandibular force, including its depth can be best and correctly gauged by direct palpation, which is a part of clinical examination for a thorough diagnosis. The depth of the fossa may vary to 8 to 12 mm and should be kept in mind whenever implant placement is planned or when extractions are done in the region.

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**References**

