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Case Report

Implant location using CBCT for an implant supported overdenture

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Abstract: Various dental specialists are involved in dental implant placements for either a fixed or a removable prosthetic restoration. The location of placement is an important judgement that based on a proper clinical and radiographic examination. With advances in computed tomography the use of cone beam computed tomography (CBCT) has been seen as a significant step in minimizing improper implant placements. We present a case of an elderly patient wearing a dissatisfactory mandibular complete denture mainly due to severely resorbed mandibular residual alveolar ridge. A diagnostic CBCT confirmed the bone volume present at the future implant site predicting the use of a 3.5 mm by 8 mm implant fixtures. New complete dentures were fabricated followed by two stage surgery of placing implants. After a period of 5 months, two abutments (ball) were placed and the denture was retained on the abutments using an O ring. The patient was put on regular follow up for a period of one year.

Keywords: tomography, osseointegration, overdenture, implant fixture, implant abutment.

INTRODUCTION

Adding of the third dimension into radiographic imaging has created clinical experience to be more exciting while it has also reduced the clinical chances of error caused due to radiographic distortion. Whether clinicians with more advanced tests are less skilled than those who rely on clinical details will have to be seen in the future. The cone beam computed tomography (CBCT) is based on the principle of divergent X rays, thus forming a cone (Tischler, M. 2008; & Palomo, J. M. *et al.*, 2006). Treatment of patients with dental implants requires a multidisciplinary team approach that may involve both medical and dental specialist with appropriate skills in their respective field. Synchronizing and defining the role of each specialization lies in the hand of a restorative dentist or a prosthodontist (Rathi, N. *et al.*, 2014). Although scientifically not proven, but implant dentistry is being practiced by a wide range of individual dental specialists that include a periodontist, prosthodontist, restorative dentist, oral surgeon and even general practitioner. While placements of implants within the maxilla and the mandible needs accurate locations that correspond to the size of implant chosen by the clinician, CBCT allows inexperienced and non qualified clinicians to minimize likely damage of vital structures during implant surgery. Distances between various landmarks, the bone area and the bone volume are three important precise measurements that CBCT provides (Worthington, P. *et al.*, 2010). The CBCT also allows fabrication of a surgical guide in patients absence, thus reducing appointments and radiation exposure (Worthington, P. *et al.*, 2010). Clinically, there are two restorative options with implant prosthesis fixed and removable. While the fixed prosthetic options are practiced by many specialists, the removable prosthetic options involve mostly a prosthodontist in one way or the other. With cost being a major factor in low socioeconomic nations, the overdenture option in removable implants has gained a wide popularity among patients belonging to medium or lower socioeconomic strata. Economic issues also being a major determining factor in the practice of implant overdentures among academic institutes.

The important advantage of implant overdentures using a two implant framework design is also popular because of its simple designing in which the denture can be fabricated before implant placement and can be fitted on any implant position with ease. This clinical case report of an elderly male patient

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reports a two implant mandibular overdenture the location of the implants being identified using a CBCT computed tomography.

CASE REPORT

An elderly male patient in his fifties reported to the department of prosthodontics with chief complaint of difficulty in mastication and phonetics with his old dentures. The mandibular denture was extremely loose and the patient had difficulty in managing normal oral functions. Medical, social, drug and other related history were non contributory to the existing treatment plan. Clinical examination of the oral cavity showed a severely resorbed mandibular residual alveolar ridge (RAR) with a moderately built maxillary RAR. Orthopantograph of the patient showed complete loss of RAR in mandible with only basal bone present **(Fig 1a)**. Routine medical tests were done to enhance the possibility of implant supported prosthesis. A clinical remount of the existing dentures was done to aid in diagnosis of mounted casts. Treatment options given to the patient included a four or two implant supported overdenture for maxillary and mandibular arches, a conventional complete denture prosthesis or a relining of the old denture. The patient consented to.

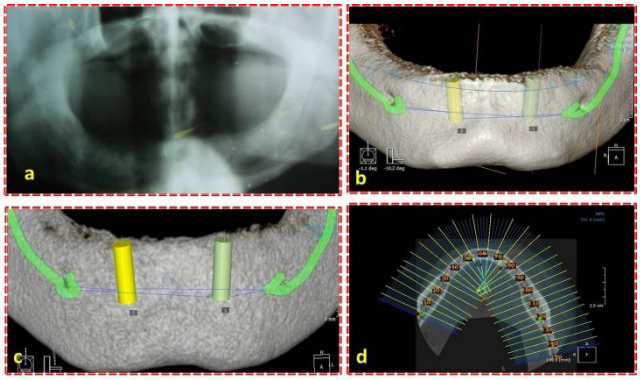

Figure 1: (a) Orthopantomograph showing resorbed mandibular ridge (b) and (c) CBCT analysis and probable location of the implants (d) CBCT showing an occlusal analysis of the ridge to determine the width of the implant

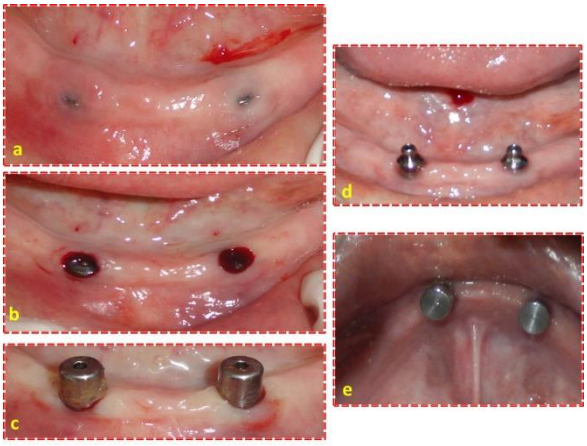

Figure 2: (a) Stage 2 surgery showing location of implants (b) punch tissue removal (c) healing cap (d) abutment placement (e) healing cap placement

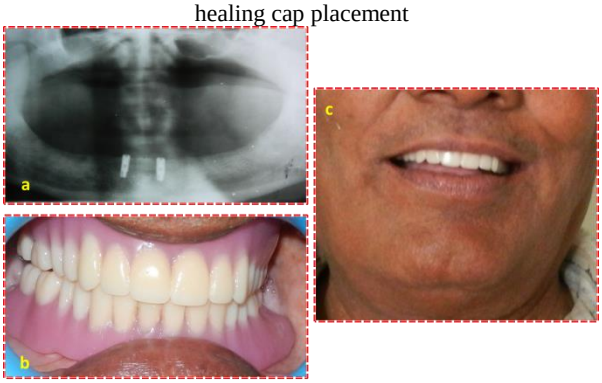

Figure 3: (a) Post surgical radiograph showing osseointegration of implant within the bone (b) complete denture prosthesis (c) completed restoration at follow up visit

The two implants supported mandibular overdenture with a conventional maxillary complete denture prosthesis. To enhance the position of the implants and to get a clear idea about mandibular landmarks a CBCT investigation was done **(Fig 1 b, c, d)**. The ideal position and inclination of implants on either side was done in relation to the mental foramen and the labial thickness of the available bone **(Fig 1b, c)**. The width of the bone at the located implant sites was found to be ideal for a 3.5 mm by 8 mm implant **(Fig 1d)**. Treatment for implant supported overdenture started with a first stage surgery in which the two implants fixtures (Nobel Bio care, Goteborg, Sweden) were placed using a CBCT generated surgical guide. After placing nylon sutures, the patient was asked to take a regimen of antibiotic (Amoxicillin 500 mg) and anti-inflammatory drugs (diclofenac sodium 50 mg) for a period of one week. The osseointegration of implants was allowed for a period for 5 months since short implants were selected with no cortical stability generated at implant placement. On the second stage surgery, the implants were located using the locator bar (#8589-2) **(Fig 2a)** following which a tissue punch was used to expose the implant body **(Fig 2b)**. This was followed by placement of a healing cap for a period of three weeks **(Fig 2c)**. Two abutments (ball with O ring) were placed over the implant fixture and their respective rings were verified for fit before screwing them into the implant fixtures **(Fig 2d)**. The patient was discharged with healing abutment placed back since some tissue around the abutment was excised **(Fig 2e)**. A post abutment placement radiograph showing the fit of the abutment was taken before commencement of the denture fitting process **(Fig 3a)**. The new denture that was fabricated before implant placement was then adjusted and the "O" ring was incorporated within the tissue surface of the denture through relieving of the denture followed by self cure resin application. The occlusion was checked and the patient was discharged with instructions regarding maintenance and care of the denture **(Fig 3b, c)**. The patient was put on a follow up and on subsequent appointment, he was highly satisfied with the outcome of his dental treatment.

DISCUSSION

An elderly completely edentulous patient restored with a two implant mandibular overdenture and maxillary conventional complete denture has been described. The diagnostic evaluation of the case has been done using a CBCT radiograph which was mainly used in this case to locate the most suitable implant location and critical anatomic landmarks. The urge to use the CBCT in this case was mainly to find the amount of available bone labiolingually in the symphysis menti region, which is a region where the labial cortical plate runs posteriorly before terminating into mental protuberance thus decreasing the labiolingual thickness of the bone. Implant placement can penetrate the thin cortical bone, resulting in failure. Since the thickness in this case was also less, it helped us to determine the length of the implant that would be suitable for the case. A 2- implant supported overdenture has been stated as a minimum standard of care in completely edentulous patients (Rathi, N. *et al.,* 2019; & Feine, J. S. *et al.,* 2002). While the fabrication of the prosthesis is done first before attaching it to the implants, the clinical procedures for fabricating implant overdentures are simple. The only critical procedure being the implant placement is in its presumed accurate location which is enhanced by radiographic and surgical templates with more accuracy through using CBCT (Engelman, M. J. *et al.,* 1988; & Mattoo, K. *et al.,* 2014).

The use of two individual ball abutments was preferred over the fabrication of bar over two implants for increasing the longevity of both implants and decreasing error in alignments (Misch, C.E., & Crawford, E.A. 1990). Use of existing dentures to be used as a surgical guide that should be decided on the existing condition of the complete denture. Bear *et al.*,, in their study of facial measurements to determine vertical dimensions reported use of the pupil Stomion landmark since it shows least deviation between completely dentulous and completely edentulous patients (Brar, A. *et al.,* 2014). Although various soft tissue landmarks extraorally can be used to evaluate the existing discrepancies in the vertical dimensions of the denture, one should be sure about the use of existing dentures. For this patient, we used a method described by Kumar *et al.,* (2011), which reflects the amount of freeway space present in the existing denture by presenting it outside the oral cavity. The correct vertical dimension in the existing denture is paramount for the success of implant supported prosthesis. Increased vertical dimensions of the denture increase the forces on the implant and lead to abrupt and sudden closure by the patient. This inadvertently increases the forces on the implant and the forces rather than functional become parafunctional in nature. The attachment of plastic rings to the implant abutments was done according to the principles of implant overdenture while technique utilized to attach was similar to that reported in the previous literature (Minocha, T. *et al.,* 2020).

CONCLUSION

Lower socioeconomic patients requiring a minimum standard of effective dental health care can be accomplished successfully using a two implant overdenture. Patient satisfaction with such prosthesis motivates other patients to seek same care.

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