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Osseo densification - A novel technique for implant placement

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Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Introduction: The primary stability of dental implants originates from the engagement with the cortical bone mechanically, whereas the secondary stability is known by means of osseointegration through the bone formation and remodelling from the cancellous bone. Osseo densification is an innovative biomechanical technique for dental implant placement. It uses Densifying Burs to produce low plastic deformation owing to its non-excavating densifying method which preserves the bone.

Objectives: To evaluate the Osseo densification (OD) technique used in implant site reparation by using Densah burs.

Materials And Methods: Three dental implants were placed in two patients: using the new Osseo densification drillingtechnique.

Results: The results showed a significant improvement in both primary and secondary stability using Densah burs.

Conclusion: Densah burs produce better bone quality around the implant than conventional drills. It improves Primary and secondary stability as well.

Keywords: Remodelling, Osteotome Technique

Introduction

On recent times, the replacement of missing tooth with dental implants has become a well-known treatment modality.

For long-lasting clinical outcome of implant thereby it is necessary to achieve primary implant stability. Other factors, such as bone quality and quantity, surgical techniques are important for achieving the same. Maintaining sufficient bone density and bone bulk are essential factors to achieve bone-to-implant contact for obtaining a biomechanically stable implant.

A new technique has been developed by Salah Huwais in 2013 which enhances the bone density around dental implants known as Osseo densification (OD). This relatively new concept with universally compatible drills have been proposed to help in better osteotomy preparation, bone densification, indirect sinus lift and achieve bone expansion at different sites of varying bone densities. Osseo densification technique utilizes custom-designed burs, which allow bone preservation and condensation through compaction autografting during osteotomy preparation, thereby increasing primary stability than conventional implant drills.[1]

The challenges for achieving primary stability are often found in maxilla where bone is deficient both in terms of quality and quantity. However, there are several surgical techniques introduced in the past for enhancing primary stability in such low-density areas.

Some of these are enumerated as follows:

Under sizing the osteotomy is a common practice, especially in narrow ridges to preserve bone bulk; but under sizing the osteotomy may create a high degree of bonemechanical strain.[2]

Osteotome technique

This is one of the alternatives, which was introduced by summers et al.[3] for low-density bone, particularly the maxilla. This technique compresses the trabecular bone laterally and apically with minimal trauma, leading to improved bone density.[4]

Although alveolar ridge expansion is achieved by the osteotome technique, the pressure exerted on the crestal cortical bone could cause increased peri-implant marginal bone loss, which eventually decreases secondary stability.[5]

Drilling protocol as a whole, be it under sizing osteotomy or conventional method or osteoma technique for dental implant placement, has several drawbacks such as heat generation and bone removal, which worsens the stability in low-density bone.

Materials And Methods

The study was approved by institutional review board. The study was conducted in the department of periodontology to evaluate the stability and crestal bone loss (CBL) of implants placed using OD drilling technique. Oral and written information was given to the patient regarding the risk of surgery and written informed consent and ethical clearance was obtained. Two patients were treated with OD drilling technique. Three implants were placed in two patients.

Case Report 1

A 47-year-old female patient reported to the Department of periodontology with missing maxillary anterior 21, 22, 23 (Fig1). Radiographic examination revealed that the available crestal bone width with 21 was 4.10mm and height with 21 was15.4mm. Crestal bone width with 23 was 4.35mm and height was12.72mm.

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Fig 1: After thorough history was recorded and necessary investigations like

1. OPG
2. CBCT
3. Complete blood count
4. BT, CT
5. Blood sugar tests were done.

The patient was scheduled for surgery. The patient was asked to take antibiotic coverage of amoxicillin 2g 1 hour for prophylaxis prior to surgery. Subsequently, patients were instructed to rinse with 0.2% chlorhexidine solution for 1 min and expectorate. After this pre-operative procedure were completed, sterile surgical drapes were used to cover the patient's chest to reduce the possible contamination from extraoral sources. Under local anesthesia the surgical procedure was carried out. After administration of local anesthetic (Lignox 2%, Warren Pharmaceuticals), a crestal incision was placed and a full thickness flap was reflected. A pilot drill of diameter 1.5mm was used for initiation of osteotomy. This was done using the pilot drill in a clockwise direction. Radiographs were taken to confirm the position of pilot drill.

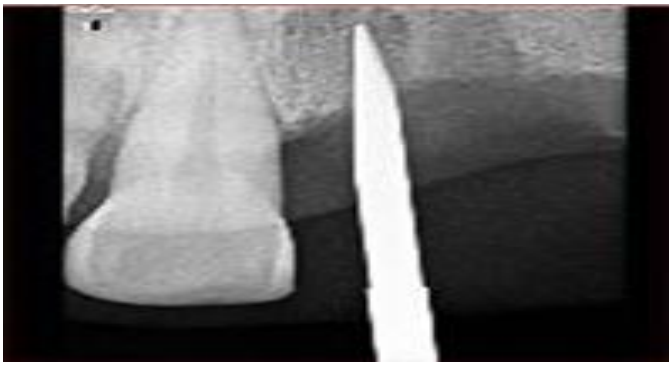

Fig 2: Once the initial osteotomy was determined, it was then sequentially expanded using the Densah burs in densification mode, which involves using the drills in a pumping motion with copious saline irrigation in counter clockwise direction. Two implants of 3.5mm diameter and 11.5mm length were placed into the prepared osteotomies and cover screws were placed.

Fig 3: Primary closure was achieved using silk sutures and was submerged for healing. These sutures were removed 1-week postoperatively.

Fig 4: Immediate post-operative radio graphs were recorded to assess the final position of theimplants.

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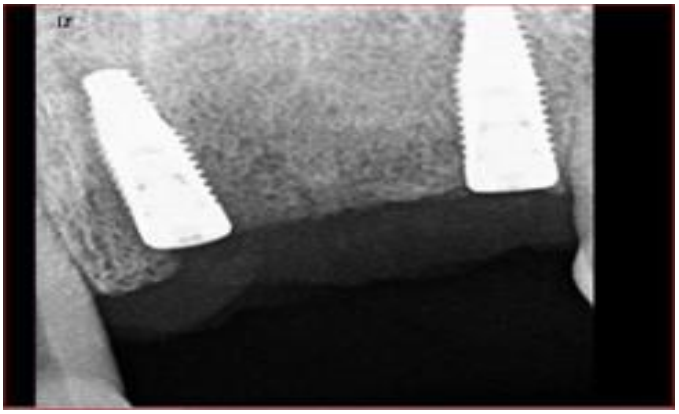

Fig 5: Patient was instructed to follow a soft and tepid diet in the first 3 days after surgery, along with instructions for oral hygiene. Patient also received a prescription for Amoxicillin 500 mg, one tablet every 8 h for 7 days, starting 1 h pre-surgery. Additional prescriptions included anti- inflammatory and analgesic drugs for 3 days along with antacid twice a day for 7 days.

Following 3 months, the second stage was initiated, and healing abutments were placed. After 10 days the closed tray impressions were recorded, and a screw retained prosthesis was delivered.

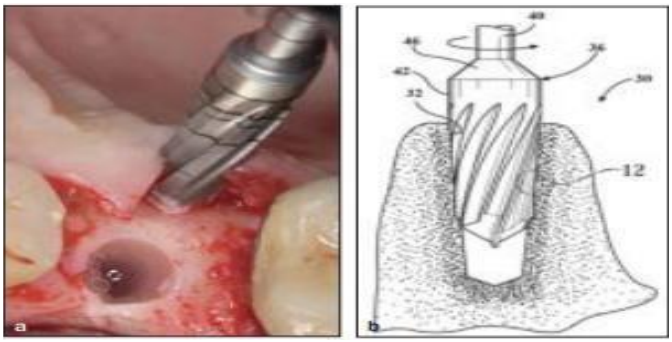

Fig 6: (a) Densifying bur preparation of an implant site in bone through osseous densification, a none traction technique that creates a layer of compacted bone along the surface of an osteotomy (b)

Case report 2

A 41-year-old female patient reported to the Department of Periodontology with chief complaint of fractured prosthesis with maxillary left posterior region with 23, 24, 25. Patient wanted to replace missing teeth with implant prosthesis. Radiographic examination revealed that the available ridge width at 24 region was 3.9mm and ridge height at same region was 12.22mm. After thorough history was recorded and necessary investigations like

1. OPG
2. CBCT
3. Complete blood count
4. BT, CT
5. Blood sugar tests were done.

The patient was scheduled for surgery. The patient was asked to take antibiotic coverage of amoxicillin 2g 1 hour prior to surgery for prophylaxis. Subsequently, patients were instructed to rinse with 0.2% chlorhexidine solution for 1 min and expectorate. After this preoperative procedure were completed, sterile surgical drapes were used to cover the patient's chest to minimize the potential contamination from extraoral sources.

The surgical procedure was performed under local anesthesia. After administration of local anesthetic (Lignox 2%, Warren Pharmaceuticals), a crestal incision was placed and a full thickness flap was reflected.

Fig 7: (Full thickness reflected and osteotomy was initiated with pilot drill)

Osteotomy was initiated with a pilot drill of 1.5mm diameter. This was done using the pilot drill in a clockwise direction. The position of pilot drill was confirmed by taking a radiograph.

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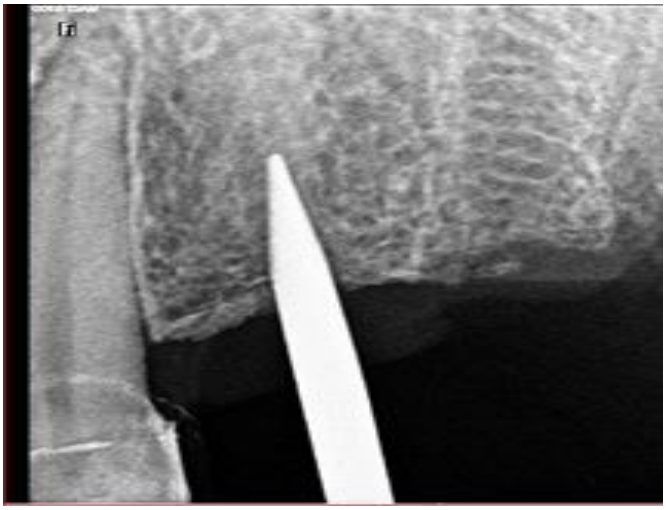

Fig 8: Once the initial osteotomy was determined, it was then sequentially expanded using the Densah drills in densification mode, which involves using the drills in a pumping motion with copious saline irrigation in counter clockwise direction. One implant of 3.5mm diameter and 10.5mm length was placed into the prepared osteotomy and cover screws was placed.

Fig 9 and 10: showing placement of implant with cover screw radiographically andclinically

Primary closure was achieved using silk sutures and was submerged for healing. These sutures were removed 1-week postoperatively.

Fig 11

Patient was instructed to follow a soft and tepid diet in the first 3 days after surgery, along with instructions for oral hygiene. Patient also received a prescription for Amoxicillin 500 mg, one tablet every 8 h for 7 days, starting 1 h pre-surgery. Additional prescriptions included anti- inflammatory and analgesic drugs for 3 days along with antacid twice a day for 7 days. After a gap of 3 months, the second stage was initiated, and healing abutment was placed. After 10 days the closed tray impression was recorded, and screw retained prosthesis was delivered.

Discussion

The concept of improving the quality/quantity of bone to increase its stability of implant has previously been studied and main goal of it is to achieve improved initial stability in sites where sinus elevation is necessary. The osteotome technique by gradual expansion causes compression of surrounding bone by using hand driven device which leads to increased insertion torque value. This is an indication of improved primary stability which is perceived by clinician. In Osseo densification drilling technique, interfacial remodelling was seen where primary engagement between the bone cortical shell and both implant types regardless of surgical instrumentation existed. Also, no negative bone response signs like extensive remodelling and extensive micro cracks which leaves large void space between implant and surrounding bone that could be the cause of potentially compromise the system biomechanical competence was observed, regardless of surgical instrumentation and type of implant employed. Also, in Osseo densification, non-vital bone debris acted as an autograft. Histological observation of this autografted particles showed active superficial and bulk remodelling. The current clinical case suggests that there is improved primary stability and bone-to-implant contact in Osseo densification

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drilling technique regardless of implant microgeometry.[7] however, this study has given us a global vision of results that are obtained by Osseo densification technique and its possible use. In terms of primary stability and to decrease the chances of implant micromovements, the interface implant-bone plays a major role. Failure to achieve this may cause loss of implant. So, the research on methods to enhance this technique shall be a priority in the foreseeable future. The Osseo densification technique might get application in numerous fields of surgeries including orthopaedic surgery, where failure of screw causes severe complications that needs to overcome. When autologous bone is of poor quality, this technique seems to be promising.[8]

Conclusion

Osseo densification is a novel osteotomy preparation method in which bone is preserved. Osseo densification utilizes proprietary high-speed densifying burs for compaction and autografting of bone. Its result is an expanded osteotomy with preserved and condensed bone tissue that maintains alveolar ridge integrity particularly in deficient alveolar ridges. Osseo densification results implant placement with enhanced primary as well as secondary stability. The healing process is accelerated due to bone matrix and cells which are maintainedin situ.

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