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Case Report

Symphysial Appositional Graft to Restore the Upper Central Incisor Site: A Case Report

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Abstract

Before implant placement, a 3D exploration to the bone volume is crucial. In some cases, we face bone defects that should be treated through alveolar ridge augmentation in order to create enough bone for endosseous implant. Two major materials have been described in this procedure: xenografts and autogenous bone graft which has been always the gold standard for bone defect corrections. In this case report, we will discuss the use of autogenous block graft from the symphysis as a method to increase bone width in order to restore the upper right incisor using an endosseous implant.

Keywords: Symphyseal Appositional Graft; Endosseous Implant; Guided Regenerated Bone; Implant Supported Prosthesis

Introduction

Today, implantology is an important part of the practitioner's therapeutic arsenal. Integrated into the treatment plan of oral rehabilitation, it can avoid the use of removable prostheses or fixed restorations that sometimes require the preparation of healthy teeth. Implant-supported restorations, obeying functional as well as aesthetic requirements, will sometimes urge the use of bone grafting techniques in order to overcome these difficulties.

These procedures, aiming to increase bone volume, have been developed in recent years. From the progress made in allograft and xenograft to more elaborated solutions such as guided tissue regeneration (GTR). However, it seems that in comparison to all these operating modes previously mentioned, from a biological, immunological and even medico-legal point of view, autogenous bone has proven its superiority. This is why we are particularly interested in this type of rehabilitation.

Autogenous bone grafts have now been used for more than thirty years in pre-implant surgeries. It is still considered, at the present time, as the gold standard for bone reconstruction.

In this case report, we will discuss the use of autogenous block graft as a method to increase bone width in order to restore the upper right incisor using an endosseous implant.

Case Presentation

N.B a 23-year-old female patient has consulted to the Outpatient department of the Monastir Dental Clinic, Faculty of Dental medicine (TUNISIA). The clinical exam revealed the absence of the upper right central incisor due to an ancient trauma (Figure 1).

The endo buccal exam revealed a concavity on the buccal side of the crest which is so typical in the case of a trauma. This concavity might give us an assumption of crest width that could be insufficient for implant placement. To confirm the diagnosis, radiographic explorations has been realized (Figure 2): an orthopantomography (OPG) and a cone beam computed tomography (CBCT). The OPG confirmed the absence of a remaining root tip. To explore the width of the alveolar ridge, CBCT scan confirmed the presence of a buccal bone depression (width = 4mm).

After clinical and radiological exams confrontation: a zircon crown supported by an endosseous implant after a block graft harvesting from the symphysis was retained.

Figure 1: Frontal and occlusal intra oral views.

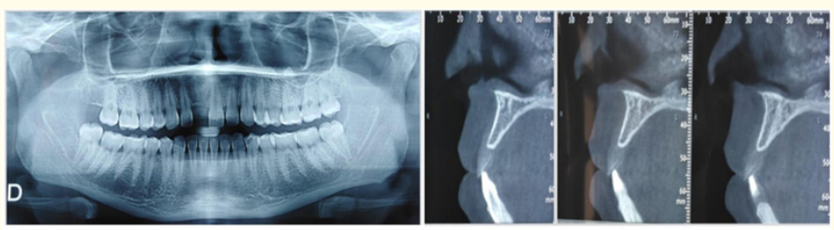

Figure 2: Radiographic explorations (a): OPG (b): CBCT.

Additional CBCT scan has been made to explore the symphyseal area, evaluating bone dimensions and anatomical obstacles (Figure 3).

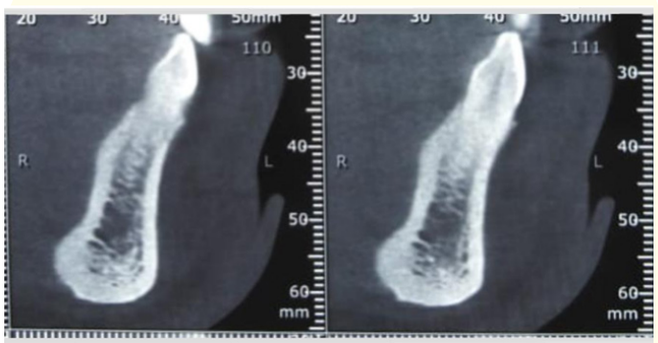

Figure 3: CBCT scan of the symphyseal area.

Seven days before surgery the patient was undergoing scaling and root planning and trained to correct hygiene procedure. On the day of the surgery, the patient rinsed with 0.2% chlorhexidine for one minute.

Block grafting surgical procedure

Receiving site

Local anesthesia was administered. We started by a straight vertical incision that continues with a sulcular incision, and finally two realising incisions to guarantee flap mobility. A proper flap reflection using Howarth periosteal elevator is the key to have an adequate visibility and accessibility to the alveolar ridge (Figure 4).

The graft dimensions evaluation on the receiving site was measured using a Marquis coded probe. In this case it was 12mm/8mm. Those measures should be marked on the donor sites during harvesting (Figure 5).

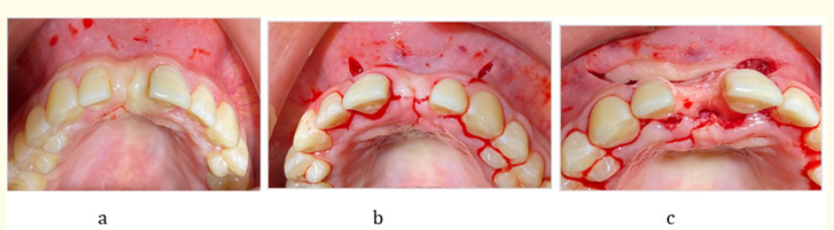

Figure 4: (a) anesthesia injection; (b) incision; (c) flap reflection.

Figure 5: Graft dimensions evaluation.

The flap has to be a mucoperiosteal one and must be raised sufficiently over the mucogingival junction in an apical direction for at least 10 mm to cover the graft.

With conventional dental forceps, we hold the flap in a coronal direction to evaluate the tension during coverage of the augmentation site.

With a new scalpel (blade No. 15) and at the distal part of the flap perpendicular to the periosteum, the periosteum should be cut without stopping at a depth of 1–3 mm. Always moving the blade in a direction from distal to mesial. The blade should cut the tissue in a level apical to the mucogingival junction to avoid flap perforation.

After this step, pulling the flap and checking for a tension-free flap advancement is very important. In case of insufficient closure, small parallel cuts on the internal face of the flap to detach any muscle insertions will give more mobility.

Finally, the buccal flap has been adequate in a way that the margin covered on the lingual or palatal site at least of 3-5 mm. (Figure 6).

Figure 6: Flap adaptation after periosteal incisions.

The final step before moving to the donor site surgery is to perform small perforations in the cortical bone to get to the spongious bone which will assure the internal vascularization of the graft (Figure 7). Those perforations permit the access to the medullary endosteal spaces. It is an important source of osteoprogenitor cells that will boost bone cicatrisation simultaneously with the periosteum.

Figure 7: Cortical bone perforation.

A saline-soaked compress is then placed at the recipient site while harvesting the graft from the donor site

Donor site

After local anesthesia, two incision at the marginal limit of keratinized gingiva (security zone of 5 mm to avoid recessions) (Figure 8 (a)) and two releasing incision gave an optimal access to the symphyseal bone . A full thickness flap was reflected with a sufficient visual access to the surgical site. (Figure 8(b)*) . Osteotomy was performed using a piezoelectric device (O T 7 insert) creating a unicortical cut (Figure 8(c)*). The cuts were made at least 5 mm inferior to root tips and 5 mm superior to the inferior border of the mandible and 5mm to the mental foramen respecting the rule of MISH . The cuts limits should exceed the graft dimensions specially at the angles in order to guarantee its separation from the bony tissues around it. The graft was harvested with an osteotome and was recontoured to adapt it to the receiving site (Figure 8(d)*). The donor site was filled with an haemostatic agent (surgicel ©) (Figure 8(e)*). The periosteum and muscle attachment were carefully sutured in one layer. The mucosa closed as a second layer using resorbable sutures to avoid bone exposure during cicatrisation (Figure 8(f)*).

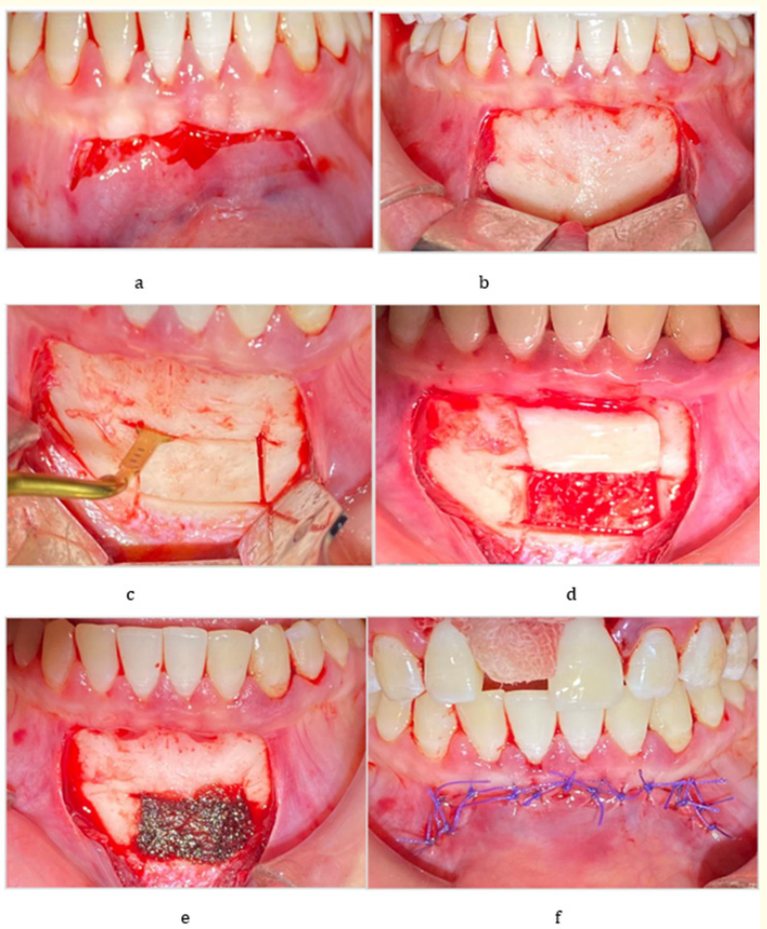

Figure 8: (a) incision; (b) flap reflection; (c) piezoelectric corticotomy; (d) graft harvesting; (e) surgicel© filling; (f): suture.

The Graft was placed back into the receiving site (Figure 9(a)*). It was stabilized with 2 titanium screws (2 × 10mm) (Figure 9(b)*). Xenograft was placed around the margin of harvested graft for a butter healing shape then all the graft was covered by a second layer of xenograft to fill the space between it and the alveolar ridge (Figure 9(c)*). It was then covered by a resorbable collagen membrane which should passe the graft limits by 2mm to unsure epithelial cells exclusion and graft stability (Figure 9(d)*)

After stabilizing the collagen membrane, the site was closed with 3–0 sutures. An apical mattress suture was performed to translate the tension line apically and also for more stabilization to the membrane. Then for wound closure, classic O sutures have been used (Figure 10).

Post-operatively, the patient was given antibiotics, analgesics and anti-inflammatory medication. The patient was recalled every alternate day to check for wound dehiscence and hematoma.

One month later, a ceramic provisional restoration has been bonded while waiting graft healing which is 6 months at minimum (Figure 11).

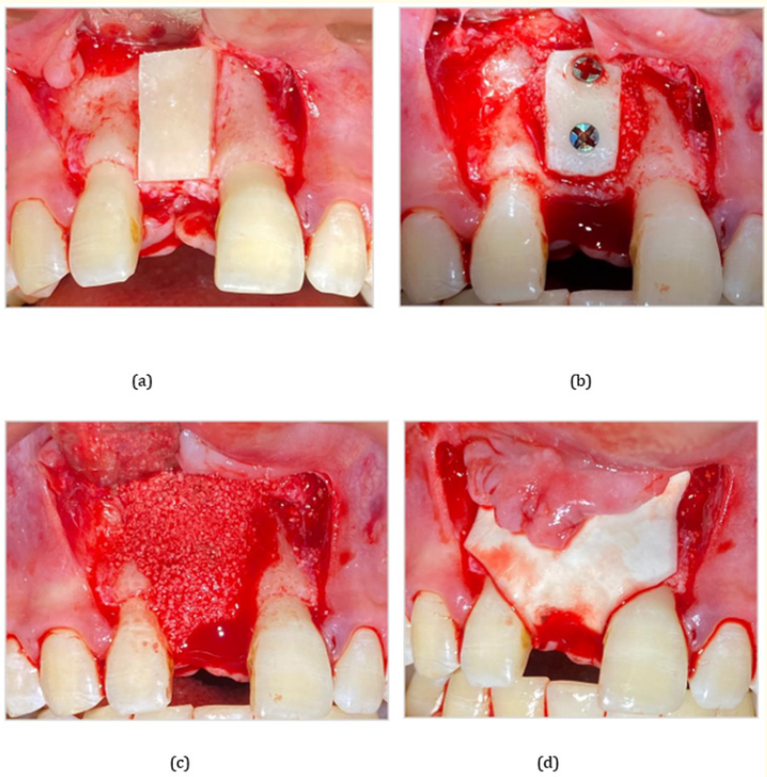

Figure 9: (a) graft adaptation; (b) graft fixation; (c) xenograft; (d) collagenic membrane adaptation.

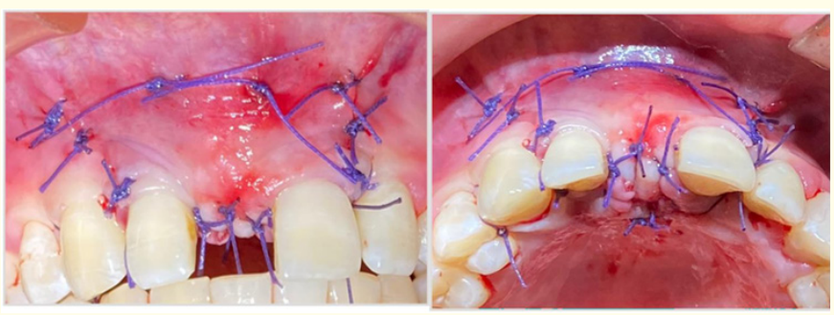

Figure 10: Post operative view after sutures.

Figure 11: Temporary ceramic restauration.

After 10 months (Figure 12*) the CBCT scan showed a gain in bone width (3mm at least) that allows us to move the implant placement. The implant size was selected as per CBCT measurements and was finalized as 3.6 × 10 mm.

Implant surgery procedure

A crestal incision was given along with 2 releasing incisions around the 11 region (Figure 13(a)*). Full thickness mucoperiosteal flap was reflected to expose the titanium screws which were then removed (Figure 13(b)*). Following this, biotech dental Implant (3.6 × 10mm) was placed (Figure 13(c)*). Primer stability was above 45Ncm^{-1} so healing abutment was screwed in the same surgery (Figure 13(d)*). The site closed using 3-0 suture (Figure 13(e)*). After 3 months, secondary stability was verified and crown prosthesis was delivered (figure 13(f)*).

Figure 12: CBCT scan after 10 months.

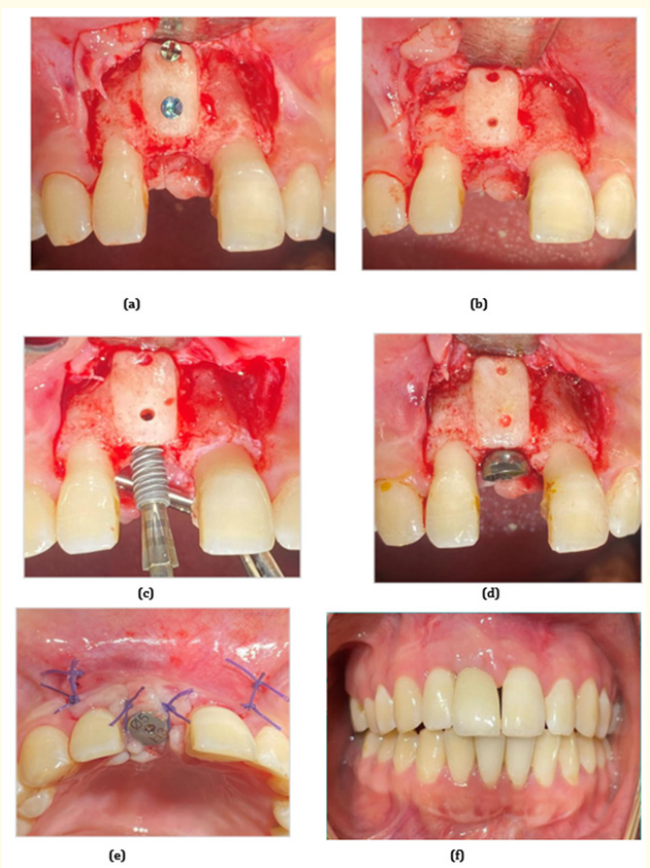

Figure 13: (a) Graft shape; (b) screws removal; (c) implant placement; (d) healing abutment screwing; (e) suture; (d) the final prothesis.

Discussion

The key to a successful aesthetic and functional implant treatment is to achieve a harmonious relationship between the implant-supported restoration and the natural teeth.

Ideally, the implant should be in line with the future prosthetic tooth and in line with the bone crest. In cases of deficient bone volume, the use of angled abutments can correct an offset emergence profile. However, according to Bahat., *et al*. (2007), and due to many factors (aesthetic, mechanical, etc.), surgical reshaping always seems to be preferable to the modification of supra-implant abutments [1].

According to Baudoin., *et al,* Abd El Salam and Davarpanah., *et al*, the width of the alveolar ridge should allow the implant to be covered on all sides by a minimum of 1mm of bone [2-4].

There are many types of grafts which can be used to correct the crest dimensions. In this case we have used appositional autograft.

Autografts

An autogenous bone graft is an autograft based on taking bone tissue and grafting it into the same individual. Widely used, this graft represents one of the most interesting techniques because of its osteogenic potential. The presence of osteoinductive cells and growth factors will stimulate the proliferation of osteoblasts and bone apposition. As a result, due to those many properties (osteogenesis, osteoinduction and osteoconduction) autogenous bone grafting is the technique of choice among the various materials that can be used for fillers and grafts [5,6].

As an autogenous, bone it has many advantages: The first advantage is that the graft eliminates, by definition, any risk of rejection of immunological origin and of transmission of infectious diseases (bacteria, virus, prion) [7]. Moreover, knowing that bone regeneration is governed by the three basic mechanisms of osteogenesis, osteoconduction and osteoinduction, it is interesting to remember that autogenous bone initiates these three processes. Autogenous bone is osteogenic (because it contains living bone cells), osteoinductive (because of the presence of matrix proteins) and osteoconductive (the bone framework guides remodelling), which makes it the most effective graft material in most clinical situations (Zerah, 2004) [8-10].

At the same time, it has some disadvantages such as the necessity of a second operative site: the donor site. This means that the possible postoperative consequences inherent in this surgery must be taken into consideration.

[11]. It is this disadvantage that has led some authors, to use allogeneic bone, or synthetic materials, if the autogenous bone is not used [12]. Another major disadvantage of autogenous bone grafting is it's more or less significant long-term resorption. This resorption will be all the greater as the constraints are greater [13,14].

In addition, the availability of this autogenous bone can also be a disadvantage, as in the case of an important reconstructions where heavy interventions are to be considered (cranial or iliac harvest, for example).

Appositional grafts

(Used in this clinical case). According to Maujean., *et al*, appositional bone grafts correspond to the addition of material in the form of screwed bone blocks or autogenous (and/or exogenous) bone particles, whether or not covered by a membrane, to a site with a quantitative or qualitative bone deficit [15,16].

It can be used for

Horizontal alveolar reconstructions. This is the typical indication for block grafts but also for thin ridge expansions. - Block grafts: Horizontal bone loss most often requires autogenous bone harvesting en bloc during symphyseal or retromolar harvesting [17,18].

The first intra-oral donor site described in pre-implant reconstructive surgery is the mandibular anterior donor site or "symphyseal site». It is an easily accessible donor site that allows harvesting under local anaesthesia.

In fact, symphyseal bone in its massive form (cortical blocks), is used for the treatment of limited or medium-sized crest height deficiencies [18]. Crushed and used alone, or in association with bone substitute materials possibly supplemented by membranes obtained by blood centrifugation (PRF).

Quantitatively, it is possible to obtain a graft of up to 5 cm in length (in one or two pieces), 5 to 6 mm in thickness and 12 to 15 mm in height, depending on the subject (19). In 1999, Misch compared the two harvesting sites, retro molar and chin, and noted that the latter is easier to access and has a larger volume; it yields a thick cortico-cancellous block with an average size of 1.74cm^3 (20). For harvesting the symphyseal graft, osteotomy cuts were given conventionally according to the rule of 5mm by Misch [21].

Inherent contraindications to symphyseal harvesting: [22] Insufficient height at the basal bone level, a treatment plan involving placement of implants at the mandibular anterior ridge, A bony defect greater than 4 teeth in extent, or with very significant vertical bone loss, in which case the indication for an extraoral donor site will be preferred.

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The graft healing takes place in several phases. The first, which is dependent on the recipient bed, consists of an inflammatory reaction with the penetration of vascular buds into the grafted material, providing the mediators involved in neovascularization and cell migration. Those buds are from two origins: the first is endosteal, the second is periosteal [23]. Thanks to this revascularization, the physiological processes of osteoclastic resorption and bone neoformation will, as during physiological bone remodelling, progressively and more or less completely lead to the replacement of the graft by neo formed bone [24].

For a minimum bone resorption during healing, any pressure after bone volume increasing should be eliminated via two methods: flap design and suture technique.

Incision design and flap reflection techniques may increase flap mobility, allowing the flap to rest passively over the membrane and increased volume of graft material. Most strategies combine flap extension, vertical incisions, and periosteal releasing incisions to increase mobility and passivity of full thickness (mucoperiosteal) flaps. Park., *et al*. [25] found that the addition of one vertical incision extends the length of the flap by 1.1 mm, the second vertical incision extends the flap 1.9 mm from baseline, and a periosteal releasing incision extends the flap by 5.5 mm from baseline. Raising the flap has an immediate consequence: it becomes mobile. This mobility will create additional tension.

The key to eliminate all tension and mobility, according to Alain SIMONPIERI., *et al*. [26] is the suture that must immobilise the vestibular flap. This is the principle of the apical mattress suture which will immobilise the flap creating a completely tension-free zone. This absence of tension will prevent not only the early reopening of the flap, but also creates a shortening of the vestibular flap, resulting in thickening of the gingiva especially in its keratinised part.

For a maximum exploitation of bone volume, the software should be used to vary for each implant: - its dimensions: diameter and length its inclination in the vestibulo-lingual/palatal and mesio-distal planes as needed.

This is the only method that allows the double obliquity of an implant to be visualized simultaneously.

Depending on the available bone volume, several solutions are often possible if one takes into account the prosthetic constraints, the dimensions of the available implants and their possible inclinations. All these solutions can be considered by implant simulation, and the one corresponding to the best compromise between all these factors will be retained.

Conclusion

Autogenous bone was and still the gold standard solution for bone defects. The evolution of instrumentation (piezo devices) and 3D radiographic explorations have made harvesting more accessible for practitioners. it should be always introduced to the patients as a first therapeutic plan. In case of a contraindication, then bone substitutes (xenografts etc…) can be exploited.

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