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Case Report

Integrated management of extraction sites: Socket preservation to final prosthesis: Case report

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Abstract

Socket preservation after tooth extraction helps maintain alveolar bone volume, supporting future implant placement and prosthetics. Implant stability is essential for successful osseointegration and is measured by ISQ values, ranging from 1 to 100. Higher ISQ values (above 60) indicate good primary stability, predicting better healing and long-term implant success. This case report aim to evaluate the feasibility of implant placement following socket preservation in sites with reduced bone volume after tooth extraction, by measuring implant stability using ISQ values through resonance frequency analysis (RFA). This case report includes one patient with inadequate bone volume after tooth extraction. Patient underwent socket preservation before implant placement. ISQ values were measured at baseline (implant placement) and again after 3 months (during prosthetic rehabilitation). Case report demonstrated favorable outcomes, with successful implant integration and effective bone preservation following socket preservation before implant placement. ISQ measurements indicated good primary stability at implant placement, with values above 60, and continued stability at prosthetic rehabilitation, with ISQ values exceeding 70. This case report demonstrates that socket preservation in sites with reduced bone volume after tooth extraction can effectively maintain alveolar bone, facilitating successful implant placement. The favorable ISQ values observed at implant placement and after three months indicate good primary stability and sustained Osseo integration, supporting the feasibility of this approach. Thus, socket preservation proves to be a valuable technique to enhance implant stability and improve long-term treatment outcomes in compromised extraction sites.

Keywords: Socket preservation, Implant stability quotient (ISQ), Radio frequency analysis (RFA), Primary stability, Secondary stability

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1. Introduction

The success of implant therapy is now evaluated not only by implant survival but also by the long-term aesthetic and functional outcomes. Currently, implant placement should be prosthetically guided, ensuring precise three-dimensional positioning to provide optimal support and stability for the surrounding hard and soft tissues.

"Alveolar ridge preservation" describes procedures performed at the time of tooth extraction aimed at minimizing external resorption of the alveolar ridge and promoting bone formation within the dental socket. The term was originally introduced by Dr. Robert G. Schallhorn in 1982 as "bone maintenance."[2] It is also known by synonyms such as "socket preservation" (SP), "ridge preservation," and "socket grafting."

According to a 2011 consensus, the goal of SP is to support the remaining hard and soft tissues, maintain sufficient bone volume for ideal functional and aesthetic results, and facilitate future treatment.[3] This procedure can be carried out using various bone graft materials, barrier membranes, or a combination thereof. SP can be categorized into three types based on the resorption rate of the grafting material used. The first category represents a long-term preservation approach, typically applied when only prosthetic restoration is planned without implant placement. The second category involves medium-duration preservation with slowly resorbing materials that maintain bone volume over an extended period. Implant placement can occur after

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primary healing, even if residual graft particles remain, making it suitable for cases where implant placement is significantly delayed. The third category is short-term preservation, designed to maintain tissue volume during the initial healing stages, with implant placement performed shortly thereafter. While SP and socket augmentation are procedures performed at the time of tooth extraction, guided tissue/bone regeneration and augmentation refer to treatments done prior to or during implant placement.[4]

A major advancement in implant dentistry occurred in the 1960s when P.I. Brånemark and his team introduced the concept of osseointegration — a biological process where the implant surface forms a direct, stable connection with living bone without any intervening fibrous tissue. Osseointegration remains the cornerstone of modern implantology, ensuring long-term implant stability and integration.[1]

Implant success is primarily dependent on its stability, which occurs in two distinct phases: primary and secondary stability. Primary stability is achieved immediately upon implant placement through mechanical engagement with the cortical bone. This initial stability is influenced by factors such as bone density, implant design, and surgical technique. However, primary stability alone does not guarantee long-term success, as it typically decreases during early bone remodeling.[7]

Secondary stability develops biologically over time as new bone forms around the implant. The transitional period between these phases, usually within the first two to three weeks after placement, is critical and may show a temporary decline in stability before remodeling strengthens the implant interface.[7]

Factors like bone quality, implant surface modifications, and surgical approach affect the overall implant stability and osseointegration. Several methods have been developed to assess implant stability, including insertion torque analysis, Periotest, and removal torque testing, though these often have limitations in accuracy and reproducibility.

Resonance frequency analysis (RFA), introduced by Meredith et al. in 1996, has become a widely accepted technique for evaluating stability. It uses the Implant Stability Quotient (ISQ), which ranges from 1 to 100.[6] Higher ISQ values indicate greater stability: readings above 70 generally reflect excellent osseointegration, values between 57 and 60 suggest borderline stability requiring close monitoring, and values below 57 may necessitate longer healing or additional interventions. While primary stability often corresponds with high ISQ values initially, secondary stability is marked by a gradual increase in ISQ as bone remodeling reinforces the implant-bone connection. Tracking ISQ over time provides valuable information on osseointegration and helps clinicians determine the best timing for prosthetic loading.

2. Materials and Methods

This case report involved patient who presented with inadequate bone volume following tooth extraction. Dental implants were placed, and implant stability was evaluated by measuring ISQ values using resonance frequency analysis (RFA).

2.1. Presurgical assessment

Scaling and oral hygiene instructions were given to patient 2 weeks before the surgery root. Patient received a single dose of prophylactic antibiotics 1hour prior to the intervention.

2.2. Surgical procedure

*2.2.1. Socket preservation (**Figure 1**-**Figure 6**)*

1. After anesthetizing the surgical site, a sulcular incision was made, and a full-thickness flap was elevated.
2. This was followed by atraumatic extraction of the diseased tooth.
3. After filling the socket with bone graft flaps were repositioned and approximated with interrupted sutures using 3-0 black braided silk.

*2.2.2. Implant placement-(**Figure 7**-**Figure 15**)*

1. 4 months after socket preservation implant placement planning was done.
2. After anesthetizing the surgical site, a mid-crestal incision was made, and a full-thickness flap was elevated.
3. This was followed by osteotomy site preparation and implant placement.
4. The flaps were then repositioned and approximated with interrupted sutures using 3-0 black braided silk.

2.3. Postoperative instructions

1. The patient continued the course of antibiotics for next 5-7 days as prescribed prior to the surgery and analgesics to control pain.
2. Patient was recalled at 7-10 days' post-surgery for suture removal.
3. 0.2% chlorhexidine mouthwash was prescribed to be used twice daily, from the day after the surgery is performed, for a period of 10 days.
4. Patient was also educated about reporting any kind of pain and discomfort.

2.3. Post-operative evaluation

ISQ values were measured at the time of implant placement (baseline) and at the time of prosthetic rehabilitation (after 3 months).

3. Case Description

The patient reported to the Department of Periodontology at Inderprastha Dental College and Hospital, Sahibabad, Ghaziabad, with a chief complaint of a dislodged prosthesis

in the upper left posterior region, which has been present for the past three months. The patient was apparently in good health until the prosthesis became dislodged suddenly, without any associated pain or other significant symptoms.

Figure 1: Pre-operative

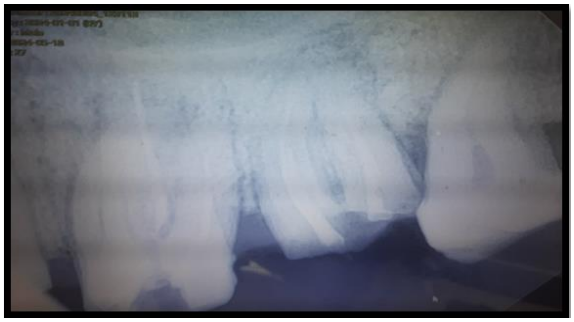

Figure 2: Pre-operative X-ray

Figure 3: After extraction

Figure 4: After grafting and suture

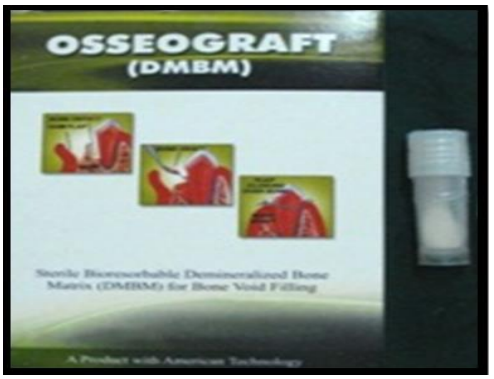

Figure 5: Bone graft

Figure 6: Immediate post-operative x-ray

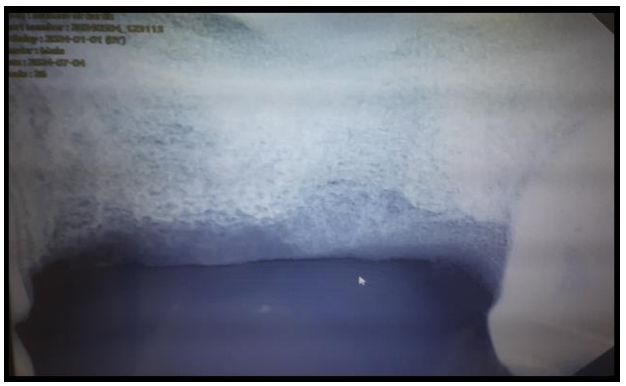

Figure 7: Post-operative X ray 4 months

Figure 8: Osteotomy preparation

Figure 9: Implant placement

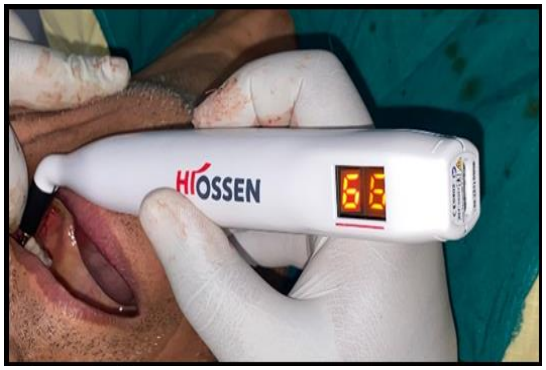

Figure 10: ISQ value at baseline

Figure 11: Implant x-ray

Figure 12: After suturing

Figure 13: ISQ value after 3 months

Figure 14: Final x ray

Figure 15: Final prosthesis

4. Results

Implant stability was assessed using Resonance Frequency Analysis (RFA) at the time of implant placement (baseline) and again after 3 months, prior to prosthetic loading. (**Table 1**) The measured implant stability quotient (ISQ) values showed an increase over time, indicating successful Osseo integration and improved implant stability.

Table 1: Implant stability using resonance frequency analysis (RFA) at the time of implant placement (baseline) and again after 3 months

Time Point	ISQ Value
Baseline (At Placement)	66
After 3 Months (Loading)	76

The increase in ISQ value from 66 to 76 reflects the transition from primary mechanical stability to enhanced secondary

biological stability. This progression confirms favorable bone healing and integration around the implant, supporting the clinical decision to proceed with prosthetic rehabilitation.

5. Discussion

This case report emphasizes the significance of alveolar ridge preservation (ARP) in achieving successful long-term outcomes in implant dentistry. Tooth extraction often leads to alveolar bone resorption, which can compromise future implant placement both functionally and aesthetically.[5] In this case, socket preservation was performed immediately after tooth extraction using a bone graft material. This approach aimed to minimize ridge collapse and maintain adequate bone volume for delayed implant placement.

The choice to delay implant placement by four months allowed for primary healing and bone maturation, facilitating optimal implant positioning.[5] The use of Resonance Frequency Analysis (RFA) to measure Implant Stability Quotient (ISQ) values provided a reliable, non-invasive method to monitor implant stability during the treatment phases. ISQ values recorded at the time of placement and again at prosthetic loading demonstrated increased stability over time, indicating successful Osseo integration.

The transition from primary to secondary stability is a critical period during implant healing. High initial ISQ values reflect good mechanical engagement, while progressive increases in ISQ over time confirm biological integration. This case showed a favorable trend, validating the clinical protocol used.

The patient's compliance with postoperative care, including antibiotic and analgesic therapy, use of chlorhexidine mouthwash, and regular follow-up, further contributed to the positive outcome. Overall, the combination of ARP, delayed implant placement, and ISQ-based stability assessment provided a structured and predictable approach, ensuring the functional and aesthetic success of the implant. This case supports the use of evidence-based protocols in modern implantology for enhanced treatment outcomes.

6. Conclusion

This case report demonstrates the critical role of alveolar ridge preservation in maintaining the structural integrity of the extraction site to support future implant placement. Through careful presurgical planning, timely socket preservation, and delayed implant placement, optimal bone volume was achieved, facilitating successful osseointegration. The use of Resonance Frequency Analysis (RFA) to monitor Implant Stability Quotient (ISQ) values provided an objective and reliable method for assessing implant stability throughout the healing process. The favorable progression of ISQ values highlighted the effective transition from primary to secondary stability, confirming the biological success of the implant. Additionally, strict adherence to postoperative protocols and patient compliance were key contributors to the positive clinical outcome. This case reinforces the importance of a comprehensive, evidence-based approach in implant therapy to ensure long-term functional and aesthetic success.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Brånemark PI. Osseointegrated implants in the treatment of the edentulous jaw. Experience from a 10-year period. *Scandinavian J Plas Reconstructive Surg Supple.* 1977;16:1-132.
2. Schallhorn RG. Regenerative response of the periodontal tissues to root planing and surgical therapy. *J Periodontol.* 1982;53(7):426–36.
3. Darby I, Chen S, De Poi R. Ridge preservation: what is it and when should it be considered. *Aust Dent J.* 2008;53(1):11-21.
4. Araujo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. *J Clin Periodontol*. 2005;32(2):212-8.
5. Chen ST, Wilson TG Jr, Hammerle CH. Immediate or early placement of implants following tooth extraction: review of biologic basis, clinical procedures, and outcomes. *Int J Oral Maxillofac Imp*. 2004;19(1):12-25.
6. Meredith N, Alleyne D, Cawley P. Quantitative determination of the stability of the implant-tissue interface using resonance frequency analysis. *Clin Oral Implants Res*. 1996;7(3):261–7.
7. Ostman PO, Hellman M, Sennerby L. Direct implant loading in the edentulous maxilla using a bone density-adapted surgical protocol and primary implant stability criteria for inclusion. *Clin Implant Dent Relat Res*. 2005;7(1):S60-9.

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