ARTIGO ORIGINAL

IMMEDIATE IMPLANT PLACEMENT WITH THE SOCKET SHIELD TECHNIQUE: A CASE REPORT WITH DIGITAL PLANNING AND GUIDED SURGERY

Colocação Imediata de Implante com Técnica Socket Shield: Relato de Caso com Planejamento Digital e Cirurgia Guiada

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ABSTRACT

Introduction: Dental implantology has evolved significantly, incorporating advanced techniques to improve surgical precision and esthetic outcomes. The socket shield technique, combined with digital planning and guided surgery, has been proposed to minimize buccal bone resorption and enhance peri-implant tissue stability. Methods: A female patient presented with discoloration and mobility of tooth #11. Clinical and radiographic examination confirmed external replacement root resorption, requiring extraction and implant rehabilitation. Digital planning and guided surgery were employed to ensure optimal implant positioning. The socket shield technique was performed by sectioning the root and preserving its buccal portion. A Straumann BLT 3.3 × 12 mm implant was placed, followed by a connective tissue graft harvested from the palate to improve soft tissue volume. After healing, a customized zirconia abutment and a lithium disilicate crown were fabricated and cemented. Results: The patient exhibited stable soft tissue contours, preserved buccal bone integrity, and an esthetically pleasing outcome. No signs of shield exposure, inflammation, or peri-implant complications were observed during follow-up. Conclusion: The combination of the socket shield technique, digital planning, and guided surgery contributes to superior esthetic and functional results in immediate implant placement. This approach minimizes alveolar ridge resorption and optimizes long-term peri-implant tissue stability.

Keywords: Socket Shield technique, immediate implant placement, digital planning, guided surgery, esthetic implant rehabilitation.

RESUMO

Introdução: A implantologia dentária evoluiu significativamente, incorporando técnicas avançadas para melhorar a precisão cirúrgica e os resultados estéticos. A técnica de proteção de encaixe, combinada com planejamento digital e cirurgia guiada, tem sido proposta para minimizar a reabsorção óssea vestibular e aumentar a estabilidade do tecido peri-implantar. Métodos: Paciente do sexo feminino apresentou descoloração e mobilidade do dente nº 11. O exame clínico e radiográfico confirmou reabsorção radicular de substituição externa, necessitando de extração e reabilitação com implante. Planejamento digital e cirurgia guiada foram empregados para garantir o posicionamento ideal do implante. A técnica de socket shield foi realizada seccionando-se a raiz e preservando sua porção vestibular. Foi colocado um implante Straumann BLT 3,3 × 12 mm, seguido de um enxerto de tecido conjuntivo colhido do palato para melhorar o volume dos tecidos moles. Após a cicatrização, um pilar de zircônia customizado e uma coroa de dissilicato de lítio foram confeccionados e cimentados. Resultados: O paciente exibiu contornos estáveis dos tecidos moles, integridade óssea bucal preservada e um resultado esteticamente agradável. Não foram observados sinais de exposição ao escudo, inflamação ou complicações peri-implantares durante o acompanhamento. Conclusão: A combinação da técnica de socket shield, planejamento digital e cirurgia guiada contribui para resultados estéticos e funcionais superiores na colocação imediata de implantes. Esta abordagem minimiza a reabsorção do rebordo alveolar e otimiza a estabilidade do tecido peri-implantar a longo prazo.

Palavras-chave: Técnica Socket Shield, colocação imediata de implante, planejamento digital, cirurgia guiada, reabilitação estética com implantes.

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INTRODUCTION

Dental implants have undergone considerable evolution, establishing themselves as a highly effective option for tooth replacement. Among innovations, the immediate placement of implants with guided techniques and digital planning stands out due to its precision and predictability. Although these methods showed variable degrees of cortical bone preservation, none of them completely prevents the mid-facial recession following immediate implant placement, as the postulated understand of alveolar bone loss following teeth extraction is the loss of the coinciding periodontal ligaments, it seems logical that root retention would avert the resorption process[1].

Casey and and Lauciello[2] in the 1970s first applied the root sub-mergence concept to preserve the ridge dimensions for full denture fabrication. Hurzeler et al[1], in 2010, hemi sectioned the third and fourth mandibular premolars in a beagle dog, retaining the buccal fragment of the distal root 1 mm coronal to the buccal bone plate; introducing the socket shield technique. Gluckman et al[3], in 2018, published a 5-year retrospective evaluation of 128 socket shield cases in the esthetic zone and posterior sites, reporting a survival rate of 96.1%. The most common complications were the internal followed by the external exposures of the shields. A modification of the original socket shield technique was introduced in 2019 by Gluckman et al[4], who emphasized on reducing the height of the socket-shield to the bone crest level to avoid the internal shield exposure and fabricated provisional restorations with an "S-shaped" emergence profile to enhance maximum soft tissue infill.

The integration of digital planning and guided surgery in immediate implant placement offers several benefits. Ramasamy et al. (2018)[5] reported a significant reduction in implant positioning variation when these techniques are employed, resulting in superior functional and aesthetic outcomes. Meticulous preparation allows for quicker and safer surgical execution, reducing chair time for the patient. Additionally, Schnitman et al. (2019)[6] highlighted that these techniques can improve implant success rates and reduce healing time, facilitating faster patient rehabilitation.

This article is a case report of an implant placement using all the available tools to improve the results, from the digital planning to socket shield technique.

Case Report

Female patient, non-smoker, with no history of chronic systemic conditions, presented to a private dental office, where discoloration and ankylosis of tooth 11 were noted. Clinical and tomographic examinations led to the diagnosis of external root resorption by replacement, indicating the need for tooth extraction followed by rehabilitation with a dental implant.

During preoperative planning, clinical and imaging assessments confirmed the absence of signs or symptoms of infection, as well as an evaluation of the root position and its relationship with the alveolar ridge. It was observed that the dental root was vestibularized in relation to the ideal implant position, which should be prosthetically guided. Given this, the socket shield

technique was chosen, and with the aid of Blue Sky Plan software, a surgical guide was fabricated to ensure proper implant positioning.

Following local anesthesia with Mepivacaine (DFL Indústria e Comércio S.A., Rio de Janeiro, RJ, Brazil), the root of tooth 11 was sectioned in a mesiodistal direction, allowing its complete removal up to the apex while preserving the buccal portion. This portion was reduced by approximately 1 mm in the cervical region, creating space for connective tissue accommodation.

A full-thickness flap was then elevated, extending to the adjacent teeth (12 and 21), to allow for a connective tissue graft. The surgical guide was positioned, and following the installation protocol, a BLT 3.3 × 12 mm implant (Straumann AG, Basel, Switzerland) was placed. The implant was installed approximately 3 mm apically to the gingival margin, achieving a torque of 35 N.

To optimize esthetics and soft tissue stability, a connective tissue graft was harvested from the palatal region of the premolars using the free graft technique, followed by extraoral de-epithelialization. This graft was positioned on the buccal aspect of the flap and secured with 6-0 polyamide sutures (Techsuture, Bauru, SP, Brazil). The donor site was treated with a Collacone collagen sponge (Straumann, Basel, Switzerland) and sutured with 5-0 polyamide sutures (Techsuture, Bauru, SP, Brazil) to facilitate healing.

In the postoperative period, the patient was prescribed Amoxicillin 500 mg, three times a day, and Decadron 4 mg (dexamethasone) before the procedure as an anti-inflammatory agent.

For the fabrication of the prosthetic crown, the impression transfer was customized using acrylic resin, which is essential for achieving a peri-implant contour that mimics the natural tooth and provides an esthetically satisfactory outcome. This also aids in maintaining an appropriate gingival contour and volume, which was enhanced by the connective tissue graft.

Finally, a custom zirconia abutment was installed, and a lithium disilicate crown was cemented, with the final characterization of the restoration respecting the natural dental features of the patient.

Figure 01. Clinical initial aspect, as the patient presented to the clinic. No signs or symptoms of infection are presente

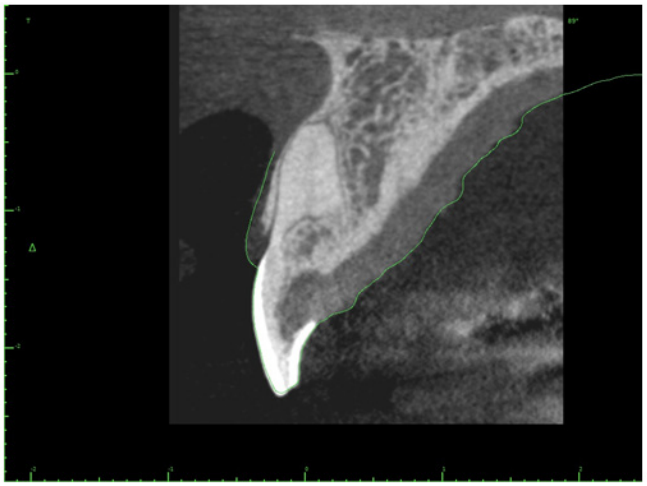

Figure 02. Initial tomographic aspect, showing the external root resorption.

Figure 03. The root after its section in the mesio-distal direction, preserving its buccal portion.

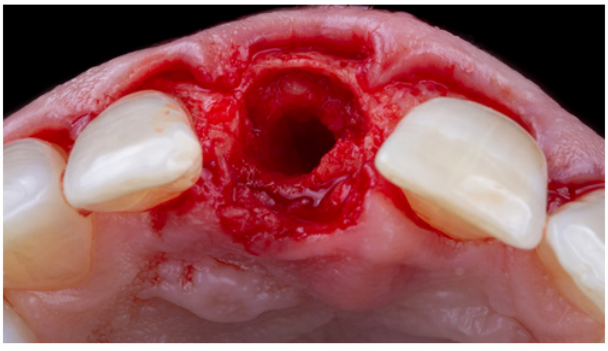

Figure 04. Flap elevation to recieve the connective tissue graft and the lowering of approximately 1 mm of the cervical portion of the root.

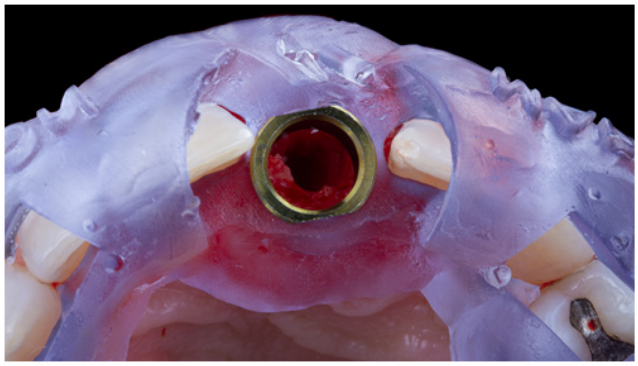

Figure 05. The surgical guide in position and the preparation of the surgical bed for the implant.

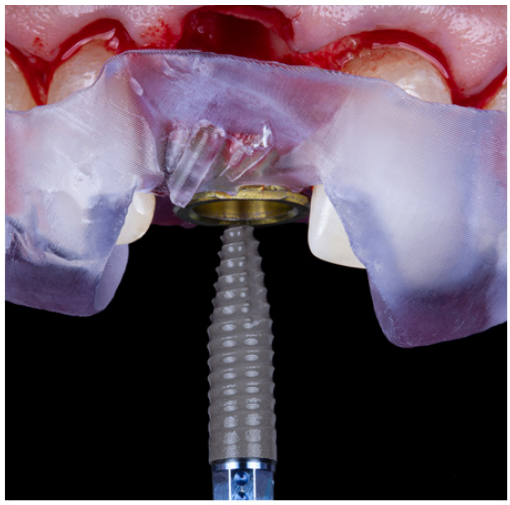

Figure 06. Instalation of a Strauman BLT implant, 3,3x12mm (Strauman AG, Basel, Switzerland) by means of guided surgery.

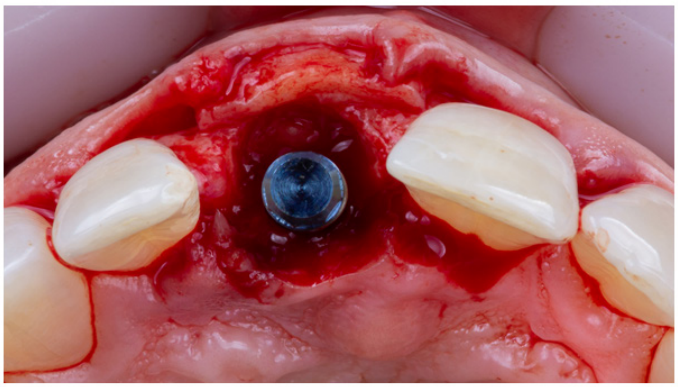

Figure 07. Occlusal view of the dental implant in place. Note the buccal root in position, with no alveolar gap between buccal bone and the implant and the connective tissue graft between buccal bone and the flap.

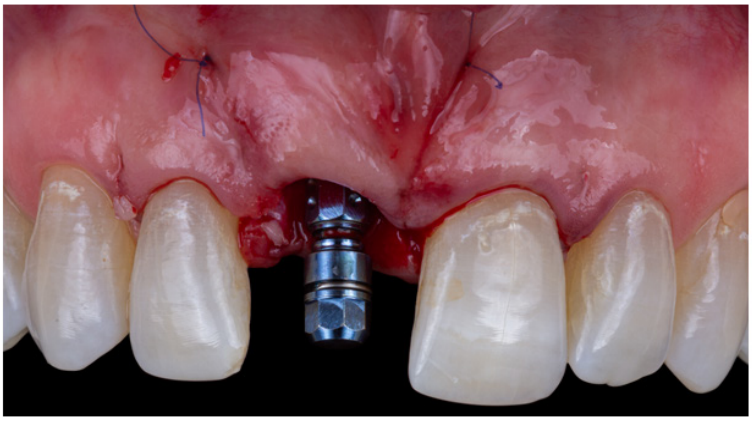

Figure 08. Frontal view of the implant in position, with the connective tissue graft already sutured to the flap.

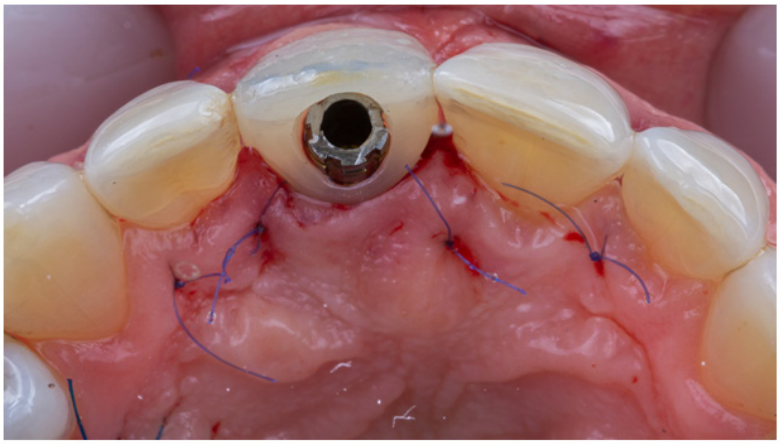

Figure 09. The cylinder of a temporary crown was instalated, showing perfect implant position with the emergence of the prosthetic screw in the singulus. The provisional crown was made in the lab an installed directly into the mouth in the same session

Figure 10. Immediate postoperative.

Figure 11. To the confection of a ceramic crown a customized transfer was used, here it is shown installed, maintaining the soft tissues in their position.

Figure 12. The customized transfer in the impression.

Figure 13. Final ceramic restoration in position, showing great similarity with the patient's natural dentition.

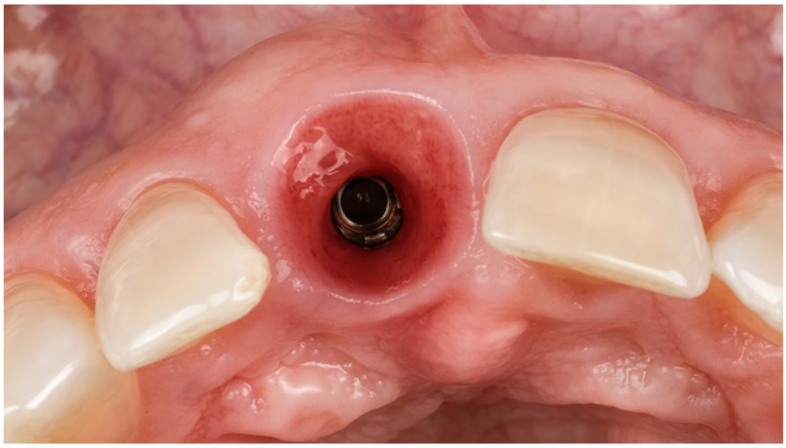

Figure 14. Occlusal view showing the preservation of a healthy peri-implant groove and optimal soft tissue volume.

DISCUSSION

Immediate placement offers several benefits, including reduced treatment time, bone preservation, and immediate aesthetic restoration. This approach eliminates the waiting period between tooth extraction and implant placement, expediting the overall rehabilitation process. Immediate insertion helps preserve the alveolar bone, minimizing the bone resorption typically observed after tooth extraction. In aesthetic zones, immediate placement allows for the immediate restoration of appearance, which is crucial for patient satisfaction. Chen et al. (2019) observed that immediate implants have a high success rate compared to delayed implants, provided the patient's anatomical and health conditions are suitable.

The timing of implant placement significantly influences the outcomes, particularly in aesthetically sensitive areas. Buser et al. (2013)[18] conducted a prospective, controlled clinical study

comparing early versus late implant placement in the esthetic zone. They found that early implant placement (within 4-8 weeks after extraction) offers better soft tissue stability and preserves the facial bone wall, resulting in superior aesthetic outcomes compared to late implant placement (more than 3 months after extraction). This finding underscores the importance of carefully considering the timing of implant placement to optimize both hard and soft tissue preservation and enhance overall patient satisfaction.

Furthermore, Chappuis et al. (2015)[19] conducted a randomized controlled clinical trial to evaluate the effect of implant placement timing on esthetic outcomes in esthetically important sites. The study found that immediate and early placements are associated with better preservation of peri-implant tissues and more favorable aesthetic results, particularly in the anterior maxilla. These findings align with the benefits of immediate implant placement, as highlighted in the current discussion.

The Socket Shield technique complements immediate implant placement by preserving the buccal portion of the extracted tooth root, maintaining it in the socket while the implant is inserted in the palatal part of the socket. This technique aims to preserve the gingival and alveolar bone architecture, preventing bone resorption and gingival collapse that can occur after tooth extraction. Gluckman et al. (2017)[8] reported that the Socket Shield technique can result in better long-term aesthetic and functional outcomes. The advantages include maintaining aesthetics, particularly in the anterior zone, and reducing the need for bone grafts. However, the complexity of the procedure requires advanced surgical skills and meticulous planning, with risks of complications if not executed correctly. Indications for the Socket Shield technique include extractions in the aesthetic zone, while contraindications include active infection, extensive root fractures, and systemic conditions compromising bone or gingival healing.

Cosyn et al. (2019)[20] conducted a systematic review analyzing the effects of implant placement timing on the outcomes of various soft tissue and bone augmentation procedures. The review concluded that immediate implant placement, particularly when combined with socket shield or other minimally invasive techniques, often results in better preservation of soft and hard tissues and reduces the need for additional grafting procedures. This reinforces the importance of immediate placement strategies to achieve optimal outcomes, particularly in maintaining the gingival and alveolar bone architecture.

Hurzeler et al. (2010)[1], Gluckman et al. (2015)[21], as well as Baumer et al. (2017)[22], recommended that the shield be reduced 1 mm above the labial bone crest to preserve the supracrestal marginal gingival fibers. In 2018, Gluckman et al[3]. reported in a retrospective evaluation of 128 socket shield cases that the most common complication was the internal exposure of the shield, followed by the external exposure of the shield. In 2019, Gluckman et al.[4] addressed these

complications by preparing the shield to the level of the labial bone crest using a gingival retractor.

Abd-Elrahman et al. (2020)[23] concluded a clinical trial with 40 dental implants, comparing the socket shield technique with conventional approaches. The implant stability and the final aesthetics, considering pink aesthetic scores, were higher in the socket shield group, highlighting the technique's effectiveness in achieving better outcomes.

Hurzeler et al. (2010)[1] assessed the connection between the implant and tooth shield histologically and reported cementum formation at the contact areas between the implant and root surfaces. This finding was confirmed by Mitsias et al. (2017)[13], who revealed cementum formation between the apical part of the shield and the implant surface due to close proximity between both surfaces, versus bone formation in the middle part where the shield and the implant did not merge.

By integrating these studies, the benefits of immediate placement and the Socket Shield technique are further supported by evidence showing enhanced aesthetic outcomes and tissue preservation. The strategic use of these techniques, informed by precise timing and planning, can lead to improved patient satisfaction and long-term success of dental implants.

CONCLUSION

Immediate implant placement using guided techniques and digital planning represents a significant advancement in implant dentistry. These approaches provide precision and efficiency, improving clinical outcomes and patient satisfaction. However, it is crucial that dentists are well-trained and familiar with these new technologies to maximize their benefits and minimize risks. As technology continues to evolve, greater integration of digital tools in dental practice is anticipated, leading to ongoing advancements in the quality and efficiency of dental implant treatments. Future studies should continue to explore these techniques, providing additional data and guidelines to optimize treatment protocols.

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Observação: os/(as) autores/(as) declaram não existir conflitos de interesses de qualquer natureza.