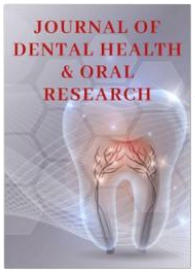

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Case Report

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Root Ring Technique for Preservation of Peri-Implant Supracrestal Architecture Following Immediate Placement in the Anterior Maxilla: A Case Report

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Abstract

Background: Preservation of peri-implant hard and soft tissues in the anterior maxilla remains a major clinical challenge. Following tooth extraction, bundle bone remodeling, interruption of periodontal ligament vascularization and collapse of supracrestal soft tissues may compromise implant aesthetics, gingival symmetry and emergence-profile stability. Immediate implant placement, socket preservation, guided bone regeneration, connective tissue grafting and immediate provisionalization can reduce but do not completely eliminate these biological changes. Partial extraction therapies, including the socket-shield and root-membrane techniques, were developed to preserve periodontal-ligament-associated tissues by retaining a facial root fragment *in-situ*.

Case Description: This case report describes a modified biologically oriented immediate implant protocol termed the Root Ring Technique. A maxillary right central incisor presenting with failure of a fiber-post-supported crown and an unfavorable retreatment prognosis was extracted atraumatically and immediately replaced with an implant. A cervical circumferential root fragment approximately 3 mm in height was harvested from the extracted tooth under copious irrigation, internally enlarged and adapted around a customized ZBL abutment connected to the implant. The root ring was bonded to the abutment using flowable composite resin and the root-ring-abutment complex was inserted immediately after implant placement and stabilized with 15 Ncm torque. The buccal gap was grafted using biphasic calcium phosphate particulate graft material without platelet-rich fibrin. A non-loading removable provisional restoration was fabricated using the patient's natural crown attached to a transparent retainer.

Results: At the one-week postoperative evaluation, the surgical site demonstrated favorable early healing, preservation of gingival contour, maintenance of buccal architecture and no clinical evidence of infection, tissue necrosis, graft exposure or root-fragment exposure. At the three-month impression appointment, radiographic review and CBCT evaluation demonstrated maintenance of the peri-implant hard-tissue contour. Following removal of the root-ring-abutment complex for impression procedures, the emergence-profile soft tissue showed a preserved transmucosal contour. The macroscopic vascular pattern appeared less dominated by longitudinal supracrestal vessels than the illustrative comparison image from another healed implant site, with some visible vascular markings oriented transversely around the emergence-profile tissues. Three-dimensional T0-T1 surface-deviation analysis further demonstrated substantial maintenance of the vestibular contour at three months, with a final ICP root mean square alignment deviation of 0.335389 mm.

Conclusion: This case represents an additional clinical application of the Root Ring Technique/horizontal socket-shield concept for preservation of supracrestal peri-implant architecture during immediate implant placement. The three-month findings, including radiographic maintenance, digital surface-analysis stability and preservation of the emergence-profile soft tissue after

root-ring-abutment removal, support the clinical plausibility of the technique. However, the interpretation of vascular patterns remains observational and cannot prove persistent periodontal-ligament vitality or biological revascularization. Because the biological mechanism remains hypothetical, the procedure should be considered experimental and requires histological validation, controlled clinical evaluation and long-term follow-up before broader clinical adoption can be recommended.

Keywords: Immediate Implant Placement; Root Ring; Socket Shield; Root Membrane Technique; Partial Extraction Therapy; Periodontal Ligament Preservation; Peri-Implant Tissues; Anterior Maxilla; Customized Abutment; Emergence Profile

Introduction

Immediate implant placement in the anterior maxilla is clinically demanding because the aesthetic outcome depends on correct three-dimensional implant positioning, preservation of the facial bone wall and maintenance of peri-implant soft tissue architecture [1-12]. The buccal plate in the anterior maxilla is frequently thin and post-extraction remodeling may result in horizontal and vertical dimensional changes that are difficult to fully correct after collapse has cccurred [1,2,13]. Systematic reviews have shown that alveolar ridge preservation procedures reduce dimensional loss after extraction but do not completely prevent physiologic ridge remodeling [3,14].

The periodontal ligament contributes to the vascular and structural integrity of the bundle bone. Once a tooth is extracted, the periodontal ligament and its vascular contribution are lost, initiating a remodeling cascade that may compromise the buccal contour, gingival margin level, interdental papillae and final emergence profile [1,15]. The peri-implant mucosa differs from the periodontal apparatus of natural teeth; collagen fibers adjacent to implants tend to be predominantly parallel or circular to the implant or abutment surface, whereas natural teeth are supported by a periodontal ligament with functionally oriented fiber insertion and vascular communication with the alveolar bone and gingiva [16,17].

Several clinical strategies have been proposed to limit post-extraction tissue alterations. These include immediate implant placement, flapless surgery, grafting of the implant-socket gap, guided bone regeneration, connective tissue grafting and immediate provisionalization [4-6,20]. Although these methods can improve tissue stability, immediate implant placement alone does not fully prevent buccal bone remodeling [21,22]. The socket-shield technique and root-membrane technique introduced a biologically distinct concept: intentional retention of a facial root fragment attached to the socket wall to preserve the periodontal ligament, bundle bone and facial tissue support [7-9,23].

This report presents an additional clinical case applying and reproducing the Root Ring/horizontal socket-shield rationale previously described by El Moheb and colleagues [10,11]. The technique described in the present report differs from conventional socket-shield and root-membrane protocols, in which the retained root fragment usually remains attached to the facial socket wall and is not incorporated into the prosthetic-abutment complex [7-9]. In the current approach, a circumferential cervical root fragment was harvested from the extracted root, internally adjusted and bonded to a customized abutment and subsequently inserted over the implant platform, functioning as a biologically oriented seal intended to protect and preserve the peri-implant socket architecture during early healing [10,11]. This manuscript therefore documents another clinical application of the Root Ring Technique and reports the early postoperative clinical and radiographic findings associated with reproduction of the previously described concept.

Case Presentation

A male patient approximately 48 years of age presented with failure of a maxillary right central incisor restoration. The tooth had previously undergone endodontic treatment and had been restored with a fiber-reinforced composite post and crown. Clinical examination revealed complete dislodgement of the crown-post complex. Radiographic and clinical assessment demonstrated inadequate retention associated with a short intracanal fiber post. An attempt was made to retreat the intracanal space and prepare a longer post space; however, the canal contained an unidentified obturation material that prevented adequate progression of intracanal cleaning and post-space preparation. Because predictable retention could not be re-established and the restorative prognosis was unfavorable, the patient was informed of treatment alternatives and extraction followed by immediate implant placement was proposed. Written informed consent was obtained for treatment and for publication of anonymized clinical and radiographic documentation (Table 1, Fig. 1,2).

Clinical Factor	Finding
Patient	Male, approximately 48 years of age
Site	Maxillary right central incisor
Main complication	Failure of fiber-post-supported crown
Relevant history	Previous endodontic treatment and post-retained restoration
Primary limitation	Inability to predictably retreat and prepare the intracanal space
Treatment selected	Atraumatic extraction, immediate implant placement, root-ring-abutment complex, buccal gap grafting and non-loading removable provisionalization

Table 1: Clinical factors.

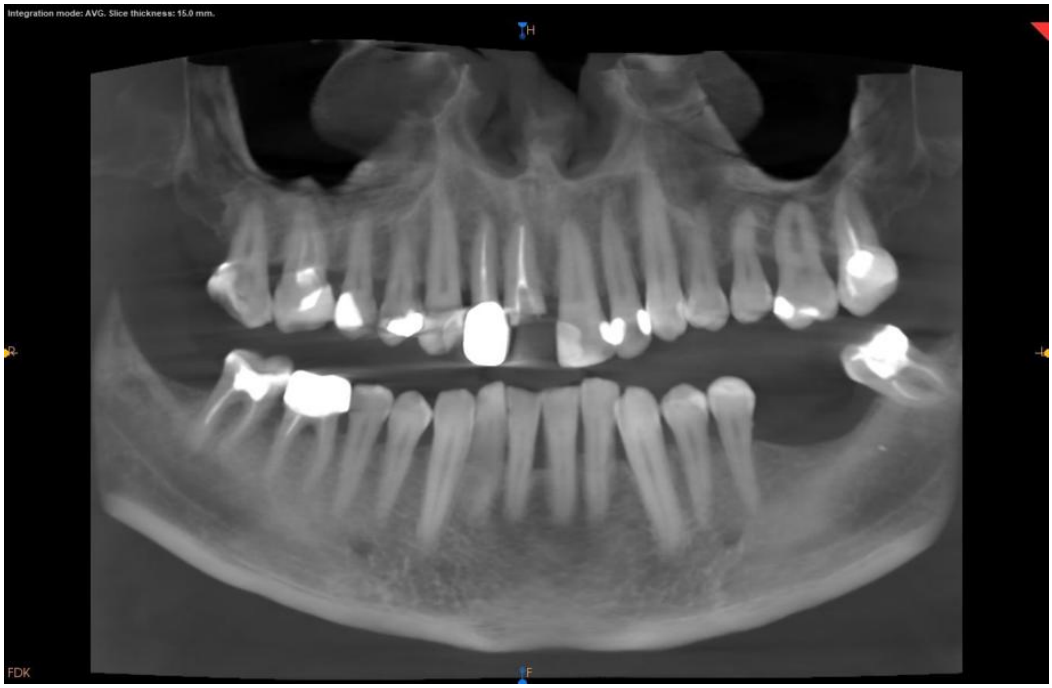

Figure 1: Preoperative panoramic radiograph demonstrating the restored maxillary anterior region before extraction and immediate implant therapy.

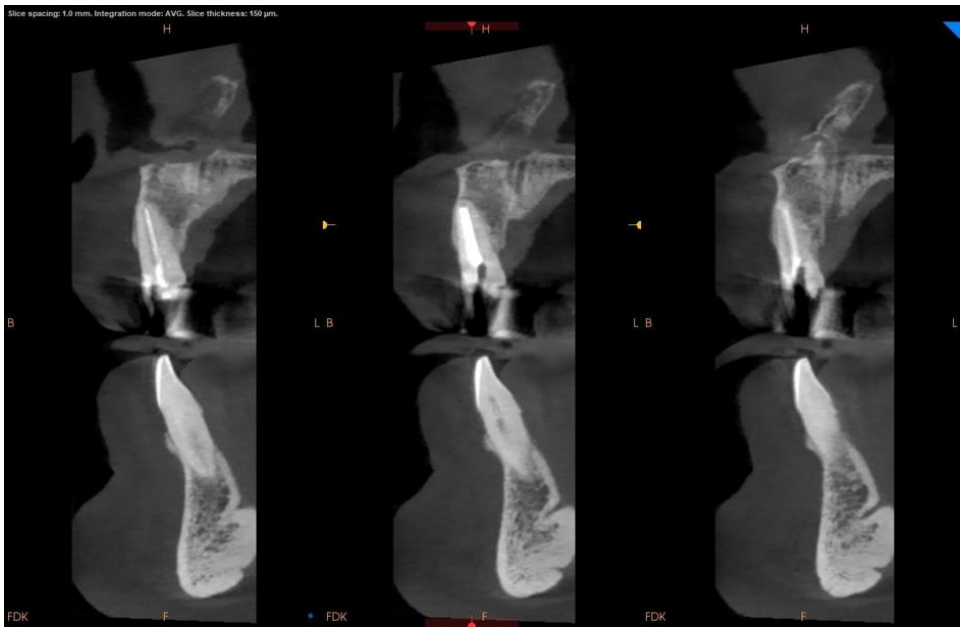

Figure 2: Preoperative sagittal CBCT sections of the maxillary right central incisor region used for assessment of root anatomy, buccal plate configuration and implant planning.

Surgical Procedure

The extraction was performed atraumatically without flap elevation. The root was removed intact, with no root fracture or intraoperative complications. Immediate implant placement was performed according to prosthetically guided principles, with the implant positioned to respect the restorative axis, the facial contour and available socket anatomy. Primary stability was achieved and a ROOTT 3.5 x 10 mm implant was installed in the planned tridimensional position.

The vestibular gap between the implant surface and the buccal socket wall was grafted with biphasic calcium phosphate particulate graft material (QualyLive, Qualybone BCP, 0.5 mm granulation). No platelet-rich fibrin membranes or additional regenerative biomaterials were used. A ZBL abutment supplied by the implant manufacturer was connected to the implant to serve as the base for extraoral customization (Fig. 3,4).

Figure 3: Immediate postoperative panoramic radiograph showing implant placement in the maxillary right central incisor region.

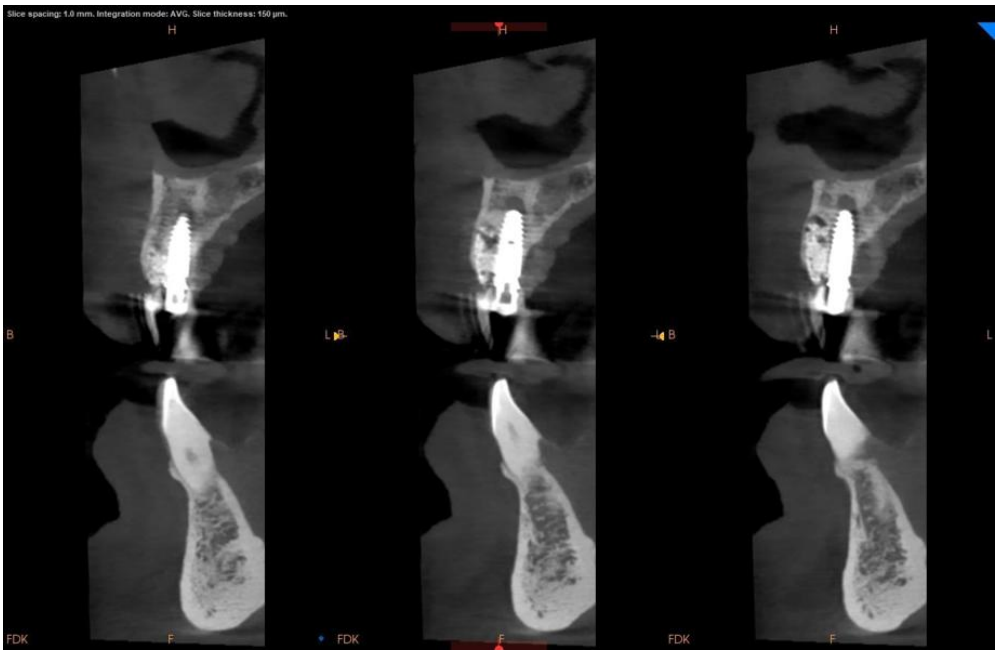

Figure 4: Immediate postoperative sagittal CBCT sections showing the implant position and peri-implant hard tissue relationship after placement and grafting.

Root Ring Preparation and Placement

The extracted root was maintained under sterile conditions. Using a high-speed handpiece under abundant irrigation, the cervical portion of the root was sectioned to obtain an approximately 3 mm-high circumferential root fragment. Special attention was given to reducing thermal trauma and preventing dehydration, with the intention of preserving residual periodontal ligament remnants associated with the cervical root surface. The internal portion of the root fragment was enlarged to create a hollow circumferential ring capable of adapting around the customized ZBL abutment. The resulting root ring was bonded to the abutment using flowable composite resin, thereby creating a unified prosthetic-abutment-root complex. This assembly was inserted immediately onto the implant and stabilized according to the manufacturer's recommended torque of 15 Ncm. A horizontal mattress suture was placed only to approximate the gingival margins around the root-ring structure. No flap advancement or extensive soft tissue manipulation was performed (Fig. 5,6).

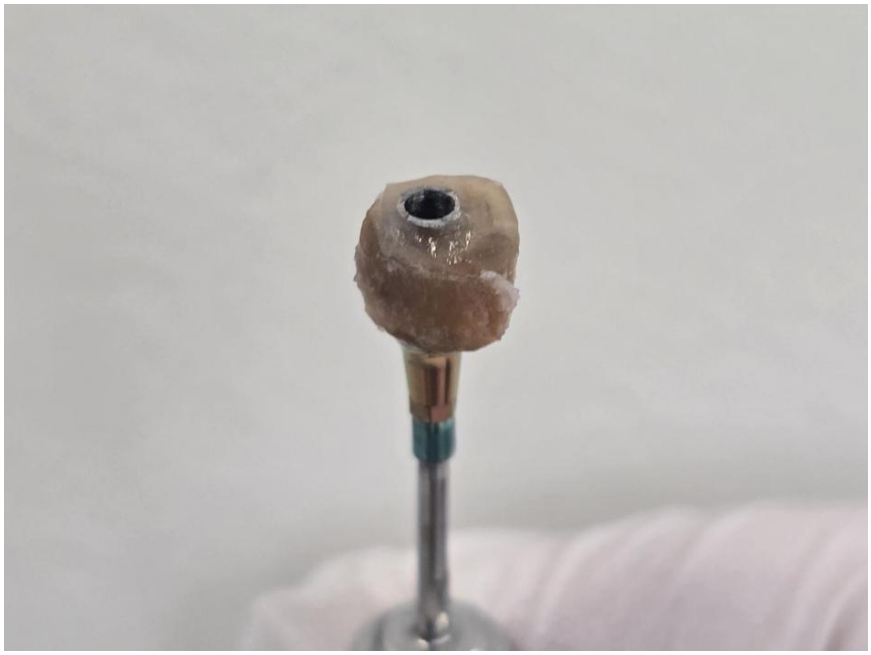

Figure 5: Root ring prepared from the cervical portion of the extracted root and adapted around the customized abutment; occlusal aspect.

Figure 6: Lateral view of the root-ring-abutment complex before insertion.

Provisional Restoration and Postoperative Evaluation

For temporary aesthetic rehabilitation, the patient's own natural crown was used as a provisional tooth and attached to a transparent removable retainer. This approach provided immediate aesthetic replacement while avoiding functional loading of the newly placed implant during the initial healing phase. The patient was discharged with postoperative instructions and medication.

At the one-week postoperative appointment, the suture was removed. Clinical examination demonstrated favorable soft tissue healing, maintenance of gingival contour, preservation of vestibular architecture and absence of clinical signs of inflammation, infection, graft exposure, root-fragment exposure or tissue necrosis. The peri-implant tissues appeared stable, with preservation of the original emergence profile during the early healing period. The patient was scheduled for further follow-up appointments including digital impressions, standardized clinical photography and tomographic evaluation.

At the three-month postoperative appointment, radiographic and CBCT documentation was obtained at the time of impression. The root-ring-abutment complex was removed for clinical assessment and impression procedures. The emergence-profile soft tissue demonstrated maintenance of a rounded transmucosal contour and apparent preservation of the supracrestal architecture. Clinically visible vascular markings were documented around the peri-implant soft tissue. In contrast to an illustrative healed implant comparison image from another patient, in which vessels appeared predominantly longitudinal from the supracrestal implant region toward the mucosal margin, the treated site showed a less longitudinal pattern, with some vascular markings appearing transversely oriented around the emergence-profile tissues. This finding was recorded as a clinical observation only; it cannot be interpreted as direct proof of periodontal-ligament vitality, vascular reconnection or biological integration of the root ring.

Digital Three-Dimensional Surface Analysis

At the three-month postoperative follow-up, CBCT-based digital surface analysis was performed to evaluate dimensional stability of the buccal cortical plate and supracrestal peri-implant architecture. Immediate postoperative (T0) and three-month postoperative (T1) CBCT datasets were exported in DICOM format and processed using 3D Slicer for segmentation and STL generation, followed by three-dimensional surface comparison using CloudCompare [27,28].

A standardized Region of Interest (ROI) extending from the distal aspect of tooth 21 to the distal aspect of tooth 12 was selected for both datasets. The rationale for selecting a broader ROI rather than limiting the analysis exclusively to the implant site was to preserve adjacent stable anatomical references and improve registration reliability during three-dimensional alignment. This approach also allowed evaluation of overall vestibular contour continuity around the implant region.

Bone segmentation was performed using identical threshold parameters for both datasets, with a minimum threshold value of 633.09 and a maximum threshold value of 3931.84. The same threshold interval was intentionally maintained for T0 and T1 to reduce segmentation variability and operator-dependent bias. Lower threshold values resulted in inclusion of low-density artifacts and non-mineralized structures, whereas higher thresholds preserved mineralized cortical structures and grafted regions while minimizing segmentation noise.

After segmentation, three-dimensional models were generated and exported as STL files. T0 was segmented and identified using beige coloration, while T1 was segmented using green coloration to facilitate visual differentiation during model overlap and qualitative assessment. Three-dimensional registration was performed using the Iterative Closest Point (ICP) algorithm in CloudCompare [28,29]. Initial point-pair alignment was based on stable anatomical landmarks outside the primary remodeling area, including adjacent dental and palatal structures. Final automatic refinement was subsequently performed using ICP registration.

The final overlap parameter was standardized at 90%. This value was intentionally selected because a complete 100% overlap may artificially force alignment of biologically remodeled regions, potentially masking true dimensional alterations. By limiting the overlap to 90%, the registration process prioritized stable anatomical regions while allowing physiologic remodeling areas to remain detectable during surface-deviation analysis. Scaling adjustment was intentionally disabled because both CBCT datasets had been acquired using standardized

acquisition parameters, voxel dimensions and field-of-view calibration. Enabling scale adjustment could introduce artificial dimensional distortion unrelated to biological remodeling.

The ICP registration process was performed using 200 iterations to support stable mathematical convergence and reduce the possibility of under-refinement during final alignment. The resulting final Root Mean Square (RMS) alignment deviation was 0.335389 mm, calculated from 45,218 surface points, which was considered acceptable for peri-implant CBCT-based three-dimensional surface analysis. After registration, three-dimensional surface-deviation analysis and heat-map visualization were generated to evaluate dimensional alterations between T0 and T1. The primary purpose of the analysis was not assessment of osseointegration itself, but rather evaluation of preservation of the buccal cortical contour and supracrestal architecture over time. Predominantly neutral surface-deviation patterns in the vestibular region were interpreted as indicative of dimensional stability and maintenance of the buccal contour during early healing. The three-month radiographs obtained at the impression appointment provided additional conventional radiographic documentation of implant position and peri-implant hard-tissue maintenance (Fig. 7-17).

Figure 7: Immediate postoperative frontal clinical view showing the root-ring-abutment complex in the maxillary right central incisor region and early gingival adaptation.

Figure 8: Immediate postoperative occlusal clinical view showing the relationship between the root ring, gingival margins and buccal tissue architecture.

Figure 9: One-week postoperative clinical view demonstrating maintenance of gingival contour and vestibular architecture after suture removal.

Figure 10: One-week postoperative close-up view demonstrating early soft tissue healing around the root-ring-abutment complex without clinical exposure or suppuration.

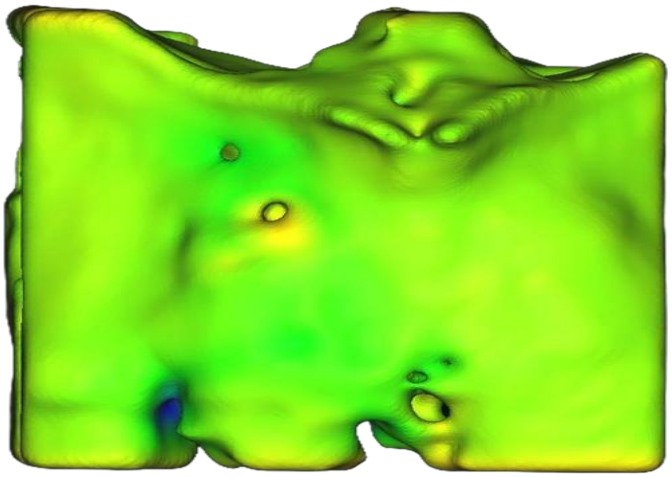

Figure 11: Three-dimensional surface-deviation heat-map analysis comparing immediate postoperative (T0) and three-month postoperative (T1) CBCT-derived STL models after ICP registration. Predominantly green surface-deviation patterns, corresponding to minimal dimensional changes within the predefined tolerance range, were observed in the buccal cortical region. Limited areas of yellow-to-red indicated only minor localized positive surface deviations, suggesting overall maintenance of vestibular contour and supracrestal peri-implant architecture during early healing.

Figure 12: Three-month postoperative panoramic radiograph obtained at the impression appointment, showing the implant-supported site in the maxillary right central incisor region.

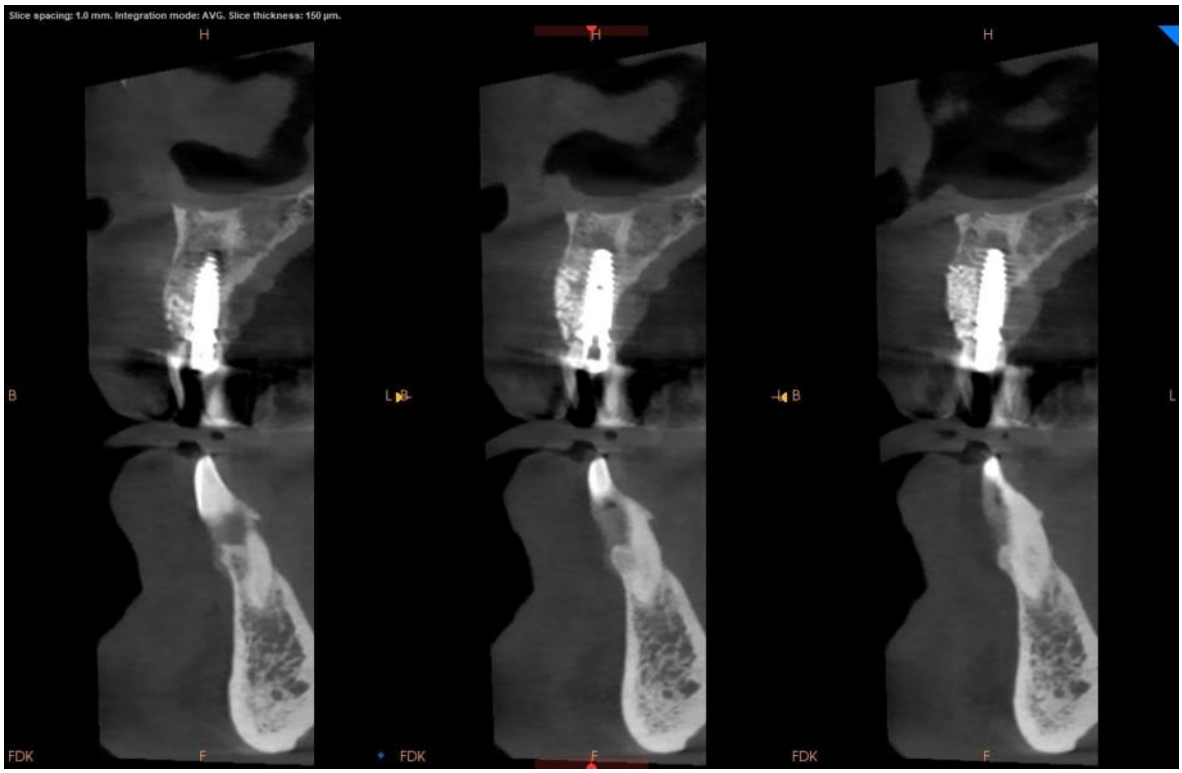

Figure 13: Three-month postoperative sagittal CBCT sections obtained at the impression appointment, documenting peri-implant hard-tissue morphology and the relationship between the implant and buccal contour.

Figure 14: Three-month clinical view at the impression appointment showing the root-ring-abutment complex and preservation of the emergence-profile soft tissue before final restorative procedures.

Figure 15: Three-month clinical close-up showing the soft-tissue relationship around the root-ring-abutment complex and visible vascular markings in the peri-implant mucosa.

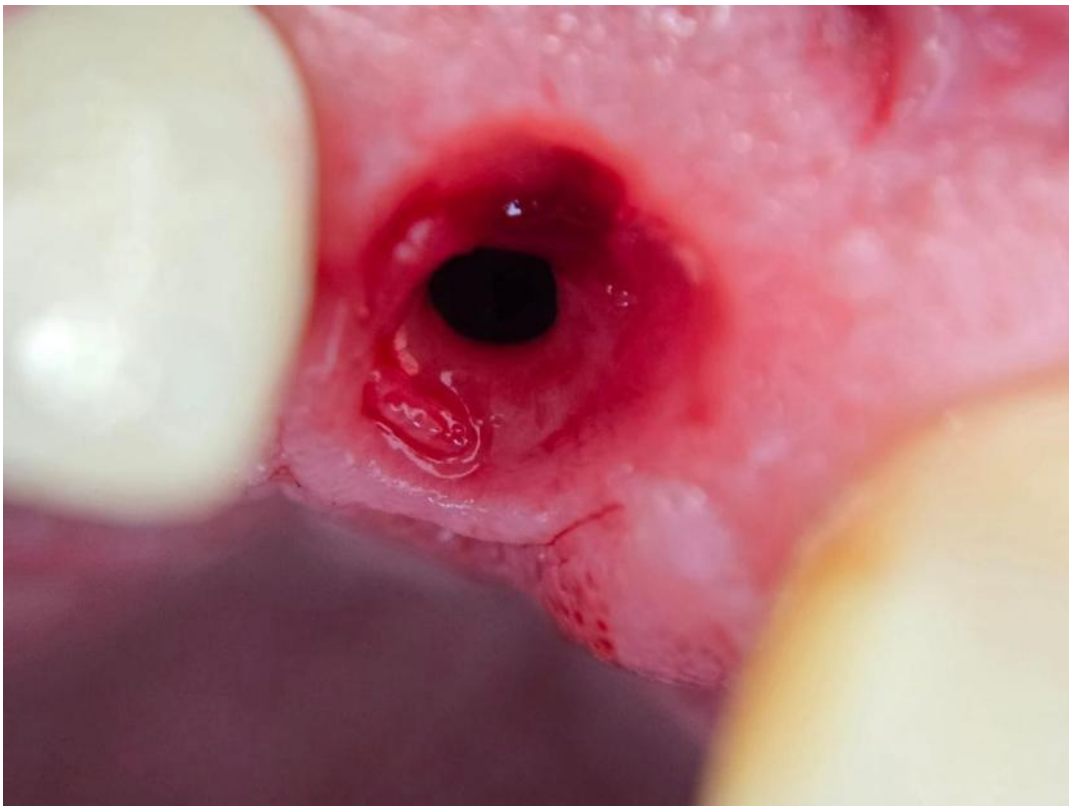

Figure 16: Three-month emergence-profile view after removal of the root-ring-abutment complex for impression procedures, showing the transmucosal soft-tissue contour.

Figure 17: Illustrative comparison from another healed implant site, showing a different supracrestal vascular pattern with more longitudinally oriented vascular markings from the peri-implant region toward the mucosal margin. This image is included for descriptive comparison only and is not part of the treated case.

Biological Rationale and Hypothesis

The biological hypothesis underlying the Root Ring Technique is distinct from conventional socket-shield therapy. In traditional implant healing, the peri-implant soft tissue seal is formed adjacent to a foreign biomaterial surface and is characterized by epithelial adhesion and a connective tissue compartment in which collagen fibers lack true insertion into the implant surface [16,17]. By contrast, natural teeth possess a periodontal ligament-mediated attachment apparatus with cementum, periodontal ligament fibers, bundle bone and vascular communication between the gingiva, periodontal ligament and alveolar bone [1,15].

The biological rationale of the Root Ring Technique can be framed through two complementary hypotheses. First, according to the wound-closure hypothesis, post-extraction healing may be partly driven by the organism's attempt to achieve rapid socket closure; vertical bone remodeling and soft-tissue migration contribute to closure of the extraction wound. If the cervical socket is perceived biologically and mechanically as already sealed by a root-derived circumferential interface, the stimulus for vertical resorption and soft-tissue collapse may theoretically be reduced. Second, according to the periodontal-ligament preservation hypothesis, retention and reimplantation of a circumferential cervical root fragment containing residual periodontal ligament remnants may preserve a biologically recognizable root surface that contributes to socket sealing and supracrestal tissue stability [10,11]. This hypothesis is supported indirectly by experimental root-reimplantation studies showing that roots with preserved original periodontal ligament tissue can develop fibrous reattachment after reimplantation, whereas root surfaces deprived of periodontal ligament by planing or scaling show impaired or absent fibrous reattachment on the denuded surface [18,19]. However, these mechanisms cannot be confirmed from clinical appearance alone. The vitality, cellular activity, vascular continuity and long-term biological behavior of the retained cervical root fragment remain unknown and require histological investigation (Table 2).

Conceptual comparison	Conventional immediate implant	Socket-shield/root-membrane technique	Root Ring Technique described in this case
Root fragment	None retained	Facial root fragment retained *in-situ*	Circumferential cervical root fragment harvested and adapted around abutment
Main biological target	Osseointegration and socket healing	Preservation of facial PDL-bundle bone complex	Hypothetical preservation of supracrestal periodontal-ligament-related architecture
Relationship to abutment	Implant-abutment complex only	Root fragment remains socket-wall-associated	Root fragment becomes part of the customized abutment complex
Evidence base	Extensive clinical evidence	Growing evidence from animal, histologic, case series and systematic review literature	Early case-report evidence reproducing the Root Ring/horizontal socket-shield concept and requiring validation
Principal risk	Post-extraction remodeling, recession, aesthetic compromise	Shield exposure, infection, resorption, technique sensitivity	Unknown fragment viability, bacterial colonization, exposure, necrosis, resorption, peri-implant inflammation, prosthetic instability

Table 2: Conceptual comparison.

Discussion

Preservation of peri-implant tissues in the anterior maxilla remains a central objective of contemporary implant dentistry. Although immediate implant placement can reduce treatment time and preserve socket anatomy when properly executed, it does not fully prevent remodeling of the facial bone wall after extraction [21,22]. The magnitude of remodeling is influenced by the pre-existing facial bone thickness, gingival phenotype, socket integrity, implant position, surgical trauma and restorative emergence design [2,12,13]. Partial extraction therapy has contributed an important biological concept by retaining a portion of the root to preserve the periodontal ligament and associated bundle bone. Hürzeler and colleagues introduced the socket-shield technique as a proof-of-principle report, showing that a retained buccal root fragment did not prevent osseointegration in an animal model and appeared to preserve the buccal periodontal ligament attachment [7]. Subsequent clinical studies of the root-membrane technique reported encouraging outcomes in anterior immediate implant therapy, including high survival rates and stable marginal bone levels [8,9]. A long-term retrospective study with up to 10 years of follow-up reported a cumulative patient-level survival rate of 96.5% and a success rate of 87.9%, within the limitations of retrospective data [23].

Systematic reviews of socket-shield and partial extraction therapy suggest promising implant survival and aesthetic outcomes but also emphasize the need for caution because much of the evidence consists of case reports, case series and heterogeneous retrospective studies [24,25]. The currently available Root Ring and horizontal socket-shield publications provide the conceptual and technical basis for the present report, which should be interpreted as another case reproducing the same biologically oriented approach rather than as a separate technique [10,11]. Nevertheless, because the Root Ring evidence base remains early and case-report driven, clinical predictability cannot yet be assumed. Reported complications of partial extraction therapies, particularly socket-shield and root-membrane techniques, include shield exposure, infection, root-fragment mobility, resorption and peri-implant inflammatory complications [24,26]. These events are generally associated with intentional retention of a periodontal ligament-supported root fragment within the extraction socket adjacent to the immediately placed implant. In contrast, the Root Ring Technique does not rely on maintenance of a retained root fragment attached to the socket wall or dependent on residual periodontal ligament support inside the alveolus. Instead, the circumferential cervical root fragment functions more similarly to a customized biologic abutment positioned around the implant-abutment complex at the supracrestal level. Consequently, the potential complication profile may differ from conventional socket-shield approaches and may be more comparable to complications associated with customized abutments in immediate implant therapy, such as localized infection, soft-tissue inflammation or interface instability.

The present case differs fundamentally from classical socket-shield protocols because it reproduces the Root Ring/horizontal socket-shield concept rather than leaving a static facial shield attached only to the buccal socket wall [10,11]. The root fragment was harvested as a cervical circumferential ring, adapted around a customized abutment, bonded extraorally and reinserted with the abutment immediately after implant placement [10]. The intended biological objective was preservation of a supracrestal root-derived sealing interface, consistent with the wound-closure and periodontal-ligament preservation hypotheses, rather than preservation of the buccal plate alone. The horizontal shield rationale also relates to proposed preservation of residual bone dimensions after extraction [11]. The observed early healing was favorable, with maintenance of soft tissue contour and no clinical signs of early exposure or infection at one week. At three months, radiographic and clinical documentation obtained at the impression appointment showed maintenance of the peri-implant contour and a preserved transmucosal emergence profile after removal of the root-ring-abutment complex.

Despite the favorable early appearance, interpretation must remain conservative. One-week healing cannot predict long-term implant success, biological integration of the root ring, maintenance of the buccal contour or absence of late complications. The retained cervical root fragment may undergo necrosis, inflammatory resorption, bacterial colonization, exposure, mobility or act as a plaque-retentive interface if not biologically or mechanically stable. Furthermore, use of flowable composite resin to bond a biological root fragment to an implant abutment creates a complex interface whose long-term biological response has not been established.

The three-month clinical photographs added an additional observational element. The soft tissue emerging from the root-ring-treated site did not show the same predominantly longitudinal supracrestal vascular pattern seen in the illustrative comparison image from another healed implant site. Because peri-implant mucosal vascular supply and connective tissue organization differ biologically from the periodontal attachment apparatus of natural teeth, such macroscopic findings should be interpreted with caution [16,17]. The transverse appearance of some vascular markings may be compatible with the hypothesis that the cervical root-derived interface influenced soft-tissue organization, but it does not prove periodontal-ligament survival, vascular reconnection or true functional attachment.

An important methodological aspect of the present report is the incorporation of three-dimensional CBCT-based surface-deviation analysis rather than reliance exclusively on conventional linear measurements. Traditional evaluation methods frequently assess isolated horizontal or vertical distances on selected tomographic slices, which may inadequately represent the true three-dimensional morphology of the buccal contour. In this case, STL-based overlap analysis combined with ICP registration and heat-map surface comparison allowed qualitative and quantitative assessment of vestibular dimensional stability. The predominantly neutral deviation pattern observed in the buccal cortical region suggests maintenance of the external contour during the early healing phase. Although these findings cannot establish long-term biological preservation, they support the hypothesis that the Root Ring Technique may contribute to maintenance of supracrestal peri-implant architecture beyond conventional immediate implant protocols.

Histological evidence, sequential CBCT evaluation, standardized clinical photography, peri-implant probing after appropriate healing and long-term prosthetic monitoring will be required to determine whether the technique provides a true biological advantage or merely short-term mechanical contour support.

From a reporting standpoint, the most important revision made to this manuscript is the clearer distinction between clinical observation and biological hypothesis. The case demonstrates an apparently favorable early soft tissue response, but it does not prove periodontal ligament vitality, vascular continuity or predictable long-term tissue preservation. Therefore, the root ring technique should be presented as an experimental case report and not as a validated alternative to established immediate implant or partial extraction protocols.

Conclusion

This case report describes an additional clinical application of the Root Ring Technique/horizontal socket-shield concept in immediate implant therapy in the anterior maxilla. The technique involves preparation of a circumferential cervical root fragment from the extracted tooth, adaptation of the fragment around a customized abutment, immediate insertion of the root-ring-abutment complex, buccal gap grafting and non-loading provisionalization.

Early postoperative findings demonstrated favorable healing and preservation of gingival contour at one week. At three months, radiographic assessment at the impression appointment and CBCT-derived T0-T1 surface-deviation analysis showed predominantly neutral vestibular contour changes and a final ICP RMS deviation of 0.335389 mm, suggesting dimensional stability during early healing. The emergence-profile soft tissue after root-ring-abutment removal showed preservation of the transmucosal contour and visible vascular markings were clinically documented. Nevertheless, these vascular observations remain descriptive and cannot establish periodontal-ligament vitality, vascular continuity or predictable biological integration. The technique should be considered experimental until supported by histological evidence, longitudinal clinical documentation, radiographic follow-up and controlled comparative studies.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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The authors have no acknowledgments to declare.

Data Availability Statement

Clinical photographs, radiographic images and supporting documentation are available from the corresponding author upon reasonable request, subject to patient confidentiality and applicable data protection requirements.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement

Written informed consent was obtained from the treated patient for treatment and for publication of anonymized clinical information, radiographic documentation and clinical photographs. The illustrative comparison image from another healed implant site should be included only if separate consent for anonymized publication has been obtained from that patient or if institutional/publication policy confirms that consent is not required for the anonymized comparator image.

Authors' Contributions

All authors contributed equally to this paper.

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