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MUKOGINGIVALNI PRISTUP POSTAVLJANJU IMPLANTANATA U MASKILARNOJ REGIJI: PRIKAZ NIZA SLUČAJEVA

MUCOGINGIVAL APPROACH TO IMPLANT PLACEMENT IN THE MAXILLARY AREA: A CASE SERIES

Darko Veljanovski, Mihajlo Petrovski, Kiro Papakoca

[1]UNIVERZITET GOCE DOLČEV, MEDICINSKI FAKULTET, ŠTIP, REPUBLIKA SEVERNA MAKEDONIJA

[1]FACULTY OF MEDICAL SCIENCES, GOCE DELCEV UNIVERSITY, ŠTIP, NORTH MACEDONIA

Sažetak

Uvod: *Postavljanje implantata u maksilarnoj regiji predstavlja jedinstven hirurški i protetički izazov zbog visokih zahteva u pogledu estetike i čestog prisustva deficita kostiju i mekih tkiva. Nedavno predloženi mukogingivalni pristup kombinuje principe regenerativne i mukogingivalne hirurgije sa ugradnjom implantata, s ciljem optimizacije ishoda periimplantantnih mekih tkiva.*
Cilj: *Cilj rada bio je da se opišu hirurški protokol i kratkoročni klinički ishodi triju slučajeva ugradnje implantata primenom mukogingivalnog pristupa u različitim kliničkim scenarijima: ranoodloženom, odloženom i pri neposrednom postavljanju.*
Metode: *Tri pacijenta sa jednostrukom bezubosti u maksilarnoj regiji lečena su primenom mukogingivalnog pristupa, koji je uključivao split-full-split koronarno pomereni bukalni režanj, transplantaciju vezivnog tkiva i protetičko kondicioniranje mekih tkiva. Svim pacijentima su ugrađeni transmukozni implantati (TRI Octa, Švajcarska).*
Rezultati: *Svi implantati su uspešno integrisani u kost i održali su stabilne nivoe krestalne kosti u periodu od šest do dvanaest meseci. Periimplantantna mukoza je pokazala zadovoljavajuću debljinu, visinu i popunjenost papila; takođe, ishodi u pogledu estetike bili su povoljni.*
Zaključak: *Mukogingivalni pristup predstavlja svestranu i efikasnu tehniku postavljanja implantata u maksilarnoj regiji, budući da istovremeno omogućava rešavanje deficita mekih tkiva i korekciju susednih mukogingivalnih problema. Da bi se ovi rezultati potvrdili, potrebno je sprovesti dalje kontrolisane kliničke studije sa dužim periodom praćenja.*

Ključne reči: *mukogongivalni pristup, neposredna ugradnja implantata, estetska zona, augmentacija mekih tkiva, transplantat vezivnog tkiva, koronarno pomereni režanj*

Corresponding author:
Asst. Prof. Dr. Darko Veljanovski, Faculty of Medical Sciences, Goce Delcev University, Stip, North Macedonia.
E-mail: darko.veljanovski@ugd.edu.mk

Abstract

Introduction: *Implant placement in the maxillary region presents unique surgical and prosthetic challenges due to high esthetic demands and the frequent presence of bone and soft-tissue deficiencies. The recently proposed mucogingival approach combines principles of regenerative and mucogingival surgery with implant placement to optimize peri-implant soft-tissue outcomes.*
Aim: *The paper aimed to describe the surgical protocol and short-term clinical outcomes of three implant cases placed with the mucogingival approach in different clinical scenarios: early-delayed, delayed, and immediate placement.*
Methods: *Three patients with single-tooth edentulism in the maxillary region were treated with mucogingival approach, involving a split-full-split coronally advanced buccal flap, connective-tissue grafting, and prosthetic soft-tissue conditioning. All patients received transmucosal implants (TRI Octa, Switzerland).*
Results: *All implants osseointegrated successfully and maintained stable crestal bone levels at 6–12 months. The peri-implant mucosa exhibited satisfactory thickness, height, and papillary fill, with favorable esthetic outcomes.*
Conclusion: *The mucogingival approach is a versatile and effective technique for implant placement in the maxillary area, enabling simultaneous management of soft-tissue deficiencies and correction of adjacent mucogingival problems. Controlled clinical studies with longer follow-ups are warranted to further validate these findings.*

Key words: *mucogingival approach, immediate implant placement, esthetic zone, soft-tissue augmentation, connective-tissue graft, coronally advanced flap*

Introduction

The replacement of missing teeth with dental implants is a predictable and evidence-based procedure yielding high long-term success rates and patient satisfaction. However, implant placement in the maxillary area continues to challenge clinicians due to the complex interplay between bone anatomy, soft-tissue architecture, and esthetic expectations[1].

Traditionally, the "esthetic zone" refers to the anterior maxilla, though patients' perception increasingly extends it to the mandibular anterior region and even to the premolar areas. Implants in these areas may be placed at various time points following extraction—immediate, early, or delayed—each with distinct biological and esthetic risks. Immediate placement, while reducing treatment time, is prone to esthetic complications, particularly when buccal bone or mucosal integrity is compromised[2].

The mucogingival approach, recently introduced by Zucchelli et al., as an alternative to flapless immediate placement, aims to combine the benefits of open surgical visibility with mucogingival and regenerative principles[3–4]. It enables correction of hard- and soft-tissue defects, coronal advancement of the gingival margin, and prosthetic soft-tissue conditioning. This technique is particularly advantageous in cases with damaged buccal bone walls or adjacent mucogingival defects, where traditional flapless immediate placement is contraindicated[5].

The present case series demonstrates the clinical application of the mucogingival approach in three different implant placement scenarios, evaluating its short-term outcomes in terms of peri-implant soft-tissue stability and esthetics.

Materials and Methods

Case Selection

Three systemically healthy patients (two males, one female; mean age = 41 years) requiring single implants in the anterior maxilla were included. Inclusion criteria:

(1) age > 18 years; (2) American Society of Anesthesiologists (ASA) I–II status; (3) good oral hygiene (full mouth plaque score (FMPS) < 20%, full mouth bleeding score (FMBS) < 20%).

Exclusion criteria: pregnancy or lactation, untreated periodontitis, bisphosphonate or oncologic therapy, and heavy smoking (> 10 cigarettes/day)[6].

Treatment planning was prosthetically driven using cone beam computed tomography (CBCT) analysis. The straightforward, advanced, complex (SAC) classification developed by the International Team for Implantology (ITI) was applied to assess surgical difficulty and risk[7]. Patients provided informed consent after receiving detailed explanations of surgical and prosthetic procedures.

A standardized medication protocol included amoxicillin 1 g/8 h for 5 days, ibuprofen as needed, and 0.12% chlorhexidine rinses twice daily for 7 days.

Surgical Protocol

Flap Design

Following local anesthesia (4% articaine + 1:200,000 adrenaline), a split-full-split coronally advanced mucogingival flap[8] was designed. The flap included at least one adjacent papilla mesial and distal to the edentulous site. Oblique submarginal incisions extended from the gingival margin of neighboring teeth toward the mucosa, at a distance corresponding to the desired coronal advancement.

The supracrestal portion was elevated in split thickness, followed by full-thickness reflection over 2–3 mm of bone exposure, and a final apical split to release muscular tension. Deep and superficial incisions were made parallel to the bone and mucosal surface, respectively, to achieve passive flap mobility. Anatomical papillae were de-epithelialized to create a vascular bed for surgical papilla adaptation.

Final suturing used external sling sutures (5-0 PGA and polypropylene, 12 mm needle), proceeding from the periphery toward the center of the flap.

Connective-Tissue Harvesting

Soft-tissue augmentation employed extraorally de-epithelialized free gingival grafts from the lateral palate, offering superior consistency and absence of glandular tissue even in thin palates[9]. The combined flap + graft thickness was standardized at ≈ 2 mm.

Graft width extended to neighboring papillae, and vertical dimension exceeded the buccal crest by 2–3 mm. The graft was sutured either to the anatomical papillae or to the inner

surface of the flap using 6-0 PGA sutures, depending on tissue resilience.

Implant Placement

All cases utilized transmucosal, tissue-level implants (TRI Octa, Switzerland). These implants have a polished collar favoring mucosal adhesion and an implant–abutment junction located coronally, away from the crestal bone[10].

Implants were placed free-hand following the CBCT plan, with osseointegratable (rough) surface 3–4 mm apical to the gingival margin of contralateral teeth, and within the alveolar contour of adjacent teeth. When achieved, a minimum torque > 35 Newton centimeters (Ncm) allowed immediate provisionalization.

Prosthetic Phase

Prosthetic soft-tissue conditioning commenced immediately after implant placement. The first provisional restoration (in the immediate case) was a composite crown relined on a titanium base; subsequent provisionals were polymethyl methacrylate (PMMA) screw-retained crowns.

Provisional contours were modified over 3–6 months according to the esthetic biological contour concept (EBC), guiding papillary fill and gingival margin position[11]. The implant stability at the timepoint of final restoration delivery was objectively measured using the implant stability quotient scale (ISQ), which was above 70 for all implants. Final restorations were screw-retained zirconia crowns cemented extraorally on titanium bases. The final esthetic outcome was evaluated utilizing the pink and white esthetic scores (PES/WES), with all implant restorations presenting high scores—above[12].

Results

Case 1—Early-Delayed Placement (Tooth 12)

A 39-year-old male presented after the extraction of tooth 12 due to recurrent infection and fistula. Tooth 13 displayed a Cairo I recession. The case was classified as complex according to the SAC classification. Four months post-extraction, a mucogingival flap was elevated, and the site was prepared via osseodensification (Densah burs). A TRI Octa implant was inserted with > 40 Ncm torque, positioned 3–4 mm below the gingival margin. A 1 mm titanium-base composite provisional was fabricated and immediately loaded.

Three months later, a PMMA provisional refined soft-tissue contours; at five months, a zirconia crown was delivered. Stable bone level and papillary fill were observed with high patient satisfaction.

Case 1 (Figures 1–19) Early-delayed implant placement and soft-tissue maturation

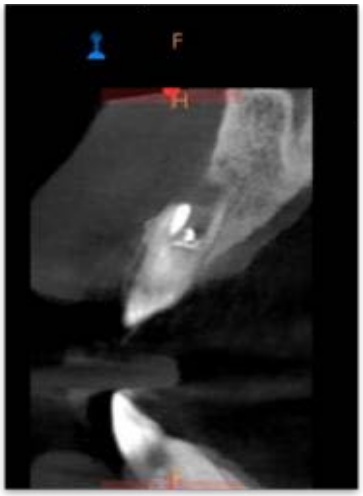

Figure 1*. CBCT imaging*

Figure 2. Flap design

Figure 3. Split-full-split ffap elevation

Figure 4. Osseodensification

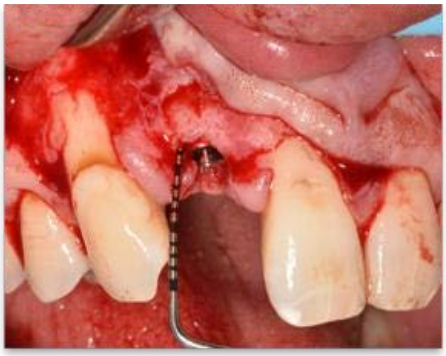

Figure 5. Implant placement

Figure 6. Graft harvesting

Figure 7. Graft plasticity

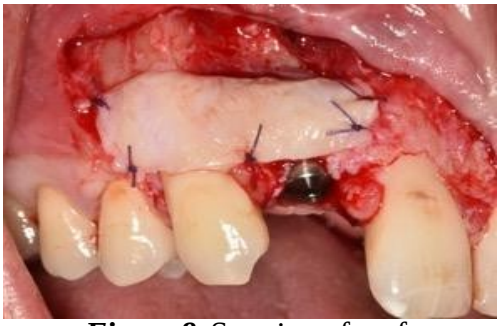

Figure 8. Suturing of graft

Figure 9. Flap sutured with first provisional

Figure 10. Emergence profile 3 months later

Figure 11. PMMA provisional

Figure 12. Second provisional in situ

Figure 13. RVG image

Figure 14. Emergence profile 5 moths later – frontal view

Figure 15. Occlusal view

Figure 16. Final Zr restoration

Figure 17. Occlusal view

Figure 18. RVG with final restoration

Figure 19. Final restoration in upper arch

Case 2—Delayed Placement with Combined Augmentation (Tooth 24)

A 44-year-old male with a history of controlled periodontitis required implant placement at site 24, extracted 8 months earlier. Cone beam computed tomography revealed a horizontal-vertical defect and adjacent canine recession. This was an advanced SAC case.

A mucogingival split-full-split flap was elevated, and a transmucosal implant was placed 3 mm below the gingival margin, leaving coronal threads exposed. Buccal dehiscence was managed with an allograft (Maxxeus, USA) and an overlying connective-tissue graft acting as both membrane and soft-tissue thickening element (bilaminar technique)[12].

No immediate provisional was placed. At 4 months, partial root coverage of the canine and satisfactory buccal volume were achieved. Sequential PMMA provisionals over 5 months yielded improved papillary architecture before final zirconia crown delivery.

Case 2 (Figures 20–44) Bilaminar approach and prosthetic conditioning of peri-implant mucosa

Figure 20. CBCT imaging

Figure 21. Occlusal pre-op view

Figure 22. Flap design

Figure 23. Split-full-split elevation

Figure 24. The ffap - occlusal view

Figure 25. Implant placement

Figure 26. Final implant position

Figure 27. Anatomical papillae de-epithelization

Figure 28. Coronal advancement of ffap

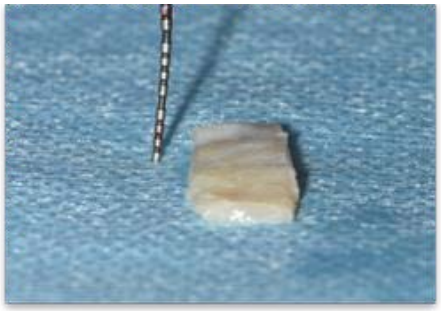

Figure 29. Graft thickness

Figure 30. Bone graft introduction

Figure 31. Defect filled up to the bony envelope

Figure 32. Soft tissue graft try-on

Figure 33. External matress sutures

Figure 34. RVG post-op

Figure 35. Lateral view 4 months post-op

Figure 36. Occlusal view

Figure 37. Frontal view

Figure 38. PMMA provisional

Figure 39. Prosthetic conditioning

Figure 40. Occlusal view

Figure 41. Emergence profile 5 months later

Figure 42. Final Zr restoration - occlusal view

Figure 43. Lateral view

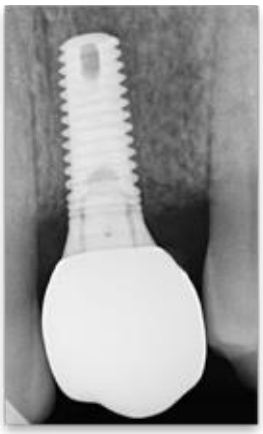

Figure 44. RVG with final restoration

Case 3—Immediate Placement with Buccal Defect (Tooth 12)

A 35-year-old female presented with a compromised tooth 12 due to failed endodontic treatment and recurrent pain. Cone beam computed tomography confirmed a complete loss of buccal bone but intact apical and interradicular bone. This was a complex SAC case.

A variable-thickness buccal mucogingival flap enabled atraumatic extraction and socket debridement. A TRI Octa implant was placed free-hand, with rough surface 3–4 mm below the gingival margin. Buccal reconstruction included allograft bone and a slow-resorbing pericardium collagen membrane fixed with pins[13].

An extraorally de-epithelialized palatal graft was sutured submarginally to the inner buccal flap using horizontal mattress sutures for optimal adaptation.

Immediate loading was deferred, and a temporary Maryland bridge was provided. After 4 months, a PMMA provisional was inserted and progressively modified every 1–2 months to stimulate tissue maturation. At 6 months, a final zirconia crown exhibited complete papilla fill, healthy peri-implant tissues, and radiographically stable bone.

Case 3 (Figures 45–76) Immediate implant placement with simultaneous hard- and soft-tissue reconstruction

Figure 45. CBCT imaging

Figure 46. Frontal view

Figure 47. Occlusal view

Figure 48. RVG pre-op

Figure 49. Flap design

Figure 50. Split thickness elevation

Figure 51. Full thickness elevation

Figure 52. Extraction of root

Figure 53. Coronal advancement

Figure 54. Osteotomy

Figure 55. Implant placed

Figure 56. Within bony envelope

Figure 57. Membrane fixation

Figure 58. Harvested graft

Figure 59. Occlusal view

Figure 60. Graft sutured to inner side of ffap

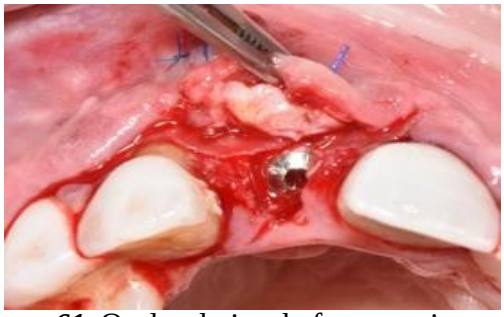

Figure 61. Occlusal view before suturing

Figure 62. Frontal view with sutured ffap

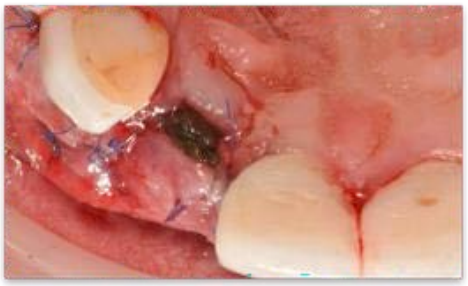

Figure 63. Occlusal view

Figure 64. Maryland bridge

Figure 65. PMMA provisional to be screwed-in 4 monts later

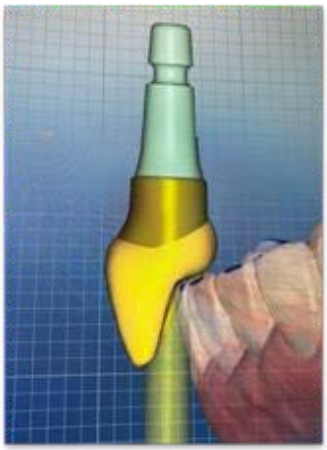

Figure 66. Design according to EBC concept

Figure 67. Occlusal view

Figure 68. Frontal view with insufficient papillae

Figure 69. RVG with provisional

Figure 70. Occlusal view

Figure 71. Papillae fill c months later

Figure 72. Emergence profile - frontal view

Figure 73. Occlusal view

Figure 74. Final Zr restoration in dental arch - frontal view

Figure 75 Lateral view

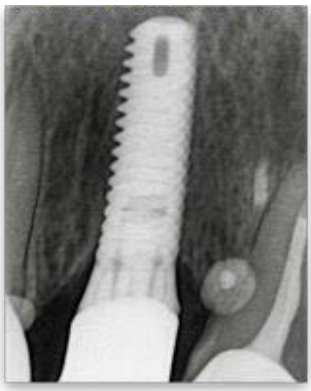

Figure 76. RVG with final Zr restoration

Discussion

The mucogingival approach integrates mucogingival and regenerative concepts into implant surgery, offering visibility, control, and the ability to simultaneously address bone and soft-tissue deficiencies[3–4,14]. Its main objectives include: 1) correction of neighboring gingival recessions, 2) visualization and augmentation of dehiscences, 3) coronal repositioning of the gingival margin, and 4) facilitation of prosthetic soft-tissue conditioning.

Raising a flap, especially in the esthetic zone, has traditionally been viewed as a risk factor for buccal bone resorption; however, current evidence indicates that buccal resorption primarily results from loss of bundle bone after extraction rather than from flap elevation itself. Moreover, damaged buccal bone is no longer considered a contraindication for immediate implant placement[14,15]. A well-designed mucogingival flap, when properly managed, does not increase morbidity and provides superior control of soft-tissue positioning compared to flapless protocols.

Immediate provisionalization plays a pivotal biological role, maintaining clot stability and graft adaptation, while also serving as a mechanical template for coronal tissue migration. In contrast, delayed loading may risk partial recession or papilla loss due to flap contraction during healing.

Implant positioning remains a conditio sine qua non for success with this approach. While free-hand placement demands high surgical expertise, guided implant surgery can further enhance accuracy, allowing the clinician to focus on soft-tissue management. When primary stability is inadequate or extensive regeneration is required, delayed loading remains a valid alternative, albeit with longer conditioning periods.

It was of paramount importance to evaluate and compare the clinical outcomes across the three clinical cases to conclude how this approach performs in different scenarios. In the present series, all three implants demonstrated uneventful healing, stable bone levels, and esthetically harmonious results after 6–12 months. The mucogingival approach proved adaptable to different timing protocols—immediate, early-delayed, and delayed—while consistently enabling correction of adjacent mucogingival anomalies[3,11].

Conclusion

The mucogingival approach represents an efficient and biologically sound technique for implant placement in the esthetic zone, particularly in cases with buccal bone or soft-tissue deficiencies and adjacent recession defects. It combines the precision of regenerative surgery with mucogingival and prosthetic conditioning principles, achieving predictable esthetic and functional outcomes.

Short-term results from this series indicate stable crestal bone levels, healthy peri-implant mucosa, and high patient satisfaction. Further prospective, randomized clinical trials with larger cohorts and extended follow-up are needed to substantiate its long-term advantages over traditional flapless and two-stage approaches.

Limitations

This study has several limitations that should be acknowledged.

First, it was based on a small number of cases (n = 3), which limits the generalizability of the findings and prevents statistical comparison or subgroup analysis.

Second, the included clinical cases were heterogeneous in terms of defect characteristics and treatment complexity, which may have influenced clinical outcomes

and reduced the ability to draw uniform conclusions across cases.

Third, the follow-up period was relatively short, and therefore, the long-term stability of the reported clinical results cannot be fully evaluated.

Despite these limitations, the present case series provides valuable preliminary clinical observations and may serve as a basis for future studies with larger and more homogeneous cohorts and longer follow-up.

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