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MODIFIED PERIOSTEAL RELEASING INCISION IN IMPLANT DENTISTRY

Dentistry

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ABSTRACT

Modified periosteal releasing incision (MPRI) represents an evolution of the conventional periosteal releasing incision (PRI) used in implant dentistry to advance mucoperiosteal flaps in guided bone regeneration (GBR). MPRI employs a shallow (~0.5 mm) horizontal periosteal incision at the base of a full-thickness flap, combined with controlled lateral stretching, rather than deeper or multiple vertical incisions of PRI. This modification aims to reduce postoperative complications such as swelling, bleeding, paresthesia (particularly in the posterior mandible near the mental nerve), and patient discomfort while still providing sufficient flap mobility for tension-free primary closure. Early case reports demonstrated vertical flap advancement of > 10 mm without nerve injury. More recent clinical studies and ex vivo investigations confirm that MPRI achieves similar flap advancement (~8 mm) as mucosal detachment techniques, while periosteal suturing significantly reduces graft displacement regardless of technique. Updates published in 2025 including visualization of the mental nerve emphasize safety improvements. This article reviews surgical principles, anatomical considerations, indications, flap biomechanics, complications, and clinical outcomes compared to alternative techniques.

KEYWORDS

INTRODUCTION

Achieving tension-free primary closure of soft tissues is critical in guided bone regeneration (GBR) for implant dentistry. The periosteal releasing incision (PRI)-a full-thickness mucoperiosteal flap lifted and released via 1–3 mm incisions into the periosteum-is the traditional approach for advancing the flap. [1-4] However, deeper or multiple incisions increase risks such as swelling, bleeding, nerve irritation (especially near the mental foramen), and patient discomfort [5] The modified periosteal releasing incision (MPRI) was introduced to minimise trauma while achieving comparable flap mobility [1,6]

Surgical Technique & Principles

In MPRI, after raising a full-thickness trapezoidal mucoperiosteal flap, a shallow (~0.5 mm) horizontal periosteal incision is made at the flap base. Instead of vertical incisions, controlled lateral stretching of the flap allows advancement of up to 10 mm or more, depending on tissue elasticity and location. [6] The technique avoids deeper submucosal incisions, reportedly reducing the incidence of perioperative complications. [6] The 2025 update emphasises the importance of visualising the mental nerve intraoperatively to prevent nerve injury during posterior mandibular applications. [1]

Anatomical & Biomechanical Considerations

The shallow incision preserves more periosteum and submucosal vascular supply, enhancing wound healing and potentially reducing dehiscence. The technique relies on soft-tissue elasticity and flap thickness; however, recent ex vivo porcine data showed flap advancement of ~8.3 mm for MPRI, comparable to mucosal detachment techniques, and independent of keratinized mucosa width or flap thickness. [2] This suggests robustness across different phenotypes in controlled settings.

Evidence From Case Report And Clinical Series

Hur et al. (2015, case report) described a 63-year-old patient undergoing vertical ridge augmentation in the posterior mandible. They achieved >10 mm advancement with MPRI, without mental nerve paresthesia or other complications, in contrast to expected risks with deep PRI. [6] This was the first clinical description of MPRI advantages.

Comparative Clinical Trials

A randomized controlled study by Zazou et al. compared MPRI, double-flap incision (DFI), circularly advanced lingual flap (CALF), and PRI in GBR with titanium mesh. CALF showed the highest mean flap advancement (~19.9 mm), PRI the lowest (~10.2 mm). MPRI achieved moderate advancement with relatively low morbidity. MPRI patients showed higher pain scores (mean ~5.3/10) compared to DFI (~2.4), though swelling was similar. [5] Membrane exposure rates were not statistically different but trended lower in DFI.

Ex Vivo Experimental Data

Raabe et al. (2025) compared flap advancement methods (MPRI and mucosal detachment technique, MDT) in porcine hemimandibles, with and without periosteal suturing (PS). Flap advancement averaged ~8.3 mm with both techniques. Graft material thickness at the crest decreased similarly in both methods (−23% to −24%), but periosteal suturing significantly reduced displacement (−14% vs −33%). [2] Soft-tissue parameters (keratinized width, flap thickness) did not influence outcomes, suggesting MPRI is reliable across phenotypes.

Indications & Clinical Relevance

- Vertical and horizontal ridge augmentation in areas where anatomy limits deep PRI, notably the posterior mandible near the mental nerve.
- Cases requiring major flap advancement (> 8–10 mm) with minimal nerve risk.
- Scenarios where reducing postoperative morbidity-bleeding, swelling, paresthesia-is desirable.

Advantages Over Traditional PRI

- Less invasive: shallower incision reduces trauma to the submucosa and periosteum.
- Lower risk of nerve injury near the mental foramen due to better visualisation and avoiding vertical incisions.
- Comparable flap advancement to standard PRI or other techniques-ex vivo ~8 mm, clinical ~10 mm. [2,6]
- When combined with periosteal suturing, it provides improved graft stabilisation.

Limitations & Potential Drawbacks

- Slightly higher reported pain in one comparative clinical trial. [5]
- Flap advancement may still be less than CALF (~20 mm) in some settings. [5]
- Requires surgical experience for proper execution of lateral stretching without tearing.
- Reliance on patient-specific soft-tissue elasticity; not yet proven in all anatomical zones.

Role of Periosteal Suturing

Ex vivo data show that periosteal suturing (PS) significantly reduces graft displacement during closure regardless of flap technique. [2] In clinical settings, combining MPRI with PS may optimise graft stability and volumetric outcomes.

Safety Considerations & Complications

- Visualising and protecting the mental nerve is essential when operating in the posterior mandible. [1]
- Shallow incision depth (~0.5 mm) avoids injury to deeper structures.
- MPRI has shown fewer complications-swelling, paresthesia, bleeding-compared with deep PRI, [6] though DFI may offer lower morbidity in some series [5]

Clinical Integration

MPRI offers a valuable alternative to conventional PRI for flap advancement during GBR in implant dentistry. It combines effective mobility (>8–10 mm), reduced trauma, improved nerve safety, and predictable outcomes when paired with periosteal suturing. While CALF or DFI may surpass MPRI in maximal advancement or patient pain in certain settings, MPRI strikes a balance between efficacy and safety. Future randomized trials with long-term outcomes and patient-reported outcomes are needed.

CONCLUSION

The modified periosteal releasing incision is an effective, less traumatic flap advancement technique in implant-related GBR. It offers significant flap mobility with reduced risk of nerve injury and postoperative morbidity. When combined with periosteal suturing, it enhances graft stability. Clinicians experienced in soft-tissue manipulation may consider MPRI as a preferred approach in complex anatomical zones or when minimizing morbidity is a priority.

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