Partial Extraction Therapies (PET): Maintaining Alveolar Ridge Contour at Pontic and Immediate Implant Sites

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Introduction

- Ridge resorption due to extraction well reported
- This is due to bundle bone-periodontal (BB-PDL) complex being lost when tooth is extracted
- Partial extraction therapy (PET) represents subgroup of pre-collapse interventions
    - Retains the tooth root and attachment, therefore retaining BB-PDL with its vascularity
- Root Submergence
    - Demonstrated with success in preservation of post-extraction ridge
    - Limited by apical pathology and endo treatment requiring alternative techniques
- Socket-Shield
    - Introduced by Hurzeler et. al
    - Uses facial or buccal root section alone to maintain
    - Tooth is sectioned Mesio-distally
    - Palatal root section removed
    - Buccal/Facial root section further prepared with attachment to socket being untouched
    - Implant placed palatal to root section
- Pontic Shield
    - Develops a pontic site
    - Retains the buccal/facial root section, applying ridge preservation materials, and sealing tooth socket

PET Classification

- At moment, no collective group for PET
- Root submergence has long been available, other PET treatments are relatively new
- Indications tend to overlap, but each procedure suited to final intention for sire
- The combination of therapies to treat an arch or quadrant affords clinician additional options
- Classification is proposed and outlined in Table 1:

Table 1 Partial extraction therapies (PET) and their indications

PET	Clinical situation(s) indicated
Root submergence[7]	Unrestorable tooth crown or tooth indicated for extraction Absence of apical pathology Healthy amputated pulp or endodontic therapy completed Intention to preserve the alveolar ridge Planned removable full or partial prosthesis Planned pontic site beneath fixed prosthesis Cantilever pontic site as an alternative to two adjacent implants Actively growing young patient planned for implant treatment later Ridge preservation in conjunction with other PET
Socket-shield[8]	Unrestorable tooth crown or tooth indicated for extraction Tooth root with or without apical pathology Intention to preserve the alveolar ridge, specifically to prevent buccopalatal collapse Immediate implant placement Ridge preservation in conjunction with other PET
Pontic shield[9]	Unrestorable tooth crown or tooth indicated for extraction Tooth root with or without apical pathology Intention to preserve the alveolar ridge Planned pontic site(s) beneath fixed prosthesis Cantilever pontic site as an alternative to two adjacent implants Ridge preservation in conjunction with other PET
Proximal socket-shield[23]	Unrestorable tooth crown or tooth indicated for extraction Tooth root with or without apical pathology Intention to preserve interdental papillae Planned immediate implant placement sites of two or more adjacent implants Papillae preservation in conjunction with other PET

Clinical Techniques

- Common to all techniques: decoronation of the tooth that is deemed non-restorable and indicated for extraction, and preservation of its root so the periodontal tissues associated are preserved
- *Root Submergence*
    - Completed to create pontic site beneath conventional FPD or implant supported FPD.
    - Requires root to be free of apical pathology, or endodontic treatment must first be completed.
    - Tooth is decoronated at level of bone crest and coronal portion of root prepared to mimic the ovate form of the future pontic
    - Soft tissue closure by primary intention – either attached gingiva advanced and sutured or soft tissue graft (more preferable).
    - Minimum of 3 months required for healing before pontic pressure can be applied
- *Socket-Shield*
    - Tooth planned for extraction at immediate implant placement site (typical in anterior maxilla)
    - Decoronated at 1 mm above bone crest level
    - Tooth is then sectioned in a mesial-distal manner, creating buccal and palatal halves

    - Palatal root section removed and any pathology at root apex, along with it
    - Buccal half of root is then concaved slightly
    - Implant is then placed palatal to the ‘socket-shield’

- *Pontic Shield*
    - Process is identical to the socket-shield technique
    - Except, instead of placement of immediate implant, the placement of bone grafting material (slow-resorbing bone substitute material) occurs
    - Socket is sealed with soft tissue graft
    - Again, a minimum of 3 months must occur before any pressure from the pontic

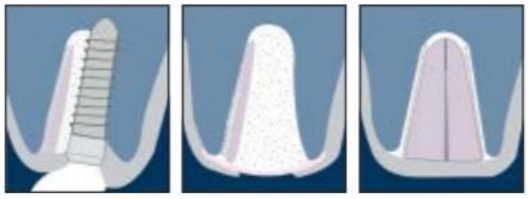

Fig 15 *Diagrammatic representation of the partial extraction therapies (buccopalatal axial view): socket-shield (left), pontic shield (middle), and root submergence (right).*

Fig 16 *Horizontal cross-section midway through the sockets of partial extraction therapies; socket-shield (left), pontic shield (middle), and root submergence (right).*

Discussion

- With extractions, the collapse of hard and soft tissue can create poor sites for ideal placement of implant or FPD
- Bundle bone arises from functionally loaded PDL and, therefore, is lost when the tooth is extracted
- If this does occur, before implant or FPD placement, surgical management may be required to prepare the site, including, but not limited to, guided bone regeneration (GBR), bone block GBR procedures, ridge-split techniques, etc.
- Of course, like any procedure, these have their limitations and drawbacks
- Preventing the ridge collapse before it occurs, or limiting it, is beneficial
- Root Submergence originally introduced to preserve alveolar ridge volume beneath CUD/CLD
- Malmgren et. al approximately 30 years ago reported bone regeneration around submerged root, coronal bone formation, and new cementum and connective tissue may form coronally
- Later, this was altered for developing sites beneath FPDs
- The concept has evolved
- Current literature to support these techniques for ridge/site preservation is very poor
- PET treatments do show promising effects in management of post-extraction ridge

- Hurzeler et. al have proven, histologically, that the techniques discussed preserve supracrestal fibres and support peri-implant tissues
- As of now, PETs do not supersede the established ridge preservation techniques

Conclusions

- PETs may be considered more conservative ridge preservation strategy in teeth planned for extraction
- Retention of all or part of the tooth for enhancement of pontic/implant site, with preservation of papillae or labial tissues has demonstrated promising results
- More abundant histologic evidence and proof of long-term clinical success is still required

Summary

- PETs have shown promise for development of immediate implant placement or pontic site development, both histologically and clinically
- Although promise is there, PETs do not yet supersede that of traditional, established ridge preservation techniques
- Other than Root Submergence, PETs, collectively, are in their infancy
- Further research and studies are required to evaluate the effectiveness of these techniques

Reference

Gluckman, H.; Salama, M.; Du Toit, J. Partial Extraction Therapies (PET) Part 1: Maintaining Alveolar Ridge Contour at Pontic and Immediate Implant Sites. *Int J Periodontics Restorative Dent.* **2016**; 36(5): 681-687.