

Gingival recession: part 3. Surgical management using free grafts and guided tissue regeneration

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VERIFIABLE CPD PAPER

This paper is the third in a three part series looking at the aetiology and management of gingival recession. Part 1 in this series discussed the aetiology of gingival recession and the non-surgical management. Part 2 discussed in detail the factors affecting the outcome of periodontal surgery and the use of pedicle flaps. This paper aims to discuss the surgical options available to correct localised recession defects using free grafts and guided tissue regeneration.

INTRODUCTION

Gingival recession is defined as the apical displacement of the gingival margin from the cemento-enamel junction (CEJ).¹ The main indications for surgical intervention to correct recession defects include the need to improve localised soft tissue aesthetics, to reduce hypersensitivity, improve plaque control and prevent further progression of recession defect.² Miller³ classified gingival recession into four categories which were discussed in the second article in this series. These categories can be used to assess the recession defect present and predict the possible outcome of any periodontal plastic surgery procedure which would aim cover the recession defect and restore aesthetics.

FACTORS AFFECTING OUTCOME OF PERIODONTAL PLASTIC SURGERY

There are several factors that can affect the outcome of any periodontal plastic surgery procedures. These are listed below and were discussed in detail in the previous article in this series. These should be assessed and corrected where possible before surgery as part of the pre-surgical preparation or during surgery in order to improve the overall success of the procedure:

- Condition of root surface – presence of calculus, caries, contaminated cementum or restorations on root surface
- Prominent fraenal attachments
- Depth of vestibule
- Tissue type
- Size of the recession defect and graft material
- Thickness of split thickness flaps raised
- Smoking
- Poor oral hygiene.

FREE GRAFTS IN THE MANAGEMENT OF GINGIVAL RECESSION

Free grafts involve harvesting soft tissue from a distant site in the mouth and grafting it over a localised recession defect. In comparison to pedicle grafts which involve one surgical site, the free grafts involve two surgical sites with the recession defect being the primary recipient site and the secondary donor site which is usually the maxillary palatal tissue. The other main difference is that the grafted tissue does not have its own blood supply and therefore relies on blood supply and nourishment from the recipient site. In order for this to occur there needs to be adequate overlap of the graft tissue with the soft tissue around the recession defect at the recipient site. Immobilisation of the graft at the recipient site is also essential. The commonly used free graft techniques include an epithelialised free gingival graft and a subepithelial connective tissue graft placed either with a pedicle flap, envelope technique or using a tunnelling technique.

IN BRIEF

- Free grafts are an alternative to pedicle grafts and are the treatment of choice in areas where the gingival biotype is thin or there is a lack of keratinised tissue.
- Guided tissue regeneration or the use of allografts and xenografts avoid the need of a second (donor) surgical site.
- The subepithelial connective tissue graft with a coronally advanced flap is considered to be the gold standard grafting procedure.

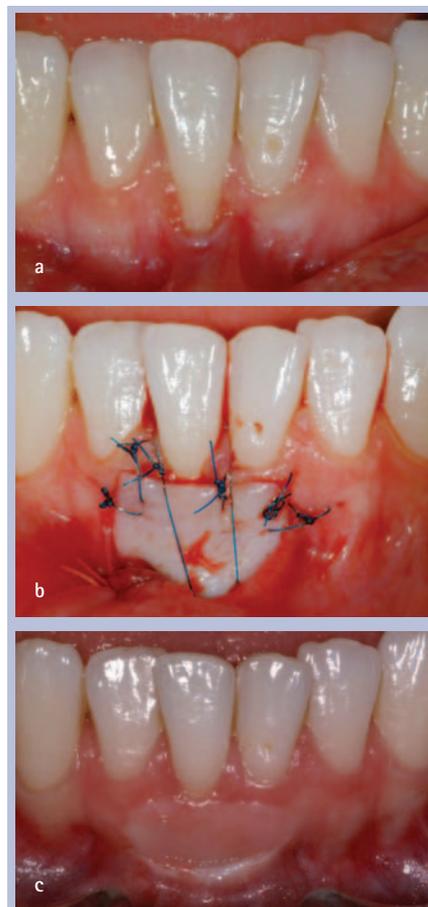


Fig. 1 Gingival recession caused by high fraenal attachment and managed using free gingival graft: (a) pre-op; (b) immediately post-op; (c) five months post-surgery

Epithelialised free gingival graft – clinical technique

The free gingival graft (Figs 1a-c), first described by Nabers,⁴ involves harvesting epithelialised tissue from the palate and placing it on a connective tissue bed at

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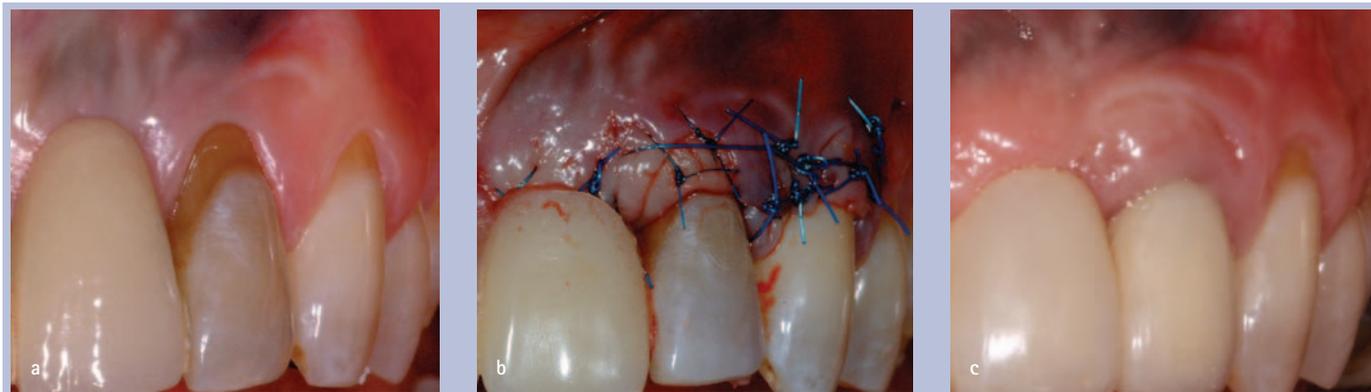


Fig. 2 Shows recession defect treated with a connective tissue graft: (a) pre-operative view of recession defect at UL2 planned for a connective tissue graft with a coronally positioned flap; (b) clinical appearance immediately post-op; (c) clinical appearance following healing of soft tissues

the recipient site with the aim of covering the exposed root surface and/or increasing the width of keratinised tissue at the recipient site.

The epithelialised free gingival graft can be used in either a one stage or two-stage procedure to cover the exposed root surface. In a one stage procedure the graft is placed directly over the root surface (Figs 1a-c) whereas in a two-stage procedure the graft is placed apical to the recession defect and following healing a second pedical flap is raised and moved coronally to cover the exposed root surface. The two-stage

procedure is often used when the gingival biotype is thin at the recipient site.

The clinical technique for an epithelialised free gingival graft involves preparing the recipient site by raising a split thickness flap around the recession defect or apical to the recession defect for a two stage procedure, to remove the epithelial surface layer and expose the underlying connective tissue while ensuring the periosteum remains intact. This is important as the graft does not have its own blood supply and will initially rely on being nourished by the transudate from the collateral

blood supply while angiogenesis takes place from the host tissue into the grafted tissue. It is also important to ensure that the recipient site prepared is large enough to allow adequate overlap of the donor tissue onto the peripheral recipient bed to ensure sufficient blood supply; usually 3 mm extension around the exposed root surface margin is a minimum.

The graft tissue is then harvested from the palate between the palatal root of the first molar and the distal line angle of the upper canine as this is the region where the thickest tissue can be found.⁵

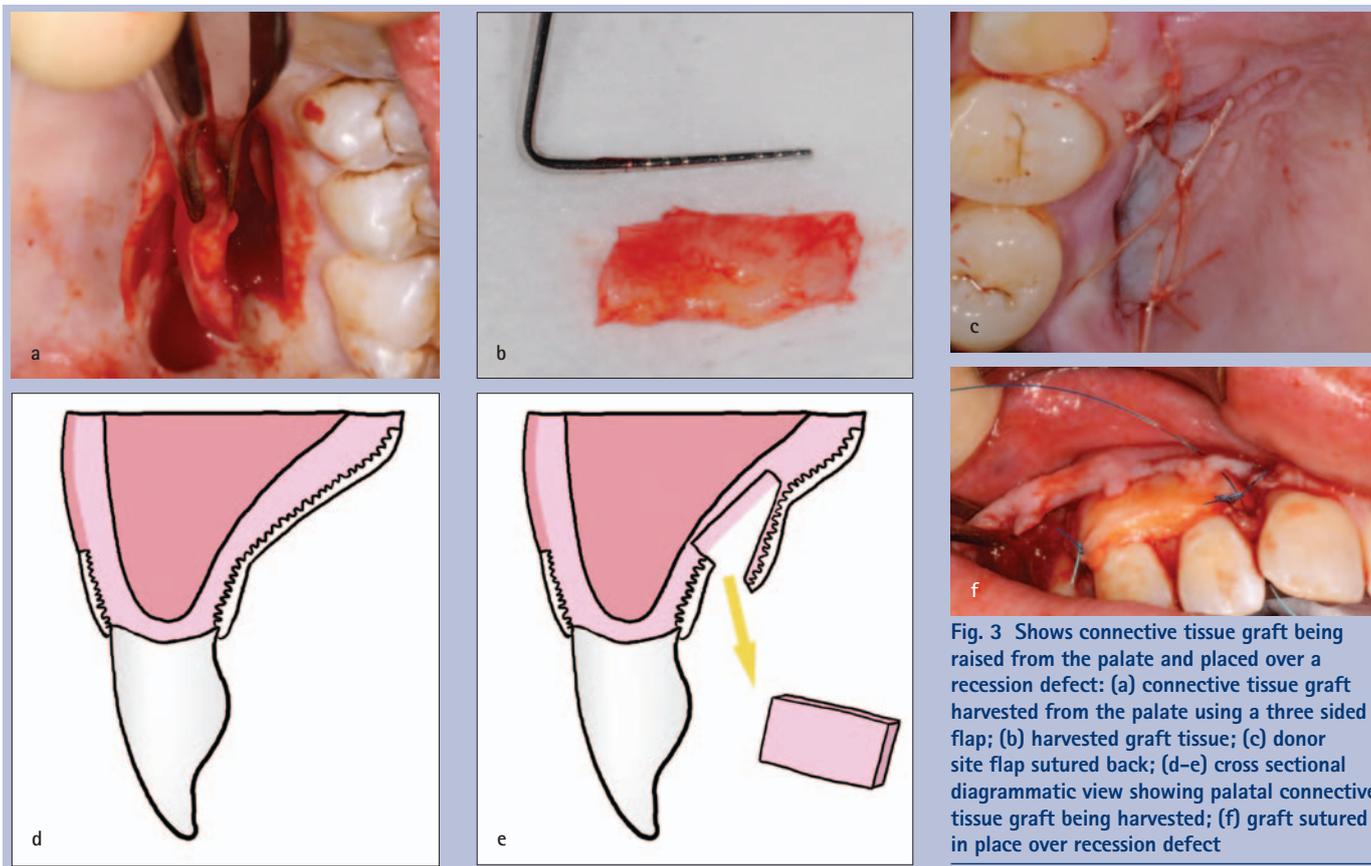


Fig. 3 Shows connective tissue graft being raised from the palate and placed over a recession defect: (a) connective tissue graft harvested from the palate using a three sided flap; (b) harvested graft tissue; (c) donor site flap sutured back; (d-e) cross sectional diagrammatic view showing palatal connective tissue graft being harvested; (f) graft sutured in place over recession defect

It is important to pay attention to local anatomy to avoid the greater and lesser palatine nerves and blood vessels. Reiser *et al.*⁵ reported that this neurovascular bundle on average lies approximately 12 mm from the cemento-enamel junction of the maxillary premolars and molars. It is also advisable to avoid the palatal rugae as this will result in a poor aesthetic appearance of the grafted tissue which is difficult to eliminate even with surgery.⁶

The size of the graft needed depends on the amount of root coverage required and should be measured using a periodontal probe or a sterile foil template. The graft tissue harvested should be approximately 33% greater than the amount required to compensate for the post operative shrinkage that will occur.⁷ An area equivalent to the size of the graft required can be marked out on the palate using a fresh blade, tissue marking pen or by making pressure indentations using the periodontal probe. The graft is then raised keeping an even thickness of 1.5 mm. Once the graft has been harvested any fatty tissue must be removed using a fine surgical scissor or a scalpel leaving only connective tissue under the surface epithelium. The graft should then be sutured in place, immobilised and gentle pressure applied for a few minutes. A periodontal dressing can be applied if necessary. The donor site can be left to granulate over or a periodontal dressing can be placed with the aid of an acrylic surgical dressing plate. Alternatively, the donor site can be covered with Orabase protective paste (ConcaTec Inc, USA).

One disadvantage of the epithelialised free gingival graft is that it retains the colour of the donor tissue. This is often different to the recipient site and therefore this procedure should be avoided in areas of high aesthetic concern.⁸

Subepithelial connective tissue graft – clinical technique

The subepithelial connective tissue (CT) graft was first described by Raetzke⁹ with the use of an envelope pedicle flap. Langer and Langer¹⁰ described an alternative technique which involved placing the subepithelial connective tissue graft with a coronally positioned pedicle flap for covering exposed root surfaces. Figures 2a-c show a clinical case treated using

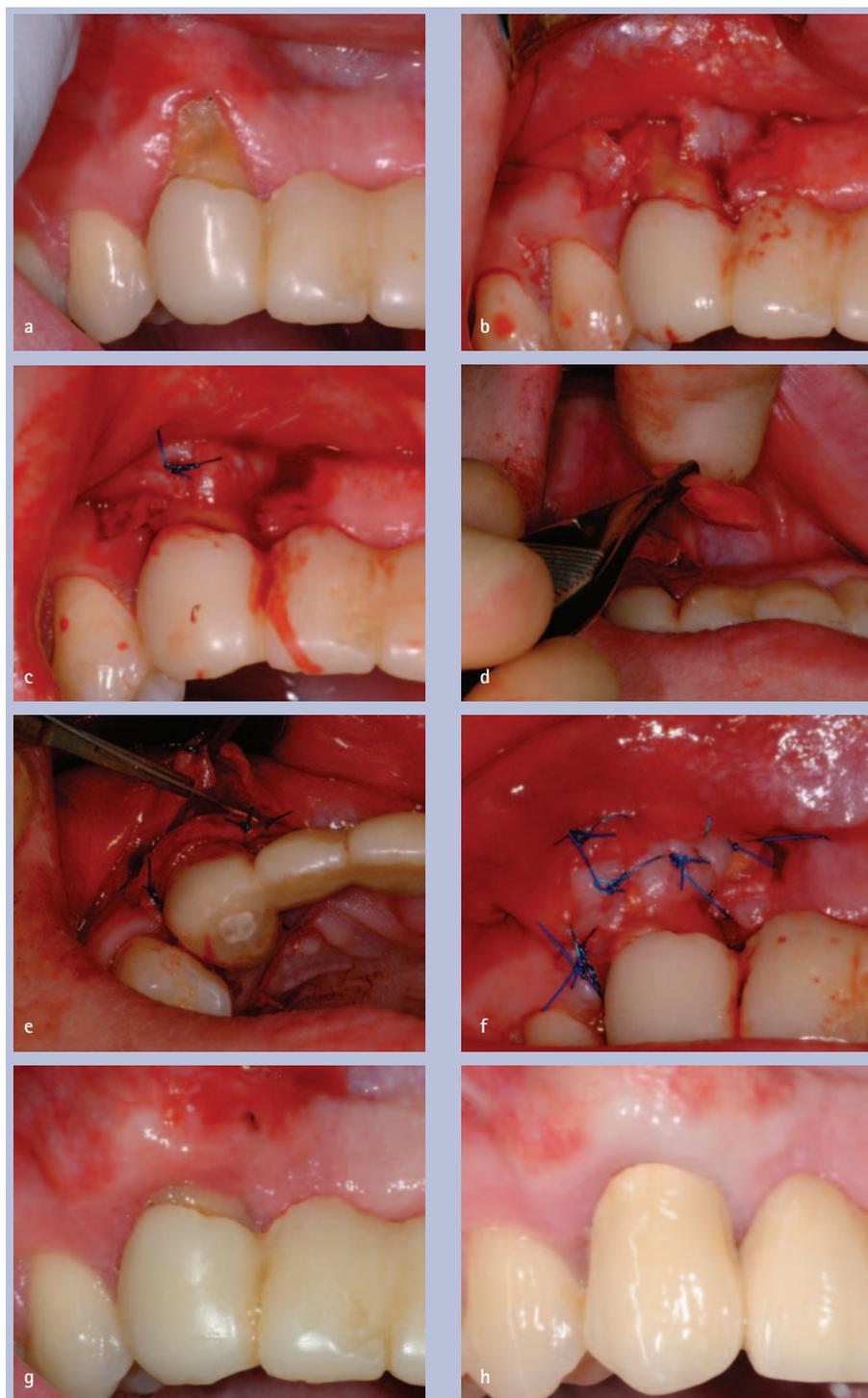


Fig. 4 Recession defect treated with connective tissue graft and a double papilla pedicle flap: (a) pre-operative view showing a 10 mm recession defect on UR3; (b) a double papilla flap is raised; (c) sutured together in the midline over the recession defect; (d) connective tissue graft raised from the palate is placed over the recession defect; (e) graft sutured into place over recession defect; (f) graft is then covered with the double papilla pedicle flap; (g) final post-op view shows significant root coverage but not complete root coverage; (h) the final bridge abutment is placed at the level of the new gingival margin to restore aesthetics

this technique. As well as providing root coverage the subepithelial connective tissue graft can also be used to increase the thickness of the gingival tissues in areas of gingival recession to reduce the risk of further recession in the future.

The procedure involves harvesting connective tissue from the palate and placing it between a split thickness pedicle flap and the connective tissue attached to the underlying periosteum at the recipient site (Figs 3a-f). The palatal flap is raised by measuring out

the size of the graft required using the techniques discussed for the epithelialised free gingival graft above. A three-sided incision is then made on the palatal tissue to create a trap door (Fig. 3a). Alternative techniques described in the literature for this include a two-sided flap or even a single incision. The superficial epithelial layer is then dissected away to expose the underlying connective tissue which can then be harvested (Fig. 3b). The palatal donor site will then require the epithelial flap suturing back (Fig. 3c). Once the connective tissue graft has been harvested any fatty tissue is removed and the connective tissue is placed into the recipient site with the coronal margin placed at the level of the CEJ or slightly above (Fig. 3f). The graft is sutured into place using fine, preferably resorbable sutures. The buccal flap is then pulled over the CT graft and sutured with a sling suture using a fine suture. Gentle pressure is then applied to the wound for a few minutes and a periodontal dressing can be placed if necessary.

The grafted connective tissue should extend at least 3 mm beyond the margins of the recession defect to allow sufficient overlap with the recipient connective tissue bed. This allows the grafted tissue to benefit from a double blood supply from both the surrounding connective tissue and the overlying split thickness flap on the outside.

The recipient site can be prepared using varying techniques. A cuff of epithelial tissue is removed from around the recession site. Crevicular incision with relieving incisions can be made to raise a three sided split thickness flap around the recession defect,¹⁰ alternatively an envelope flap can be raised by extending the crevicular incision around adjacent teeth and then undermining the tissue to create a pouch.^{9,11} Avoiding relieving incisions ensures better blood supply to the flap and therefore more predictable outcome. Alternative techniques include those described by Nelson¹² which involved the combination of a CT graft with a double papilla repositioned flap (Figs 4a-h) or a laterally repositioned pedicle flap and Zabalegui *et al.*¹³ who described the use of a tunnelling technique (Figs 5a-h).

GUIDED TISSUE REGENERATION

Various authors have described the use of resorbable and non-resorbable



Fig. 5 Connective tissue graft carried out using the tunnelling technique: (a) recession defect over upper central incisors; (b-c) tunnel flap prepared to receive connective tissue graft; (d) connective tissue graft harvested from the palate; (e) the graft is passed through the tunnel preparation; (f) and packed under the labial soft tissue up towards the recession defect; (g) final appearance immediately post placement of the graft; (h) picture shows recession defect at the two month review

membranes for guided tissue regeneration (GTR) to treat recession defects.^{14,15} This involves raising a full thickness flap around the recession defect, placing a membrane and covering it with a coronally advanced flap. The aim of this treatment is to prevent the formation of a long junctional epithelium but instead allow normal connective tissue attachment to the exposed root surface. Compared to the traditional grafting techniques described above GTR has the advantage of eliminating the need of a second surgical wound but if non-resorbable membranes are used

a second surgical procedure is required to remove the membrane. Results have shown that there is no significant difference in the outcome between resorbable and non resorbable membranes.¹⁶ While results of guided tissue regeneration have shown significant root coverage is achievable, the outcome is no better than the traditional techniques described above¹⁷ and on the down side they carry the risk of membrane exposure leading to infection, foreign body reaction and difficulties in primary wound closure.^{18,19}

THE USE OF ALLOGRAFTS AND XENOGRAFTS IN MANAGEMENT OF GINGIVAL RECESSION

The use of allografts and xenografts have also recently become available and avoid the need of a second donor site wound. Silverstein and Callan²⁰ described the use of an acellular dermal matrix allograft as an alternative to the epithelialised free gingival graft and Sanz *et al.*²¹ have described the use of a collagen matrix xenograft as an alternative to the free connective tissue graft. While these procedures look promising further research is required to assess the long term outcome of these materials compared to traditional techniques described above. A recent systematic review concluded that these grafts may be useful in situations where a large recession defect needs to be treated and graft tissue harvested from the palate would provide an insufficient volume of tissue. The use of Xenograft bone substitutes combined with collagen membranes has been advocated in the treatment of gingival recession, as well as enamel matrix proteins together with a coronally advanced flap. However, neither of these techniques has been shown to demonstrate any significant benefit over traditional grafting procedures.²²

SUTURING

Appropriate selection of suture size, material and suture needles will also affect the outcome of the surgery. In periodontal plastic surgery improved outcome is achieved with the use of finer needles and suture materials. A finer needle allows accurate positioning of the suture in the tissue and therefore more accurate closure. It also minimises tissue trauma as the needle passes through the tissue. The suture size should be as fine as possible, usually 5/0 or 6/0 for microsurgical procedures. Ideally a resorbable eg Serafast 5/0 (Serag Wiessner, General Medical, UK) or non-resorbable monofilament suture material eg novafil (Syneture, Coviden Surgical) should be used as it does not accumulate plaque and therefore reduces risk of wound infection. The flap should also be sutured back tension free as any tension in the flap can reduce the amount of root coverage achieved.²³

POST-OPERATIVE INSTRUCTIONS

Following periodontal plastic surgery the patient should be advised to avoid

brushing the surgical site for at least three weeks while initial healing occurs. During this time the patient should be prescribed a 0.2% chlorhexidine gluconate mouthwash twice daily. Immediately following surgery the patient should also be advised against lifting their lip or pulling their cheek to have a look at the surgical site. This can cause displacement of the tissues which have been carefully sutured into position.

The sutures should be left *in situ* for approximately 10-14 days as it takes about 8-10 days for the connective tissue union and adequate blood supply to develop within the grafted tissue.²⁴ At the review appointment if sufficient healing has occurred the sutures should be removed and the adjacent teeth can be gently cleaned with prophylaxis paste and flossed to remove any plaque deposits. If plaque deposits are present at the surgical site, these can be removed gently with cotton wool soaked in 0.2% chlorhexidine gluconate. After approximately three weeks when sufficient healing has occurred the patient can be advised to use a soft bristle baby toothbrush for a further two weeks to gently clean the area. The patient should be reviewed again at four weeks post surgery and if sufficient healing has occurred the patient can resume a normal atraumatic toothbrushing regime. Complete healing often occurs over several months and any probing of the site should be avoided for at least six months.

PROGNOSIS

The mean root coverage achieved with an epithelialised free gingival graft has shown to vary between 9-87% and complete root coverage varies between 9-72% of sites.²⁵ The mean percentage root coverage achieved with subepithelial connective tissue grafts has been shown to vary between 65-98%.^{22,26-29} The number of sites showing complete root coverage varies between 18-87%.^{22,28} Chambrone *et al.*³⁰ suggested that connective tissue graft could be considered to be the gold standard grafting procedure. Harris²⁹ showed 98% mean root coverage was sustained at 27.5 month follow up on patients who had Miller class I and II defects. His results also supported the idea of creeping attachment where there was a small increase in amount of root coverage between early and long term follow up periods.

When the epithelialised free gingival grafts are compared to the subepithelial connective tissue graft, both techniques are effective in the treatment of recession defects. However, the subepithelial connective tissue graft has been shown to provide a greater percentage root coverage than the epithelialised free gingival graft.³¹ Similarly subepithelial connective tissue graft combined with a coronally advanced flap has been shown to provide better root coverage than the coronally advanced flap alone over a five year follow up period.³²

The mean root coverage achieved with guided tissue regeneration has been shown to vary between 48-94% and complete root coverage varies in between 0-75% of sites.²⁵ When the subepithelial connective tissue graft is compared with guided tissue regeneration, the subepithelial graft has shown evidence of achieving greater root coverage.^{22,33,34}

Evidence shows that the size of the initial recession defect will determine the amount of root coverage achieved.²² Miller class I defects can achieve complete root coverage in 100% of cases and in class II defects complete root coverage was seen in 88% of cases.³⁵ Larger recession defects rarely achieve full coverage. One study showed recession defects of 3-5 mm only managed to attain 80.6% coverage and recessions greater than 5 mm only attained 76.6% root coverage with free gingival grafts.³⁶ Nelson¹² reported 100% root coverage in recession defects less than 3 mm, 92% root coverage in recession defects 4-6 mm and 88% in recession defects of 7-10 mm. Overall better results for percentage of complete and mean root coverage can be achieved if defects are less than 4 mm.²²

CONCLUSIONS

A variety of surgical procedures are available for the treatment of recession defects and have all shown statistically significant root coverage.²² Clinically these procedures are technically demanding and operator training and experience will affect success rates. In suitable cases a combination of the subepithelial connective tissue graft with a coronally advanced pedicle flap is considered to be the gold standard procedure due to the high success rates reported in the literature.^{33,37}

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