



Comparison of Effectiveness between Acellular Dermal Matrix Allograft and Subepithelial Connective Tissue Graft with Coronally Advanced Flap in Recession Treatment: A Systematic Review

Vini Mehta^{1*}, Shreya Bagwe², D Gopalakrishnan³ and Ankita Mathur²

¹Department of Public Health Dentistry, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pune, India

²Department of Periodontology, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pune, India

³Professor and Dean, Department of Periodontology, Dr. D.Y. Patil Dental College and Hospital, Dr. D.Y. Patil Vidyapeeth, Pune, India

***Corresponding Author:** Vini Mehta, Department of Public Health Dentistry, Dr. D.Y. Patil Dental College and Hospital, Pune, Maharashtra, India.

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Abstract

Objective: The present review aims at comparing the effectiveness of Acellular Dermal Matrix Allograft (ADMA) with Subepithelial Connective Tissue Graft with Coronally Advanced Flap on the different clinical parameters.

Methods: Randomized controlled clinical trials with a follow up of at least 6 months published between 1st January 1980 to 31st July 2019 were identified from MEDLINE, the Cochrane Central Register of Controlled Trials, the National Institutes of Health Trials, Clinical Trials Registry India, Google Scholar and major journals. After a comprehensive search, the articles were independently screened for eligibility by two reviewers. All cross reference lists of the selected studies were screened for any additional papers. Studies who had localised or multiple Miller's Class I or II gingival recession were included.

Results: Sixteen articles out of 50 titles were found to meet the eligibility criteria. There was no significant difference between Subepithelial Connective Tissue Graft and ADMA with parameters such as recession height/depth, recession width, probing depth, clinical attachment level and root coverage gain. Although ADMA is expensive, it provides less surgical time, less postoperative pain, no addition of a second surgical site, has uniform thickness and can be used for multiple recession sites which is not possible with Subepithelial Connective Tissue Graft which requires a second surgical site and is technique sensitive.

Conclusions: ADMA can be used as an alternative for Subepithelial Connective Tissue Graft in Miller's Class I and Class II localized or multiple recession defects.

Keywords: Acellular Dermal Matrix Allograft; Gingival Recession; Connective Tissue Graft

Abbreviations

ADMA: Acellular Dermal Matrix Allograft; CAL: Clinical Attachment Level; PD: Probing Depth; CEJ: Cemento-Enamel Junction; RCT: Randomized Controlled Clinical Trials.

Introduction

Gingival recession is termed as oral exposure of root surface because of displacement of gingival margin apical to cemento-enamel junction (CEJ) [1]. The etiologies that contribute to gingival recession are toothbrush trauma, tooth malalignment, calculus,

gingival inflammation and orthodontic tooth movement [2,3]. Leading to deterioration of dental esthetics and development of cervical dentinal hypersensitivity [4].

Thus, to obtain a predictable and esthetic root coverage is a challenge and goal for the periodontist. The quest for attaining patient aesthetics lead to the attempt of surgical procedures like free gingival grafts, bilaminar techniques which consist of connective tissue graft with a pedicle graft, guided tissue regeneration, laterally positioned flap.

The subepithelial connective tissue graft developed by Langer and Langer [5] in 1985 described the use of subepithelial connective tissue graft as a donor site for root coverage which offered a combination of pedicle flap and free gingival graft.

Due to second surgical site being created on the palate for harvesting the connective tissue, the patient experiences discomfort due to post surgical pain from the donor area and also risk of bleeding [3]. So such candidates are not only subjected to recession but also may not be good candidate for obtaining proper thickness of connective tissue [6]. The above limitations led to discovery of substitutes like preserved sclera [7] for coverage of denuded roots and duramater [8] to obtain gain in width of attached gingiva and coverage of denuded roots.

Acellular Dermal Matrix allograft (ADMA) which has been introduced recently has been used as a substitute to autogenous connective tissue graft at gingival recession sites [9-12]. It is a freeze-dried, cell-free dermal matrix with a collagen and elastic fibre extracellular matrix, this allogenic material is human skin derived and further treated to remove antigenic targets of mediated immunity cells [3]. Since there is no need of a palatal donor site ADMA has an advantage over autogenous connective tissue graft.

Thus considering the available literature, the main aim of this systematic review was to assess effectiveness of ADMA compared to Subepithelial Connective Tissue Graft in Class I and Class II gingival recession using clinical outcome as variants for comparison.

Materials and Methods

Focused question

In patients with localized or multiple Miller's Class I or Class II gingival recession, which procedure gives the best possible results in terms of root coverage, clinical attachment level, probing pocket depth, width of keratinized gingiva, recession height and recession width?

Eligibility criteria

A literature search was performed for randomized controlled clinical trials (RCT) with a follow up of at least 6 months published between 1st January 1980 to 31st July 2019 assessing ADMA compared to Subepithelial Connective Tissue Graft in localized or multiple Class I and Class II gingival recession using clinical outcome such as root coverage, clinical attachment level, probing pocket depth, width of keratinized gingiva, recession height and recession width as variants for comparison. Studies published in English or those having detailed summary in English were

considered. Studies where systemic diseases, those who have undergone periodontal surgery in the past 12 months, patients with traumatic occlusion and teeth with root caries were excluded.

Search strategy

Two electronic databases were used to search for appropriate studies that would satisfy the study purpose: PubMed-MEDLINE, and the Cochrane Central Register of Controlled Trials using MeSH terms. Additional sources such as Google Scholar and major journals were explored. Ongoing trial registries such as The National Institutes of Health Trials and Clinical Trial Registry India were searched. Contact with authors was done for any unpublished studies.

Screening and selection

The papers were independently scanned by two reviewers (SB and DG), first by the title and abstract. If the search keywords were present in the title and/ or the abstract, the papers were selected for full-text reading. Papers without abstracts but with titles suggesting that they were related to the objectives of this review were also selected to screen the full text for eligibility. After selection, full-text papers were read in detail by two reviewers (SB and DG). Those papers that fulfilled all of the selection criteria were processed for data extraction. Two reviewers (SB and DG) hand searched the reference lists of all selected studies for additional relevant articles. Disagreements between the two reviewers were resolved by discussion. If a disagreement persisted, the judgment of a third reviewer (VM) was considered decisive.

Data extraction

From the collection of papers that met the inclusion criteria, data were extracted with respect to the effectiveness of ADMA with Subepithelial Connective Tissue Graft on root coverage [3], recession height [13], recession width [14], width of keratinized gingiva [3], clinical attachment level, probing pocket depth.

Results

Search and selection results

The PubMed-MEDLINE, Cochrane Central, and other sources identified 588 unique records which were screened by titles and abstracts (Figure 1). After full-text reading, 141 records were excluded. This exclusion resulted in 22 full-text articles. The remaining sixteen studies [10,14-24,27,28] that fulfilled the selection criteria were processed for data extraction. Additional hand searching of the reference lists of the selected studies yielded no additional records. An overview of the selected studies and their characteristics are presented in Table 1.

| Author name | Location | Study design | Sample size | Setting | Condition | Intrvention | Comparison | Evaluation period | Confounders | Outcome | Results |
|---------------------------|---|----------------------|---|----------|------------------------------|---------------------------------------|--|-------------------|---|---|---|
| Henderson RD et al 2001 | Oklahoma city | RCT | 10 | Hospital | Miller's Class I and ClassII | Acellular dermal matrix graft+CAF | Subepithelial connective tissue graft+CAF | 12 months | sites with no recession, Class III and Class IV | PD,CAL Keratinized tissue | Increase in keratinized tissue at primary recession sites |
| Novaes Jr. AB et al 2001 | Sao Paulo | RCT | 9 patients with 30 recessions | Hospital | Miller's Class I and ClassII | Acellular dermal matrix graft+CAF | | 6 months | | PD, CAL,width of keratinized tissue | The advantage of ADMA is that a 2nd surgical site is avoided & the amount of material available is not limited, compared to a limited amount of connective tissue harvested from the palate, thus allowing the treatment of multiple defects. |
| Tal H et al 2002 | Tel Aviv | RCT | 7 patients with 14 teeth | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | Subepithelial connective tissue graft+CAF | 12 months | | PD, width of keratinized gingiva | Mean defect coverage & predictability were high & favorably compared with previous reports of connective tissue grafting. |
| Rahmani ME et al 2006 | Mashad institut | RCT | 14 patients with 20 gingival recessions | Hospital | Miller's Class I and ClassII | Acellular dermal matrix graft +CAF | Subepithelial connective tissue graft+CAF | 6 months | | PD, keratinized gingiva, recession width , CAL | ADMA and SCTG techniques could produce the same results when used for the successful treatment of gingival recessions. In addition the ADMA could be used as an adequate alternative treatment modality for conventional techniques. |
| Haghighati F et al 2006 | qFaculty of Dentistry, Tehran University of Medical Science | RCT | 9 patients with 32 recessions | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | Subepithelialconnective tissue graft +CAF | 6 months | | PD, Recession width, CAL | The use of ADMA yields similar results to that of connective tissue grafts with the advantage of avoiding a second surgery for the removal of palatal tissue at the donor site. Other advantages of ADMA are reduction in operative time & it does not require a specialist. However, the high cost of ADMA could be considered as disadvantage. |
| Tarun Kumar AB et al 2009 | Davangere | RCT | 9 patients with 18 defects | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | | 6 months | | width of keratinized tissue, PD, CAL,root coverage | ADMA is equally effective to connective tissue graft in treatment of localized gingival recession. Second surgical site is avoided,patient morbidity due to palatal donor site can be avoided & availability of unlimited grafts for treating multiple recession defects |
| Mansouri SS et al 2010 | Tehran university of Medical Sciences | RCT | 5 patients with 9 bilateral defects | hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | SubepithelialConnective tissue graft +CAF | 6 months | | Recession height, recession width, keratinized gingiva,CAL,PD | Alloderm is able to yield acceptable results compared to SCTG in treating shallow to moderate gingival recessions, simplifying the surgery, eliminating the need for a second surgical site & permitting the one-stage treatment of an unlimited number of defects. |
| Jazi MN et al 2011 | Tehran University | RCT | 15 | Hospital | Miller's Class I and ClassII | Acellular dermal matrix graft +CAF | Subepithelial connective tissue Graft+CAF | 60 months | | recession width , width of feratinized gingiva, root coverage | ADMA in 2nd surgical area is avoided & the amount of material available is not limited, compared to the limited amount of connective tissue harvested from the palate, thus allowing the treatment of multiple defects. The use of allograft contributed to a significant reduction in the patient morbidity and surgical risks. ADMA was similar to SCTG, which implies that in spite of its expense, it is a suitable material for root coverage. |
| Koudale SB 2012 | Wardha | RCT | 10 | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | Subepithelial connective tissue graft+CAF | 6 months | | PD, CAL,width of keratinized tissue | ADMA for palatal donor material is eliminated,which reduces post operative morbidity .In addition it provides an unlimited supply of graft material thus permitting multiple site root coverage, that can be extended for a sextant, quadrant, or even a full mouth arch at one time. |
| Thomas LJ et al 2013 | Alapakkam | RCT | 10 patients with 20 recession sites | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | Subepithelial connective tissue graft +CAF | 6 months | | Recession height, recession width, keratinized gingiva,CAL,PD | There was no statistically significant difference in recession height and width, gain in CAL, and increase in the width of keratinized gingiva between the two groups on the 180th day. Both procedures showed clinically and statistically significant root coverage. The results indicate that coverage of denuded root with both subepithelial connective tissue autograft and ADMA are very predictable procedures, which were stable for 6 months postoperatively. |
| Aichelmann R et al 2001 | Louisiana | RCT | 22 | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | Subepithelial connective tissue graft+CAF | 6 months | | recession width, recession height, root coverage, PD, CAL | Significant gains in root coverage, CAL, keratinized tissue were obtained using subepithelial placement of ADMA. Despite statistical differences, the test material performed similar to connective tissue graft.This implies that alternative donor tissue, acellular allogenic freeze dried drmal matrix may be a suitable substitute for autogenous connective tissue graft for root coverage in treatment of human gingival recession. |
| BT et al 2015 | Kuala Lumpur | RCT, parallel design | 6 | Hospital | Miller's Class I and ClassII | Acellular dermal matrix graft +CAF | Subepithelial connective tissue graft+CAF | 6 months | | recession height, recession width, PD | It was concluded that ADMA & subepithelial connective tissue graft yield similar outcomes when used in treatment of gingival recession defects |
| Paolontino et al 2002 | Italy | RCT | | Hospital | Miller's Class I and ClassII | Acellular dermal matrix graft +CAF | Subepithelial connective tissue graft+CAF | 12 months | | | When compared to connective tissue grafts, ADM produces a lower risk in keratinised tissue. Therefore, it should not represent the technique of choice when a maximum increase in keratinised tissue the goal of surgical procedure |
| Joly JC et al 2007 | Brazil | RCT | | Hospital | Miller's Class I and ClassII | Acellular demal matrix graft +CAF | Subepithelial connective tissue graft+CAF | 6 months | | PD, CAL | The coronally positioned flap associated with a connective tissue graft provided a more favorable outcome |
| Shori T et al 2012 | Nagpur | RCT | | Hospital | Miller's Class I and ClassII | Acellular dermal matrix allograft+CAF | Subepithelial connective tissue graft+CAF | 6 months | | | The amount of root coverage in SCTG group was almost equivalent to ADMA, though SCTG showed slightly better result. |

Table 1: Overview of the studies processed for data extraction.

Showing the comparison between Coronally advanced flap and Subepithelial Connective Tissue Graft and Coronally advanced flap with Acellular Dermal Matrix Allograft (ADMG)

*SCTG: Subepithelial Connective Tissue Graft, CAF: Coronally Advanced Flap, ADMA: Acellular Dermal Matrix Allograft

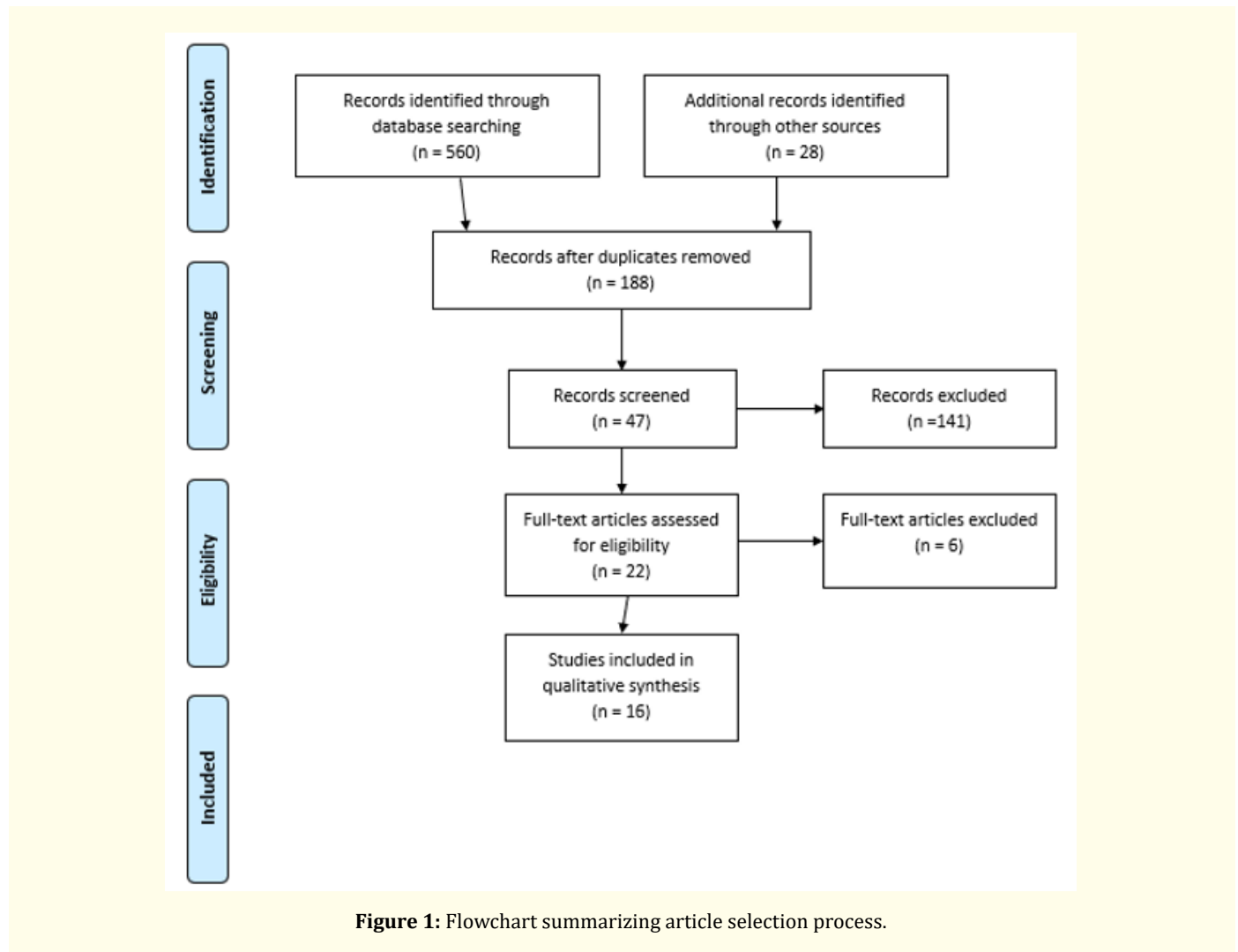


Figure 1: Flowchart summarizing article selection process.

Study characteristics

Eight RCTs followed split mouth design [14-16,20-24], six RCTs followed parallel design [10,17,23,24,27,28], one RCT followed both [19] and remaining one showed [18] block randomization. A total of 186 patients with 307 recession defects were included and all the randomized controlled trials were conducted in hospital setting. The included studies selected from the dental literature had Subepithelial Connective Tissue Graft plus Coronally Advanced Flap as control and Acellular Dermal Matrix Allograft as intervention with a minimum follow up period of 6 months till long term follow up which lasted for 60 months.

Outcome parameters

The recession height/recession depth, recession width, clinical attachment level, probing depth reduction were recorded in the following studies. [15-19,21-27]. However there was no statistical significance between the two groups with respect to recession

height/recession depth, recession width, clinical attachment level, probing depth reduction. 10 RCTs [15-17,20-23,26-28]. 3 studies [15,17,24] recorded statistically significant changes in increase in width of keratinised gingiva in subepithelial connective Tissue Graft group when compared with Acellular Dermal Matrix group. Although one study [22] showed increase in keratinised tissue in Acellular Dermal Matrix Group compared to Subepithelial Connective tissue group but it was not statistically significant. All studies showed root coverage gain. 5 studies [17,18,23,24,26] showed complete root coverage.

Discussion

During the past few years, the effectiveness of Periodontal Plastic surgery in treatment of localized or multiple recession defects have been recorded. Out of the several techniques being followed for treatment of gingival recession, two techniques namely, Subepithelial Connective Tissue Graft plus Coronally Advanced Flap

and Acellular dermal Matrix Allograft plus Coronally Advanced Flap have been studied in recent years for their effectiveness in treatment of gingival recession.

Hagighati F [18] reported that Acellular Dermal Matrix allograft caused reduction in operative time and does not require a skilled clinician. On the other hand, Tarunkumar AB [21], showed that Connective Tissue Graft is technically sensitive. Koudale SB., *et al.* [25] reported that Acellular Dermal Matrix Allograft has unlimited supply of graft material and could be used for multiple root coverage which could be extended for sextant, quadrant or full mouth arch at one time. However, Thomas., *et al.* [26] reported that Acellular dermal Matrix is expensive, yet it is a suitable material for root coverage. Paolantino M., *et al.* [17] reported that Connective Tissue Graft showed quicker healing. In a randomized clinical trial based on analysis of patient acceptance conducted by Goyal N., *et al.* [28], they showed ADMA better in terms of duration of surgical procedure and postoperative comfort. However, the high cost of acellular dermal matrix was reported by four patients in this study.

Limitation

Although, the major databases were used for the literature search, papers might have been missed because they might not be listed in these sources. The present review encompasses articles published in English language, which may have excluded potentially valuable evidence. There is a dearth of literature in histologic evaluation and comparison of healing. Most of the studies did not have a long term follow up and did not include all the parameters.

Implications in Future Research

Long term research needs to be carried out to evaluate Acellular Dermal Graft in shallow defects. Also there is a need to conduct studies on the mechanism of increase in width of keratinized gingiva and compare the creeping attachment when treated with Acellular Dermal Matrix Graft.

Conclusion

Although ADMA is expensive, it provides less surgical time, less postoperative pain, no addition of a second surgical site, has uniform thickness and can be used for multiple recession sites which is not possible with Subepithelial Connective Tissue Graft which requires a second surgical site and is technique sensitive. Thus it can be concluded that, Acellular Dermal Matrix Allograft can be used as an alternative for Subepithelial Connective Tissue Graft in Miller's Class I and Class II localized or multiple recession defects.

Conflict of Interest

None declared.

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