

# ROLE OF EDTA IN ROOT CONDITIONING PERSONIFIED

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## ABSTRACT:

Periodontitis produces substantial changes on the root surface which is referred to as 'pathologically exposed' root surface. Plaque, calculus and cytotoxic substances penetrate the pathologically exposed root surface and act as physical barrier inhibiting the new attachment and providing a substrate for bacterial growth. Such obstacles cannot be removed by scaling and root planing alone. Rather, leads to smear layer formation hindering new attachment. Therefore, various agents have been introduced in order to detoxify, decontaminate, and demineralise the root surface and promoting root conditioning. EDTA has been well known as a chelating agent. However, its role in root conditioning and periodontal regeneration is more to be discovered. Hence, to explore the same, EBSCO HOST was searched for entries since 1966 – 2014, which included:- Journal of Periodontology, Annals of Periodontology, Periodontology 2000, Journal of Clinical Periodontology, International Journal of Periodontics and Restorative dentistry, Journal of Indian Society of Periodontology and Journal of Periodontal Research. A total of 6 studies were reviewed, out of these 6 studies, only, 2 reported evidence of regeneration for EDTA. It was found that the role of EDTA as a root conditioning agent in regeneration is still controversial and doubtful.

**Keywords:** EDTA, root conditioning, new attachment, periodontal regeneration



## INTRODUCTION:

The diseased root surfaces are unfavourable for new attachment.<sup>[1]</sup> Traditional treatment of pathologically altered root surfaces has relied on scaling and root planing alone.<sup>[2]</sup> Nevertheless, this procedure leads to the

formation of smear layer that impairs and hinders the periodontal healing and regeneration. Thus, emphasis has been given to root surface conditioning through various agents, which promote root decontamination and exposure of

the collagen matrix aiming at new attachment formation and, therefore, periodontal regeneration.<sup>[3,4,5]</sup>

EDTA is an aminopolycarboxylic acid and a colourless, water-soluble solid. Its conjugate base is named ethylene diamine tetra acetate. Its usefulness arises because of its role as a hexadentate ('six-toothed') ligand and chelating agent, i.e. its ability to sequester metal ions such as  $\text{Ca}^{2+}$  and  $\text{Fe}^{3+}$ .<sup>[6]</sup>

The compound was first described in 1935 by Ferdinand Munz, who prepared the compound from ethylene diamine and chloroacetic acid. Today, EDTA is mainly synthesised from ethylenediamine (1, 2 diaminoethane), formaldehyde, and sodium cyanide.<sup>[7]</sup>

A chelating agent such as EDTA working at neutral pH is preferable with respect to preserving the integrity of the collagen fibres, early cell colonization & fibrous wound healing. Etching at neutral pH preserves the flap & adjacent tissue vitality while low pH necrotizes after 20 seconds of exposure.<sup>[8]</sup> Hence, it can act as novel root conditioning agent, to assess the same, this review was planned.

## MATERIALS AND METHODS<sup>[9]</sup>

EBSCO HOST was searched for entries since 1966 – 2014, which included these journals:- Journal of Periodontology, Annals of Periodontology, Periodontology 2000, Journal of Clinical

Periodontology, International Journal of Periodontics and Restorative dentistry, Journal of Indian Society of Periodontology and Journal of Periodontal Research.

To identify studies not found in the databases search, certain issues of the following journals were searched manually: Journal of Periodontology, Journal of Clinical Periodontology, Journal of Indian Society of Periodontology and Journal of Periodontal Research, Chronicles of Dentistry, Indian Journal of Oral Sciences, text books.

**Inclusion criteria:** Randomized controlled trials in systemically healthy human subjects; comparative, histologic and animal studies, narrative reviews published in English; presenting any modality of root surface biomodification.

**Exclusion criteria:** Studies lacking baseline–outcome comparisons; with insufficient data; with more than one variable in addition to root surface biomodification; and case reports, because of their weaker clinical evidence.

## RESULTS AND DISCUSSION

EDTA has been well known as a chelating agent, i.e. it has ability to sequester metal ions such as  $\text{Ca}^{2+}$  and  $\text{Fe}^{3+}$ . After being bound by EDTA, metal ions remain in solution but exhibit diminished reactivity.<sup>[6]</sup> A total of 6 studies were reviewed, out of these 6

studies, only, 2 reported evidence of regeneration for EDTA.

On treatment with EDTA, the dentin had surface with an abundance of patent dentinal tubules with diameters of 2-3 $\mu$ m (normal diameter 1-1.5 $\mu$ m), intertubular surfaces with dense fibrillar network extending in to dentinal tubules, with cross striated appearance.<sup>[10]</sup>

EDTA chelates divalent cations depleting the culture medium of free calcium. A chelating agent is a material combined with a metal in weakly dissociated complexes in which the metal is part of a molecular ring structure.<sup>[11,12]</sup>

Blood clot which has divalent cations, primarily calcium may block the chelating increases the binding of matrix proteins to dentin and stimulates fibroblast attachment & growth.<sup>[11,13]</sup>

EDTA was used with trypsin because the continuous flow of blood in the site, blood clot obscures the effects of etching solutions on dentin surfaces.<sup>[14]</sup>

- 1% trypsin for 20 min – dissolves blood clot & expose the underlying dentin.
- Trypsin a pancreatic proteolytic enzyme which is able to degrade ECM collagen type I in contrast to Type III which predominates in dentin is resistant to trypsin degradation.

Root surface associated smear is removed & collagen fibres exposed on EDTA gel preparation used non-surgical root planning.<sup>[15]</sup>

EDTA – apparently produced morphologic changes in the collagen fibres.<sup>[14]</sup>

A neutrally buffered EDTA has recently been suggested for use in periodontal regeneration EDTA – enhanced healing compared to citric acid.<sup>[14]</sup>

Belal Helmy Mahmoud et al. (2010)<sup>[16]</sup> conducted a study to verify the effect of EDTA and/or PDGF application on root adhesion and proliferation of pdl fibroblast cells. Periodontal regeneration using EDTA or PDGF showed promising results, but the effect of combined application was still unclear.

Minocha Tanuj et al. (2013)<sup>[17]</sup> conducted a study to evaluate and compare the root surface changes subsequent to the application of citric acid, tetracycline, EDTA, and the combination of citric acid and tetracycline, and its influence on the adhesion of a fibrin clot.

The root specimens treated with the combination of citric acid and tetracycline, best supported the fibrin clot. EDTA gel of 24% was least effective to promote the adhesion of a fibrin clot.<sup>[17]</sup>

## CONCLUSION

Within the limitations of this review, it is possible to conclude that the application of EDTA as a root biomodification agent provide no or minimal clinical benefit with respect to gain in attachment levels or reduction in probing pocket depths. Thus, its role in regeneration is still unpredictable and doubtful. Therefore,

further studies are needed to assess the additive effect of EDTA as a root

conditioning agent on regeneration in larger sample size.

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