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Editorial

Role of pyridinoline cross-linked carboxyterminal telopeptide of Type I collagen (ICTP) in periodontal diagnosis

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Abstract

Probing depths, bleeding on probing, clinical attachment levels, plaque index, and radiographs measuring alveolar bone level are examples of traditional periodontal diagnostic measures utilised in clinical settings. These conventional tools' advantages include their affordability, convenience of use, and relative non-invasiveness. Conventional diagnostic methods are intrinsically limited since they can only evaluate the history of a disease, not its present state. Damage from previous bouts of destruction is measured by radiographic assessments of alveolar bone loss and clinical attachment loss readings obtained by the periodontal probe. Research on diagnosing oral and periodontal diseases is progressing towards techniques that use objective metrics, including biomarkers, to identify and quantify periodontal risk.

Keywords: Periodontal diagnosis, Biomarkers, ICTP

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1. Introduction

In the life sciences, biomarkers of disease are crucial and are starting to play a bigger part in drug discovery, diagnosis, and therapy outcome monitoring. The goal for biomarkers is to enable more reliable medication efficacy measures and earlier diagnosis of disease progress. A better understanding of biomarkers' relationship to the mechanism of illness progression and therapeutic intervention is necessary for them to take on their proper function in normal practice. In order to improve the clinical care of patients with periodontal disease, new diagnostic tests that can identify the presence of active disease, forecast future disease progression, and assess the response to periodontal therapy must be developed.[1]

1.1 Pyridinoline cross-linked carboxyterminal telopeptide of type I collagen

The most prevalent type of collagen in osseous tissue, type I collagen makes up 90% of the organic matrix of bone. In a variety of bone resorption and metabolic disorders, collagen breakdown products have become important indicators of bone turnover. Pyridinoline cross linkages, which comprise pyridinoline, deoxypyridinoline, N-telopeptides, and C-telopeptides, are a class of chemicals that break down collagen. Collagen's mature intermolecular cross-links are pyridinoline and deoxypyridinoline. Pyridinoline, deoxypyridinoline, and amino- and carboxyterminal cross-linked telopeptides of type I collagen are released into the bloodstream following osteoclastic bone resorption and collagen matrix disintegration. Cross-linked telopeptides are thought to be unique biomarkers for bone resorption because they are produced when collagen molecules undergo post-translational modification, which prevents them from being recycled during collagen synthesis. furthermore, the selectivity of pyridinoline cross-links for bone is what makes them valuable as possible indicators of bone turnover. It has recently been discovered that a degradation fragment that comes from the helical portion of type I collagen and contains the α1 chain's 620–633 sequence strongly correlates with amino- and carboxyterminal telopeptides linked to bone resorption.

When trypsin or bacterial collagenase breaks down bone type I collagen, a 12- to 20-kd fragment known as the

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pyridinoline cross-linked carboxyterminal telopeptide of type I collagen (ICTP) is produced. In a number of bone metabolic disorders, such as osteoporosis, rheumatoid arthritis, and Paget's disease, there is a correlation between the bone resorption rate and elevated blood ICTP and other pyridinoline cross-linked components. Additionally, following bisphosphonate or oestrogen therapy, postmenopausal osteoporotic individuals showed notable reductions in pyridinoline cross-links. Pyridinoline cross-links are a potentially useful diagnostic tool in periodontics due to their specificity for bone resorptionBiochemical markers that are specific to bone degradation can help differentiate active bone loss in periodontal or peri-implant conditions from simple gingival inflammation.

Additionally, there was a high correlation between ICTP levels and whole-subject levels of numerous periodontal pathogens, such as *Treponema denticola, Tanerella forsythensis, Porphyromonas gingivalis, and Prevotella intermedia*.[2] Elevated ICTP levels at implant locations were strongly correlated with colonisation by organisms like *Streptococcus gordonii, Fusobacterim nucleatum subsp vincentii, and Prevotella* intermedia that are linked to failed implants. Additionally, diagnostic methods have been used to assess how well active periodontal therapy is working. Study involving individuals with periodontitis undergoing scaling and root planing (SRP) found significant correlations between GCF ICTP levels and clinical indicators of periodontal disease, such as attachment loss, pocket depth, and bleeding on probing. Additionally, elevated baseline levels of GCF ICTP—especially at shallow sites—were found to be predictive of future attachment loss as early as one month after initial sampling.

2. Conclusion

While many biomarkers have been studied, there is currently no conclusive evidence that any single type is more sensitive or specific than others. However, research investigating GCF ICTP levels as a diagnostic marker for periodontal disease activity has shown promising results. ICTP levels have been observed to significantly decrease following periodontal treatment and have also been identified as a reliable predictor of future alveolar bone and attachment loss. Additionally, ICTP has shown a strong correlation with clinical indicators and potential periodontal pathogens. Nevertheless, controlled longitudinal human studies are still needed to fully establish the role of ICTP in predicting periodontal tissue breakdown, disease progression, and treatment response.

3. Source of Funding

None.

4. Conflict of Interest

None.

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