



REVIEW ARTICLE

Rethinking Gingival Recession Evolved Modern Insights and Emerging Trends

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ABSTRACT

Gingival recession apical migration of the gingiva from the cemento-enamel junction – is a globally prevalent periodontal condition with the prevalence rate ranging from 93.9% in US adults to 58.3% Pakistani adults. Despite the growing understanding of periodontology worldwide, the field of periodontology remains relatively underdeveloped in Pakistan. However, there is a rising curiosity in academia and clinical practice. This review article aims to comprehensively discuss the multiple aspects of gingival recession (GR) with the new understanding of etiological factors, clinical features, problems associated with GR, RT (2017) classification, new advancements in diagnostic tools and a brief account of its management. Moreover, it provides relevant clinical pictures of the author's own cases for contextual and clinical relatability. The search strategy included the search across Google Scholar, PubMed, Scopus, and Web of Science using the keywords “gingival recession(s)” “gingival recession/etiology,” “gingival recession/classification,” and “diagnosis AND management,” focusing on relevant studies published in English in the last 10 years. Further references were identified through snowballing the bibliographies to present a comprehensive review. From a total of 507 studies in the first search hit to refining it to 54 research studies pertaining to the focus of this article are included in this review.

Keywords: Gingival recession, recession classification, periodontal diseases.

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INTRODUCTION

Gingival recession (GR) is a globally prevalent condition associated with periodontal disease.¹ It is defined as apical displacement of the gingival margin beyond the cemento-enamel junction (CEJ), consequently exposing the root surface to the intraoral environment.^{1,2} A systematic review of 15 studies involving 37,460 participants concluded that GR is a prevalent condition affecting about 78% of the population globally, with prevalence rates of 93.9 % in U.S adults, 97.9 % in Chinese adults,^{1,3} 40.98% Indian adults and 58.3 % in adult Pakistani population.⁴ These figures highlights the widespread nature of GR and its relevance to both public and individual oral health.

Gingival recession is multifactorial in origin, with contributing factors including periodontal phenotype, traumatic tooth brushing, anatomical anomalies, inappropriate restorative margins, high frenum attachment, and parafunctional habits.⁵ Its varied presentation and etiology make accurate diagnosis and appropriate management challenges,⁶ particularly in the absence of standardized classification or treatment protocols. The clinical implications of GR extend beyond aesthetics, often contributing to dentin hypersensitivity, root caries, non-carious cervical lesions, and in advanced cases,

tooth mobility or eventual tooth loss.^{6,7} Moreover, the psychosocial impact of GR stemming from aesthetic concerns and functional discomfort can significantly diminish a patient's oral health-related quality of life (OHRQoL).⁷

In recent years, periodontology has witnessed substantial academic and clinical advancements. Innovations in periodontal plastic surgery, improved understanding of soft tissue dynamics, and the development of refined classification systems (e.g., Cairo classification) have reshaped the way clinicians approach GR.^{5,6,8} However, despite the abundance of emerging research, existing reviews often focus narrowly on individual treatment modalities or specific populations, leaving a gap in comprehensive literature that integrates these advancements with clinical decision-making. Therefore, this narrative review aims to bridge this gap by consolidating evolving knowledge to inform evidence-based clinical practice and highlight areas for future research in the management of GR.

Etiology of gingival recession

The etiology of gingival recession is generally considered to be multifactorial, involving a range of precipitating and predisposing factors, Table 1. The following sections explore each etiology in detail.

Table 1. List of precipitating and predisposing factors causing gingival recession

Predisposing factors	
Periodontal Disease	Periodontal disease plays a crucial role in gingival recession. ^{9,10}
High Frenulum Attachment	Aberrant attachment of the frenulum can exert force on the surrounding tissue which can cause recession. ^{11,12}
Gingival Phenotype	Thin gingival phenotype is prone to marginal recession. ^{13,14}

Bone Dehiscence	Marginal bone loss and thinning of buccal bone can cause gingival recession. ¹¹
Age	Natural aging of gingival tissue can influence the development of gingival recession. ¹⁵
Precipitating factors	
Mechanical Trauma	Due to aggressive tooth brushing, oral self-inflicted injuries, and certain prosthetic restorations. ¹⁶
Smoking	Nicotine in cigarettes plays a key role in gingival recession. ¹⁴
Malocclusion	Occlusal dysfunctions contribute to the development of gingival recession. ¹⁷
Hormonal Changes	High levels of estrogen and progesterone in pregnancy cause gingival inflammation, increasing the risk of gingival recession. ¹⁸
Iatrogenic Factors	Faulty restorative and orthodontic treatments contribute to the development of gingival recession. ¹⁸

Predisposing factors

Predisposing factors are the anatomic and structural variations that place the gums at a risk of developing recession.⁸ Some of the predisposing factors are thin gingival biotype, alveolar bone dehiscence, tooth malposition, lack of keratinized mucosa and other structural variations.^{8,13}

Periodontal diseases: Periodontal disease is a progressive inflammatory condition of the tooth-supporting tissues, primarily driven by dental plaque accumulation at the gingival margin which plays a crucial role in gingival recession.^{9,10} Inflammation due to bacterial infection combined with plaque buildup, can destroy gingival tissue and the supporting bone around the teeth, ultimately causing attachment loss.¹⁸ In the study conducted by Alhaddad et.al, the results found periodontal disease as the primary cause of advanced gingival recession in 40.2% of cases.⁵

Anatomical factors: Anatomical factors such as thin gingival tissue, bone dehiscence, and a rigid frenulum attachment are common predisposing factors that contribute to the development of gingival recession.^{9,10}

Frenula attachment: A thin gingival phenotype with a strained frenula attachment can significantly contribute to gingival recession (Figures 1), by creating a constant pulling force on the gingiva, leading to tissue mobility and sub gingival plaque accumulation especially at the labial aspects of the teeth.^{10,18}

Recognizing the impact of frenal attachment on gingival health is vital for clinicians, as recession linked to these attachments can lead to root exposure and aesthetic concerns. Early intervention is essential.¹⁹



Figure 1. Multiple frena in the lower anterior region contributes to the gingival recession.

Gingival phenotype: Gingival phenotype, previously known as gingival biotype, plays a crucial role as a risk factor for future gingival recession.²⁰ This trait is genetically determined showing an inverse relationship with recession risk thicker gingiva resists damage, while thin phenotypes are more prone to recession.^{21,11} A thin gingival phenotype is characterized by delicate gingival tissue, a narrow zone of keratinized tissue and thinner supporting bone, which can increase the risk of gingival recession and other periodontal issues.⁶ Although the necessity of keratinized tissue in preventing recession remains debated, studies show that less than 2 mm correlates with higher recession risk.^{6,8} Figure 2



Figure 2. Picture shows multiple factors contributing to gingival recession in this case. Thin gingival phenotype, bone dehiscence, lack of keratinized mucosa, anatomic position of the tooth and plaque accumulation.

Bone dehiscence: Gingival recession is linked to various functional problems, including bone dehiscence, a defect of bone crest where the buccal bone becomes thinner or lacks the marginal bone.^{22,11} This significantly contributes to recession and root exposure, particularly around misaligned teeth. Mucosal thinning is affected by alveolar bone thickness, influenced by tooth position and anatomy. While fenestration defects may play a role in recession, they typically arise alongside other contributing factors rather than as the sole cause.¹⁰

Precipitating factors

Mechanical trauma: Aggressive tooth brushing in otherwise healthy gingiva is a major contributor to gingival recession.¹³ Gingival recession is often caused by poor brushing habits, using excessive force, stiff bristles, incorrect technique, and brushing too frequently.¹⁶ To prevent gingival recession, it is essential to consider the type of brush, brushing frequency, and the technique.

Smoking: Smoking is a risk factor for periodontal disease, impairing neutrophil function, and hindering the elimination of periodontal pathogens. This leads to attachment loss and visible gingival recession.^{16,23} Nowadays vaping has gained popularity amongst young adults, and studies show it can cause oral ulcers, xerostomia, and inflamed gums in adolescent users.²⁴ Jeong et al in their study found out that 35.8% men and 28.6% women who vaped had periodontal diseases.²⁵ Therefore, quitting smoking entirely is crucial to maintain proper oral health rather than switching to vaping as a “safer” alternative.

Iatrogenic factors: Iatrogenic factors in dentistry, such as negligence, improper instrument use, and poor planning, can lead to complications like gingival recession.¹⁹ Contributing factors include faulty

restorations, orthodontic treatments, and prosthodontic treatments.¹¹ Orthodontic treatment can cause plaque buildup around brackets and wires, leading to deeper probing pockets, connective tissue loss, thinning of marginal tissue, and gingival recession due to bone dehiscence from tooth displacement.^{11,13} (Figure 3)



Figure 3. Gingival recession following orthodontic treatment

Signs and symptoms

Gingival recession is clinically visible, and the changes are often noticed and well reported to the dentist by the patient. Symptoms of GR include bleeding gums, accumulation of plaque, root caries, abrasion and cervical wear, and dentine hypersensitivity.^{6, 26, 27}

Dentine hypersensitivity is commonly associated with GR due to exposed root surfaces.^{26,28} Root caries can occur on exposed root surfaces, particularly in regions such as restoration edges, mesial and distal concavities.²⁵ Non-carious cervical lesions (NCCLs) also occur on root surfaces due to non-microbial damage, appearing as deep rounded or wedge-shaped craters at the CEJ. These lesions weaken tooth structure, encourage plaque buildup, and enhance associated dentine hypersensitivity.^{22,28} Furthermore, asymmetric gingival margins can result from gingival recession, giving the affected tooth an unusual longer appearance and uneven gingival zenith.²⁹ Owing to this unsightly appearance, people tend to seek dental care.²⁸

Classification of gingival recession

Over the years, numerous classifications of gingival recession defects have been proposed. The most widely accepted amongst them was Miller's classification that has been used in dentistry since 1985. However, Miller's classification categorizes the different types of gingival recession based on characteristics of mucogingival junction and does not account for other factors contributing to etiology and sequelae of GR, as explained in Table 2 in accordance with the 2017 classification.³⁰

Table 2. Clinical characterization of GR according to the 2017 classification

	Gingival Site			Tooth Site	
	REC Depth (mm)	GT (mm)	KTW (mm)	CEJ (A/B)	STEP (+/-)
No recession					
RT1					
RT2					
RT3					

RT = recession type, REC Depth = depth of gingival recession, GT = gingival thickness, KTW = keratinized tissue width, CEJ = cemento enamel junction (Class A = detectable CEJ, Class B = undetectable CEJ), STEP = root surface concavity (Class + = presence of a cervical step > 0.5 mm, Class - = absence of cervical step)

The present classification on gingival recession is given as.

Recession Type 1 (RT1): This type shows that the recession is localized with no clinical attachment loss (CAL) in interproximal areas. The interproximal cemento enamel junction (CEJ) was not clinically observable on either the mesial or distal surfaces of the tooth.

Recession Type 2 (RT2): In type 2, the recession is seen associated with loss of interproximal attachment. The amount of interproximal loss of CAL is less than or equal to the loss of buccal attachment.

Recession Type 3 (RT3): Loss of interproximal attachment is greater than the

loss of buccal attachment. This type signifies that there is more loss of clinical attachment interproximally compared to the buccal side.³¹

DIAGNOSIS

Accurate diagnosis of the condition is essential for treatment. The extent of gingival recession allows a dentist to prepare a treatment plan. To allow comparison between multiple treatment techniques, recession depth i.e. distance between CEJ and gingival margin (GM) is measured.³² Recession is conventionally measured using a periodontal probe but this method is prone to multiple errors due to variations in angulation and placement as well as rounding errors.³³

To reduce these errors, computer aided image analysis was proposed.³⁴ In 2D radiographs, the precision of the measurement was improved by using a digital ruler that allowed for measurements to be made to the nearest 0.01 mm and the need for rounding off measurements was eliminated. However, the main limitation of this method is recession width and surface area are dependent on the shooting angle.^{35,36} To further improvise diagnosis, 3D scanners were designed to evaluate numerous characteristics of gingival

recessions, like depth, thickness, area or volume.³⁷

Imber J-C⁶ in his study describes introduction of a highly accurate method for the visualization and quantitative assessment of gingival margin changes, including gingival recessions, using serial 3D digital dental models where he defines techniques, for measuring both mild and severe recessions. Although the high accuracy of the intraoral scanners that reaches 30–50 µm, CEJ registration could be problematic due to the presence of saliva or the absence of a tactile surface irregularity.^{6,38}

Management of gingival recession

An effective management protocol for gingival recession includes both non-surgical and surgical procedures. The first step in developing an effective management and prevention plan is to identify susceptibility factors and modifiable conditions that contribute to gingival recession.² By addressing these factors, treatment outcomes can be optimized. Figure 4 shows a clinical case of GR successfully managed with non-surgical and surgical intervention. Table 3 provides an overview of both surgical and non-surgical options available for the treatment of gingival recession.



Figure 4. Surgical management of the gingival recession case

Table 3. Non-surgical and surgical interventions to manage gingival recession

NON-SURGICAL INTERVENTIONS	Identifying underlying etiology ²	Educating on proper brushing technique ³⁸	Careful finishing of dental restorations (e.g.; composite, ceramics, or metal) ²	Management of dental hypersensitivity ²
SURGICAL INTERVENTIONS	Free graft procedures ³⁹	Pinhole surgical treatment ⁴⁰	Guided tissue regeneration ¹⁰	Flap procedures ³⁹

CONCLUSION

To conclude, the literature suggests that GR is indeed a highly prevalent condition worldwide. Its progression leads to root caries, hypersensitivity and ultimately interferes with patient's comfort. Although it has both localized and systemic causes, early detection can lead to less severe consequences. Accurate diagnosis, which necessitates a comprehensive patient history, clinical examination, and further diagnostic testing, is crucial to devising a treatment plan. Extensive research has been done about multiple treatments procedures (both surgical and non-surgical) and the details of which are beyond the scope of this review.

List of abbreviations

GR	Gingival recession
OHRQoL	Oral health related quality of life
AAP	American academy of periodontology
NCCL	Non-carious cervical lesion
REC	Recession
GT	Gingival thickness
KTW	Keratinized tissue width
CEJ	Cemento enamel junction

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Availability of data and materials

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Consent for publication

Not applicable

Disclaimer of using AI tools

Not utilized. All ideas, arguments, and conclusions presented in the article, however, are entirely the authors' original work. The authors take full responsibility for the accuracy and integrity of the content.

Patient consent

Not applicable

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