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INTERPROXIMAL REDUCTION IN ORTHODONTIC PRACTICE: INDICATIONS, TECHNIQUES, OUTCOMES, AND FUTURE DIRECTIONS- A NARRATIVE REVIEW

***Dr. Ratna Rachel Ponraj, Dr. Carol Winnie Lobo, Dr. Chandra Surrian Sinnathaanby**

Faculty of Dentistry, Manipal University College Malaysia, Malaysia.

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***Corresponding Author**
Dr. Ratna Rachel Ponraj
Faculty of Dentistry, Manipal University College Malaysia, Malaysia.

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ABSTRACT

Background: Interproximal reduction (IPR) is a widely used orthodontic procedure aimed at gaining space by selective removal of proximal enamel. Although routinely performed in fixed and clear aligner therapy, concerns remain regarding its biological and clinical effects. **Aim:** To review the indications, techniques, biological considerations, clinical outcomes, and future directions of interproximal reduction in orthodontics. **Methods:** A narrative review of available literature including clinical trials, systematic reviews, and in-vitro studies related to orthodontic IPR was undertaken. **Results:** Evidence supports IPR as an effective and conservative alternative to extractions in mild to moderate crowding and tooth size discrepancy cases. Proper technique, polishing, and fluoride application minimize adverse effects on enamel and periodontal tissues. **Conclusion:** When judiciously planned and carefully executed, IPR is a safe and effective adjunct in contemporary orthodontic practice. Further long-term clinical studies are required to establish standardized protocols.

KEYWORDS: Interproximal reduction, Enamel stripping, Orthodontics, Clear aligners, Space management.

INTRODUCTION

Interproximal reduction (IPR), also known as enamel stripping or slenderization, involves the deliberate removal of a small amount of enamel from the proximal surfaces of teeth.[1-2] The

procedure has been employed in orthodontics for several decades as a conservative method to manage space discrepancies, correct tooth size discrepancies, and improve alignment without resorting to extractions.[3-4] With the increasing popularity of clear aligner therapy, the relevance of IPR has further expanded, as it is often incorporated into digital treatment planning.[5-6]

Despite its widespread use, IPR remains controversial due to concerns regarding enamel damage, increased caries susceptibility, tooth sensitivity, and periodontal effects.[7-9]

METHODS

A narrative review methodology was adopted. Relevant articles were identified through electronic searches of PubMed and Google Scholar databases using keywords such as "interproximal reduction", "enamel reduction", "orthodontics", and "clear aligners".[10-12]

INDICATIONS FOR INTERPROXIMAL REDUCTION

IPR is primarily indicated in cases of mild to moderate crowding, typically ranging from 3 to 6 mm, where extraction therapy may be avoided.[1,3] It is also beneficial in correcting Bolton tooth size discrepancies, improving inter-arch relationships, and reshaping triangular teeth to reduce black triangles.[13,8] In clear aligner therapy, IPR is frequently planned digitally to facilitate controlled tooth movement and improve treatment predictability.[5-6]

TECHNIQUES OF INTERPROXIMAL REDUCTION

Various techniques have been described for performing IPR. Manual abrasive strips offer precise control but are time-consuming.[12-13] Rotary instruments such as diamond burs and discs provide efficiency but require operator skill to prevent excessive enamel removal.[4,14 Oscillating systems combine efficiency with control and are commonly used in modern orthodontic practice.[12] Digital planning tools have enhanced the accuracy and predictability of IPR by allowing pre-determination of reduction amounts.[6]

BIOLOGICAL CONSIDERATIONS

The enamel thickness varies across different teeth and surfaces, making careful assessment essential before IPR.[15] Studies suggest that removal of up to 0.25 mm per proximal surface is generally safe when followed by proper polishing and topical fluoride application.[1,7]

Enamel surface roughness increases immediately after IPR but can be significantly reduced with polishing.[7,16] Current evidence does not demonstrate a significant increase in caries risk when oral hygiene is maintained.[8,17]

PERIODONTAL AND PULPAL EFFECTS

Concerns regarding periodontal health following IPR include plaque accumulation and gingival inflammation.[18,19] However, most clinical studies report no significant long-term periodontal deterioration when IPR is performed conservatively.[9,20] Transient tooth sensitivity may occur but is usually self-limiting.[2] There is limited evidence of pulpal damage associated with properly executed IPR.[14]

CLINICAL OUTCOMES AND STABILITY

IPR has been shown to effectively facilitate alignment and space closure in orthodontic treatment.[1,3] Long-term stability appears favorable when appropriate retention protocols are followed.[2] Nevertheless, high-quality longitudinal studies assessing outcomes beyond five years are limited.[17]

CONTROVERSIES AND LIMITATIONS

The lack of standardized guidelines regarding the amount of enamel removal and technique selection remains a major limitation.[11] Operator variability and patient-related factors further influence outcomes.[12] More patient-reported outcome measures are needed to evaluate discomfort and satisfaction associated with IPR.

FUTURE DIRECTIONS

Future research should focus on developing standardized protocols, evaluating long-term biological effects, and integrating advanced digital technologies for guided IPR.[6] The role of artificial intelligence in predicting optimal IPR amounts represents a promising area for future exploration.

CONCLUSION

Interproximal reduction is a valuable adjunct in contemporary orthodontic practice. When guided by proper diagnosis, conservative planning, and meticulous execution, IPR offers an effective alternative to extraction therapy with minimal adverse effects.[1-2] Ongoing research is essential to refine techniques and establish evidence-based guidelines.

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