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Pericervical Dentin in Modern Endodontics

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Dentin is a naturally hydrated, mineralized connective tissue that forms most of the tooth structure and comprises around 45% inorganic material, 35% organic matrix, and 20% water. This network preserves tissue hydration, conveys mechanical and thermal stimuli to sensory receptors, and facilitates adhesive bonding (1).

Pericervical dentin (PCD) is defined as the dentin structure extending approximately 4 mm coronal and 4 mm apical to the cemento-enamel junction (2). This zone is important, as it conveys occlusal forces from the crown to the root, distributes stress along the long axis of the tooth, contributes to the ferrule effect, and enhances fracture resistance.

Endodontic treatment aims to eliminate infection and preserve tooth structure. However, this treatment might lead to fracture (3). Research showed that failure is not because endodontic treatment does not significantly alter the intrinsic mechanical properties of dentin (4). Rather, fracture depends instead on the quantity, distribution, and integrity of the remaining tooth structure (2,3). It is the dentin removed during access cavity preparation and canal shaping that compromises strength (5). Preserving the PCD is therefore critical to maintaining biomechanical integrity (6).

Conventional access cavity preparation removes a considerable volume of dentin, potentially affecting the integrity of the PCD (6). In contrast, minimally invasive access aims to limit dentin removal by retaining portions of the pulp chamber roof together with the PCD, leading to maintained structural integrity. On the other hand, file instrument size and geometry govern the final canal lumen and may influence dentinal strain and crack

generation (7). Smaller-diameter files help shape the canal while minimizing dentin removal and sparing PCD (8). Greater residual PCD thickness is consistently associated with improved biomechanical performance and fracture resistance, which is why minimally invasive endodontics places such emphasis on this zone (9).

Preservation of the PCD is not always achievable. In such cases, restoring the PCD region with adhesive or fiber-reinforced materials can restore fracture resistance to levels comparable with those of teeth with intact PCD. In the literature, this reinforcement is realized clinically as intraorifice barrier and intracanal reinforcement, where the adhesive restorative materials or fiber-reinforced systems are placed within the PCD region. Resin composite and fiber-reinforced material bond to dentin and exhibits a modulus of elasticity close to that of dentin. This allows better stress distribution and reduces stress concentration and cuspal deflection (5). This, in turn, improves the fracture resistance of endodontically treated teeth (ETT) (2,10,11).

Traditionally, obturating materials are seared off at the level of the orifice where they are surrounded by part of the PCD. However, obturating materials are sealing materials that exhibit no structural reinforcement (10). Therefore, removing the obturating materials to the level below the PCD and replacing it with adhesive materials might enhance the fracture resistance of ETT.

In conclusion, PCD should not be overlooked but rather treated as an important landmark in the tooth structure, initially through minimally invasive endodontics. When it is compromised, attention is required to reinforce it with bonded, dentin-like materials.

References

1. Nanci A. Ten Cate's oral histology: development, structure, and function. 7th ed. St Louis: Mosby-Year Book Inc; 2008.
2. Clark D, Khademi J. Modern molar endodontic access and directed dentin conservation. *Dent Clin North Am*. 2010;54:249-273.
3. Lam PP, Palamara JE, Messer HH. Fracture strength of tooth roots following canal preparation by hand and rotary instrumentation. *J Endod*. 2005;31:529-532.
4. Sedgley CM, Messer HH. Are endodontically treated teeth more brittle? *J Endod*. 1992;18:332-335.
5. Usta SN, Tekkanat H, Sağlam Y, Aydin C. Exploring the impact of remaining tooth structure and preparation size on the fracture resistance of endodontically treated mandibular premolars. *J Dent Res Dent Clin Dent Prospects*. 2025;19:23-28.
6. Varghese VS, George JV, Mathew S, Nagaraja S, Indiresha HN, et al. Cone beam computed tomographic evaluation of two access cavity designs and instrumentation on the thickness of peri-cervical dentin in mandibular anterior teeth. *J Conserv Dent*. 2016;19:450-454.
7. Jamleh A, Adorno CG, Ebihara A, Suda H. Effect of nickel titanium file design on the root surface strain and apical microcracks. *Aust Endod J*. 2016;42:25-31.
8. Aazzouzi-Raiss K, Ramírez-Muñoz A, Mendez SPM, Vieira GCS, Aranguren J, et al. Effects of conservative access and apical enlargement on shaping and dentin preservation with traditional and modern instruments: a micro-computed tomographic study. *J Endod*. 2023;49:430-437.
9. Haridoss S, Rajendran M, Swaminathan K, Anbarasi, Sharma A, et al. Impact of pericervical dentin on fracture resistance of endodontically treated posterior permanent teeth: a systematic review and meta-analysis. *J Contemp Dent Pract*. 2024;25:372-385.
10. Ambalathveetil R, Nassar M, El-Damanhoury H, Jamleh A. Fracture resistance of endodontically treated teeth after peri-cervical dentin reinforcement: An ex vivo study. *J Endod*. 2026;S0099-2399(26)00422-X.
11. Karahan S, Dağ ZB, Uzunoğlu Özyürek E. The effect of intraorifice barrier materials on the fracture resistance of endodontically treated teeth: A systematic review and network meta-analysis. *J Endod*. 2026;52:696-712.e1.