# Immunohistochemical Characterization for Perforation Repair Material

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*I would like to dedicate my thesis to the soul of my beloved mother, whom I deeply miss every day. I wish she were here with me but I am glad I was able to complete what she wished for. Mama you were my sunshine, unlimited support, endless love, best friend, and best company ever. I owe you a lovable thank you for the endless things you did to me. Thank you for being the unforgettable, best mother ever. I really pray that you will be resting in Heaven. I love you mama.*

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# INTRODUCTION

An endodontic perforation may be defined as; an artificial opening in a tooth or its root, created by boring, piercing, cutting or pathological resorption, which results in communication between the pulp space and the periodontal tissues [(1)]. Except for resorption and caries, root perforations are iatrogenic and are one of the main causes of endodontic failure. The etiology and location of the perforation as well as the size of the defect are significant factors for the prognosis and treatment planning [(2)]. A good prognosis can be expected in case of fresh, small, coronal, and apical perforation [(2, 3)]. When left untreated, perforations in the cervical third of the root or on the floor of the pulp chamber have the worst prognosis.

The time elapsed from the development of the defect is another critical factor influencing the post treatment prognosis; a delay in repairing a perforation opens the way to bacterial contamination [(4 and 5)]. Further, the prognosis depends on the material used to repair the defect.

An ideal endodontic repair material should seal the pathways of communication between the root canal system and its surrounding tissues. In addition, it should be nontoxic, noncarcinogenic, nongenotoxic, biocompatible, insoluble in tissue fluids, dimensionally stable and capable of promoting regeneration of the periradicular tissues [(6)]. The main reason to control perforations is to limit the inflammatory process and to promote PDL attachment.

Many materials have been used to repair perforations, they include; mineral trioxide aggregate (MTA); (ProRoot MTA), Root MTA, Bioaggregate, Biodentine, calcium enriched matrix cement (CEM) and others. However studies have shown that MTA is apparently superior to other materials with respect to marginal adaptation, bacterial leakage, and cytotoxicity.

# *INTRODUCTION*

Calcium silicate cements have gradually become the material of choice for the repair of all types of dentinal defects creating communication pathways between the root-canal system and the periodontal ligament. With their proven biocompatibility and ability to induce calcium-phosphate precipitation at the interface to the periodontal tissue, they play a major role in bone tissue repair. The high quality of the material-dentin interface, which improves over time, secures long-term clinical success and reduces the risk of marginal percolation.

Biodentine cement (Septodont) is part of a new approach seeking to simplify clinical procedures. A modified powder composition, the addition of setting accelerators and softeners, and a new predosed capsule formulation for use in a mixing device, largely improved the physical properties of this material, making it much more user friendly

Dogs are demanding experimental models, having two rooted lower premolars that often bifurcate as close as 1 to2 mm from the cementoenamel junction (CEJ). As a result, epithelialization and the formation of connective tissue at a furcation perforation are more likely than in humans, where the furcation lies deeper within the alveolus. Thus, any technique shown to produce favorable results in dogs may have a more favorable response in humans, where the distance from the CEJ to the furcation area is greater.

Evaluating the radiographic, histological and immunohistochemical effect of different perforation repair materials on dogs' teeth is the subject of concern in this study.