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Tissue Responses to an Experimental Calcium Phosphate Cement and Mineral Trioxide Aggregate as Materials for Perforation Repair: a Histological Study in Dogs

In some cases, root perforations can result from resorptions and carious lesions. However, this incident usually occurs during endodontic treatment and preparations for a post and represents an important reason for endodontic failure. The purpose of this study was to evaluate histologically the inflammatory reactions and tissue responses to an experimental tricalcium phosphate cement (TCP) and mineral trioxide aggregate (MTA) when used as repair materials in furcation perforations in dogs. Perforations were performed in 24 mandibular premolars of six anaesthetized dogs and filled either with ProRoot™ MTA (grey) or TCP. The root canals were subsequently shaped and filled, and the access cavities closed with a bonded chemical cured composite resin. The animals were sacrificed at 12 weeks. After radiological examination, the treated teeth and surrounding structures were processed for light microscopy using the cutting-grinding technique with methyl methacrylate embedding. Concerning grade of inflammation, MTA exhibited significantly better results than TCP ($p = 0.004$; Chi square test according to Pearson). No furcation was free from inflammatory cells. Mild inflammation was observed in nine of twelve cases with MTA and only twice in those with TCP. No significant differences were revealed between MTA and TCP in terms of bone reorganization ($p = 0.304$; Mantel-Haenszel-Chi square test) or deposition of fibrous connective tissue ($p = 0.744$). Considering the predominantly mild tissue reactions observed, both cements seem to be suitable for perforation repair and superior in comparison with traditional materials. Nevertheless, perforations located in the furcation of teeth remain an endodontic and a periodontal problem with an uncertain prognosis, in spite of the promising modern materials applied.
