

## The Pattern of Fracture of Endodontically Treated Teeth

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Dear Editor,

It is well known that the primary function of a tooth is mastication. However, tooth fracture remains a major complication in endodontically-treated teeth. When the normal structure of a tooth is compromised by traumatic injuries, endodontic treatment remains the most viable option to maintain the tooth. However, endodontically treated teeth (ETT) exhibit greater brittleness and are more prone to fracture than non-ETT. It has been claimed that the inherent problems are mainly due to the drying of ETT over time and due to changes in their collagen cross-linking (1, 2). The main causes of failure in ETT are loss of retention of posts and/or crowns, secondary caries, and root fractures. Teeth that undergo root fracture usually have to be extracted (3, 4). In recent years, an increasing demand for endodontic treatment has been observed and (5), the purpose of the present study was to evaluate the pattern of fracture of ETT in adults. Case files extracted from the archives of our university between January 2005 and December 2009, were retrospectively analyzed. Cases with satisfactory periapical radiographs, ETT and fractured ETT were included in the study. For each case, fracture diagnosis was established from the following available retrospective records in the case files preoperative notes, periapical radiographs, and post-extraction evidence, as noted in the case files. Other items recorded were fracture types, and whether the tooth was used as an abutment or not, whether the tooth was posted or veneered and whether the abutment was a fixed or removable partial denture supporting. Vertical root fractures (VRF) were defined as fractures starting from the root, subgingivally, while cracks in teeth following root canal treatment (RCT) were considered cracks of the crown region, supragingivally. Out of 3000 examined case files, 755 were endodontically treated cases, of which 153 were disqualified for different reasons, as stated earlier. From the qualified 602 cases, 385 were females and 217 males, while posted and veneered teeth were 110 and 123 cases,

respectively. Only 120 out of the 602 ETT suffered various forms of fractures, resulting in a fracture prevalence of 19.9% and were more in females (62%) than males (38%). Fractures were more frequent in the mandible (59.7%) compared with the maxilla (40.3%). First molars fractured more often (50%) ( $P < 0.05$ ), while cusp fractures were the most frequent (55%), followed by VRF (28.7%), and tooth split (4.7%) ( $P < 0.05$ ). No frank fracture was seen in the lateral incisors and canines. Fractures occurred more often in the fixed partial denture abutments (66.7%) than in removable partial denture abutments (33.3%) ( $P < 0.05$ ). The age interval of study subjects was 18-66 years. Fractures were more prominent in the 41-50 years age band (40%), followed by the 31-40 years age band (25%) ( $P < 0.05$ ). On the other hand, fractures occurred more often in posted teeth (58.3%) than in veneered ones (41.7%), though the difference was not significant ( $P < 0.05$ ). Fractures occurred more often with the use of sodium hypochlorite as an irrigant (40.3%) than with the use of normal saline (33.3%) and hydrogen peroxide (26.4%,  $P < 0.05$ ). Similarly, fractures were more frequent in teeth in which access cavities were restored with amalgam (65.1%,  $P < 0.05$ ). The current study showed that fractures occur more often in amalgam-restored teeth. Perhaps, the most overriding factor may correlate with the configuration of the access cavity. Usually, access cavities suitable for amalgam require modifications to accommodate the mechanical retentive aids required of amalgam. This is contrary to resin and glass-ionomer filled cavities, in which retentions are not dependent on mechanical aids. This results in an inherent structural weakness for amalgam repaired cavities. However, Dammaschke et al. (6) have concluded that the mean fracture rate of teeth restored with glass-ionomer was significantly higher compared with composite and amalgam. Also, Pradeep et al. (7) showed that fracture strength of ETT restored with amalgam and composite resin did not differ significantly from each other. These

results have been considered as unanticipated findings, as it has been claimed by many authors that bonded restoration materials lead to cuspal reinforcement, with an increase in the strength of the tooth. These results show that the improvement in the strength of ETT is not only based on the restoration material, but also other factors, such as kind of tested teeth, the extension of the cavity, and occlusal forces.

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### Author's Contributions

Study concept and design: Christopher I. Udoye, Matthew A. Sede. Acquisition, analysis and interpretation of data: Christopher I. Udoye and Hamid Jafarzadeh. Drafting of the manuscript: Christopher I. Udoye and Matthew A. Sede. Critical revision of the manuscript for important

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