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**An Investigation of Dentine Fracture Toughness and Restorative Choice for
Cracked Teeth**

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Preface

Dentine fracture is a commonly presenting dental condition that often poses significant clinical difficulties. This thesis reviews the clinical features, diagnosis and management of cracked teeth. The etiology and mechanisms of fracture are also discussed. The experimental investigations evaluate (1) the fracture toughness values for dentine and the nature and mechanism of crack propagation and (2) stresses that result at a point of fracture initiation for different restorative materials in the treatment of cracked teeth. Fractures may initiate from coronal tooth structure or from within the root and may vary between vital and endodontically treated teeth. There are many terminologies and classifications in the literature for cracked teeth which can be as confusing as the array of clinical symptoms that are associated with this condition. The term “Cracked Tooth Syndrome” is misleading as there are a range of symptoms that do not form a distinct and reliable pattern. Symptoms will vary with teeth that have healthy pulps, for teeth with inflamed or necrotic pulps, and for teeth that have been endodontically treated.

The ‘American Association of Endodontists’ have classified five specific variations of cracked teeth; craze line, fractured cusp, cracked tooth, split tooth, and vertical root fracture. The importance of differentiating dentinal, pulpal and periodontal pain for diagnosis and treatment for these specific entities will be elaborated. A decision flow chart indicating the treatment options available is presented.

The experimental studies (Chapters 4 and 5) have been presented in the format of the manuscripts submitted for publication and each chapter has a separate reference list. Chapter 4 is a presentation of an investigation of the fracture toughness values for hydrated and dehydrated bovine dentine and the nature and mechanism of crack propagation. This chapter has been published in the “International Journal of Fracture” in 2004 (Kahler B, Kotousov A. Fracture in hydrated and dehydrated dentine. International Journal of Fracture 2004;127:L155-159.). Chapter 5 is a presentation of an analysis of the material choice for restoration of teeth with incomplete fractures. This chapter has been published in “Key Engineering Materials” in 2005 (Kahler B, Kotousov A, Borkowski K. On fracture of restored teeth. Key Engineering Materials 2005;293:245-252.).

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