

CHAPTER 1

Introduction

1.1 Statement of the problems and objectives

Dental caries is one of the most common diseases and continues to be a significant health problem. According to the report of the 7th National Oral Health Survey in 2012 by the Thai Bureau of Dental Health, Ministry of Public Health, 21.6% of 12-year-old Thai children needed class I restorations and 13% of them needed class II restorations. In children aged 15 years, 25.6% needed class I restorations and 16.3% needed class II restorations (1). When treatment is not provided, caries progresses close to the pulp and pulp exposure may occur. But if the lesion does not involve the pulp, the pulp protection should be provided with liner and base materials to act as barriers between the pulp and the restorative material.

It is important to manage carious lesions in young permanent teeth to preserve the teeth for their effective function. Compared to adult teeth, young permanent teeth have larger pulp chambers with high levels of active immune cells that command a favorable healing potential. Moreover, young permanent teeth have more permeable and less mineralized dentin, allowing the rapid diffusion of acid are more susceptible to rapidly progressing caries (2-4).

Dental restorations should biologically restore and protect the integrity of the dentin-pulp complex to maintain its biological function. Consequently, the use of liner and base covering the vital dentin for pulp protection is generally recommended (2). The general purposes of using liners and bases are to act as a barrier or protective layer before placing final restorations (5) Moreover, the objective of placing a protective material indirectly over the pulp is to promote the pulp tissue healing and facilitate the formation of reparative dentin in order to preserve the pulp vitality (6).

In a survey in 2007 regarding the teaching and use of resin-based materials for restoring posterior teeth in dental schools in North and South America, Europe, and Asia, the authors found that calcium hydroxide, glass ionomer cement (GI), or resin-modified glass ionomer cement (RMGI) were commonly used as a liner in moderate and deep cavity preparations (middle and inner thirds of dentin) (7). However, disadvantages of this method are low strengths of calcium hydroxide and RMGI has been characterized as being cytotoxic when it is placed close to, or directly on, the pulp tissue (5, 8-10).

New calcium-silicate-based cement, called Biodentine™, known as ‘dentin in a capsule, has been recently introduced as a biocompatible and bioactive dentin substitute. This new material can be used as a dentin substitute in several clinical indications. It has the ability to induce odontoblast differentiation and mineralization in cultured pulp cells (11). Although it seems to be a good material, there is currently little clinical evidence to support its use as a pulp protection material.

At present, there are no studies comparing the outcomes of pulp protection with conventional liner and base, such as calcium hydroxide (Dycal®) and resin-modified glass ionomer (Vitrebond™) to the new calcium-silicate-based cement (Biodentine™) in young permanent teeth with deep caries. Therefore, the purpose of this randomized, clinical, controlled trial is to compare the outcomes of pulp protection with either Dycal® and Vitrebond™ or Biodentine™ in permanent teeth with deep caries of 6-18 years old patients.

1.2 Anticipated benefits

The anticipated benefit of this study was to compare the outcomes of pulp protection with either Dycal® and Vitrebond™ or Biodentine™ in permanent teeth with deep caries of 6-18 years old patients. This research also provides a basic knowledge for future research and clinical application for an alternative choice of material used in pulp protection in deep caries.