CHAPTER I

INTRODUCTION

1.1 Background of Present Study

Pulpal and periradicular pathosis develop only when these tissues are exposed to bacterial contamination (Kakehashi et al. 1965). Complete cleaning and shaping of the root canals and sealing them in three dimensions should result in resolution of the lesion. The degree of success of root canal therapy has been reported between 45-98.7% (Hession 1981;Meeuwissen and Eschen 1983;Sjogren et al. 1990). Harty et al. (1970) reported that the majority of failures of non-surgical endodontic procedures were because of inadequate apical seal. The preferred treatment of failing endodontic cases is non-surgical retreatment. However this may not achieve because of the complexity of root canal systems, or presenting of physical barriers (post and core restoration, separated instruments). Surgical endodontic therapy becomes indicated when non-surgical retreatment is impractical or unlikely to improve on the previous result. Its success is reported to range between 58-96% (Dorn and Gartner 1990;Frank et al. 1992).

Periradicular surgery is the most frequently performed endodontic surgical procedure. The aims of periradicular surgery are to remove the causes of disease and to provide a favorable environment for healing of the surgical wound. The surgical procedures include identification of the apex, osteotomy, apical root resection, retropreparation and placement of retrofilling.

It is a well-known fact that the apical seal is the single most important factor affecting success in surgical endodontics. The retrofilling material must provide an apical seal that inhibits the leakage of residual irritants from the root canal into the periradicular tissues (Kim 2001;Torabinejad and Pitt Ford 1996).

Mineral Trioxide Aggregate (MTA) has recently been introduced as a retrofilling material. It has good sealing ability, good marginal adaptation (Torabinejad et al. 1993;Torabinejad et al. 1994;Torabinejad et al. 1995d;Torabinejad et al. 1995e), and its hydrophilic property making it stable in the presence of blood contamination. It is also biocompatible, and capable of inducing hard-tissue deposition (Keiser et al. 2000;Koh et al. 1997;Torabinejad et al. 1994). However, it is difficult to manipulate, expensive and it has a very long setting time (Kim 2001).

Retropreparations are usually made 3 mm. deep with ultrasonic tips after apical root resection was done (Kim 2001). Despite the advantages of ultrasonic tips, Abedi et al. (1995) has demonstrated that they create more microfractures than burs during retropreparations.

Resin composite used in combination with a dentin bonding agent is a material that used in restorative dentistry and has been adapted to endodontic surgery. They provided tight seal and good sealing ability. Resin composite and dentin bonding agent also permit a conservative retropreparation by a slightly concave preparation rather than a conventional deep cavity (Andreasen et al. 1993;Rud et al. 1996;Vignaroli et al. 1995). In addition, the preparation technique offers treatment to otherwise inaccessible or fragile

roots with retrograde fillings and is also easier to perform clinically than the commonly used retroprepared cavities (Ambus and Munksgaard 1993).

Besides, resin composite is readily available in clinical practice, less expensive than MTA, and providing better seal than other retrofilling materials (Theodosopoulou and Niederman 2005). Resin composite may be considered as alternative retrofilling material to MTA and superEBA. However, there is no study that compares cytotoxicity between flowable resin composite, MTA and superEBA available. The research interest is focused on whether flowable resin composite could provide biocompatibility and promote periodontal healing comparing to currently used retrofilling material.

1.2 Research questions

How do the 4 retrofilling materials (Tetric® Flow, Filtek™ Flow, Aeliteflo™ and MTA) affect cytotoxicity and cell morphology in human periodontal ligament cells?

1.3 Research objectives

1. To investigate and compare cytotoxicity effect of Tetric® Flow, Filtek™ Flow, Aeliteflo™ and MTA upon human periodontal ligament cells using MTT assay.
2. To investigate and compare cell morphology and attachment of human periodontal ligament cells by scanning electron microscope when cultured on Tetric® Flow, Filtek™ Flow, Aeliteflo™ and MTA.

1.4 Hypothesis

1. Null hypothesis H_0 : Cytotoxicity effect of Tetric® Flow, Filtek™ Flow and Aeliteflo™ upon human periodontal ligament cells is not different from that of MTA.

   Alternative hypothesis H_A : Cytotoxicity effect of Tetric® Flow, Filtek™ Flow and Aeliteflo™ upon human periodontal ligament cells is different from that of MTA.

2. Null hypothesis H_0 : Cell morphology and attachment of human periodontal ligament cells when cultured on Tetric® Flow, Filtek™ Flow or Aeliteflo™ are not different from MTA.

   Alternative hypothesis H_A : Cell morphology and attachment of human periodontal ligament cells when cultured on Tetric® Flow, Filtek™ Flow or Aeliteflo™ are different from MTA.

1.5 Experimental Design

1.5.1 Human periodontal ligament cells (HPDLs) were grown from periodontal ligament which were obtained from healthy adult subjects' extracted teeth.

1.5.2 Cytotoxicity of material was measured by colorimetric (MTT) assay.

1.5.3 Cell morphology and attachment were determined by Scanning electron microscope.

1.6 Keywords

human periodontal ligament cell, flowable resin composites, MTA: Mineral Trioxide Aggregate

1.7 Research design

Laboratory experimental research

1.8 Limitations of research

The experimental design is an *in vitro* study using human cultured pulp cells. Effects of the interventions in this experiment cannot be completely judged to the populations.

The results from the experiment cannot be used to explain the whole mechanism of pulp healing from the interventions. The mechanisms of pulpal healing *in vivo* are more complex, involving both cellular and extracellular events. Therefore, further experiments have to be investigated.

1.9 Benefits

1. to reveal the effect of flowable resin composites compared with MTA in human periodontal ligament cells on cytotoxicity and cell morphology
2. to evauate the possibility of using flowable resin composite as a new retrofilling material.
3. to obtain basic knowledge for further studies in clinical situation.

1.10 Ethical consideration

There was no ethical problem because human teeth were obtained from caries-free impacted molars which extracted for clinical reason with patient's informed consent at the Department of Oral Surgery, Faculty of Dentistry, Chulalongkorn University.