Clinical, Radiographic and Histological Evaluation of Allium Sativum Extract in Pulpotomy of Primary Molars: A Randomized Clinical Trial

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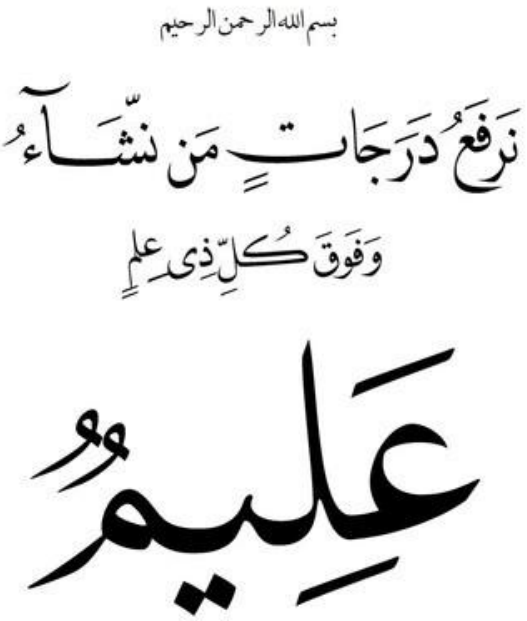

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Dedication

This work is humbly dedicated to all my valuable treasures in life:

My dearly loved mother, the meaning of love and kindness, the smile of life, the secret behind my success, the most beloved among all love.

My beloved father, the one who Allah has covered him with prestige and reverence. I carry his name proudly, his words are shining like stars to guide me today, tomorrow and in the future.

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List of Abbreviations

Abbreviation	Abbreviation for
ALARA	As low as Reasonably Achievable
BC	Before Christ
cm	centimeter
DCs	Dendritic Cells
FC	Formocresol
FS	Ferric Sulfate
HDL	High Density Level
IARC	The International Agency for Research on Cancer
LDL	Low Density Level
µ	microns
ml	millimeter
MSB	Mitis Salivarius Bacitracin
MTA	Mineral Trioxide Aggregate
NaOCl	Sodium Hypochlorite
PC	Portland Cement
ppb	Part per billion
PSP	Photostimulable phosphor radiographic systems
WHO	World Health Organization

Introduction

Dental caries has been identified as one of the leading causes of tooth loss in children all around the world. In this sense, dental extraction is the most common form of dental treatment in developing countries despite of the significant progress in recent years in dentistry [1-3].

The primary dentition's obvious function is chewing food. It also acts as a guide for the eruption of permanent teeth. Other functions include stimulation of growth of the jaw and aiding in digestion and phonation. Primary dental arches form the basis for the proper development of permanent dental arches . Premature loss of primary teeth can result in some negative consequences in both dentitions [1].

The primary objective of pulp therapy is to to maintain the vitality of the pulp of a tooth affected by caries, traumatic injury, or other causes so that preserving the integrity and health of the teeth and their supporting tissues[4,5].

Vital pulp therapy includes three therapeutic approaches: indirect pulp capping for teeth with dentinal cavities and reversible pulpitis; direct pulp capping and pulpotomy which are considered in cases of pulp exposure [6].

A pulpotomy is performed in a primary tooth with extensive caries but without evidence of radicular pathology when caries removal results in a carious or mechanical pulp exposure. The coronal pulp is amputated, and the remaining vital radicular pulp tissue surface is treated with a long-term clinically-successful medicament [7].

Pulpotomy can be performed using different capping medicaments or biological materials such as formocresol, ferric sulfate, MTA ,sodium hypochlorite , etc . However, none of them had met the same degree of effectiveness and success rate as formocresol. Due to possible hazards of formocresol (cytotoxicity, carcinogenicity, immunologic…), the demand for natural medicament to replace it as a pulp dressing material became imperative [8].

Modern medicine recognizes herbal medicine as a form of alternative medicine. A wide range of antimicrobial agents and herbal products are added to dentifrice and mouth rinsing solutions with the aim of preventing caries or biofilm formation [9].

Various natural products such as Curcuma zedoaria, calendula, Aloe vera and other herbs have been used effectively to treat oral diseases [10]. The natural phytochemicals could offer an effective alternative to antibiotics and represent a promising approach in prevention and therapeutic strategies for dental caries and other oral infections.

One of the most widely researched plants in the field of medicine is Allium sativum (Garlic). The oil of this plant was recently used in pulpotomy [11]. The antibacterial effects of the fresh garlic extract have been thoroughly researched via literature and have been found that the extract will inhibit growth of various Gram-positive and Gram-negative bacteria [12]. It is also reported that the garlic extract has inhibitory potential on isolated multi-drug resistant strains of Streptococcus mutans from human caries teeth [13].

Review of Literature

Dental caries is one of the most prevalent epidemic chronic diseases. The process of dental caries is progressive and may continue especially in children till degradation of the dental hard tissues and infection of the dental pulp. Infected pulp tissue in primary teeth is usually treated with pulpotomy [14].

Despite the new medicaments introduced for pulpotomy over the past years, formocresol pulpotomy still has popularity among pediatric dentists, particularly in developing countries [8]. Fixative properties, clinical success and availability of formocresol are common factors of its popularity. Nowadays, there are many concerns about the safety of formocresol due to its harmful effects that led to the change towards safer medicaments. Natural products are efficient, less toxic alternatives and constitute a promising source for medicines and new molecules [14].

- **Pulp Therapy of Primary Teeth:**

Management of the grossly carious primary teeth is a common but sometimes challenging aspect of dental care for young children. The first treatment decision for the young patient with one or more extensively carious primary teeth is whether to retain or extract these teeth. Factors influencing the decision to retain primary teeth include medical, dental and behavioural factors [15].

The goal of pulp therapy in the primary teeth includes:

1. Successful treatment of the cariously involved pulp to maintain the tooth in a non-pathological state.
2. Maintenance of arch length and tooth space.

3. Restoration of comfort with the ability to chew.
4. Prevention of speech abnormalities and abnormal habits.

There are many options of pulp therapy of deep carious lesions in primary teeth:

1. Indirect pulp treatment
2. Direct pulp treatment
3. Pulpotomy(applied in this study)
4. Pulpectomy

In vital pulpotomy, the coronal pulp is removed, the pulp stumps treated, and the pulp chamber is filled with a sedative dressing with the intent of maintaining the vitality of the remaining radicular pulpal tissue. Then the pulp chamber is filled with a suitable base and the tooth restored [16].

❖ Formocresol Pulpotomy:

Formocresol was first introduced by Buckley in 1904. In 1930, Sweet introduced the formocresol pulpotomy technique. Formocresol has subsequently become a popular pulpotomy medicament for primary teeth. Initially, the technique involved five visits. Sweet reduced the number of visits over the years, because of economic and behavior management considerations. . Within a few years, Spedding and Redig reported the results of a 5-min formocresol protocol, the technique which used nowadays [17].

Formocresol (FC) is a compound consisting of 19% formaldehyde, 35% cresol and 31% water base. Glycerine is added to prevent the polymerization of formaldehyde to para-formaldehyde. The presence of para-formaldehyde causes clouding of the solution [17].