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THE EVALUATION OF THE EFFECT OF ACID  
ETCHING AND THE USE OF A BASE DURING  
INTRA-CORONAL BLEACHING USING  
THIOUREA AND HYDROGEN PEROXIDE ON  
BLOOD-STAINED ROOT-FILLED TEETH

FABRIZIO DAMIANI  
BDS, GRAD.DIP.CLIN.DENT

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(Dental School)

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## SUMMARY

Intra-coronal bleaching, involving many different bleaching agents and techniques, has been used for over 150 years to restore aesthetics to darkened or stained non-vital teeth.

Spasser (1961) described a bleaching technique which he had used successfully using a mixture of sodium perborate and water to form a thick, creamy paste. This mixture was sealed into the pulp chamber with a provisional restoration and replaced every four days until the desired shade was obtained. The sodium perborate, in the presence of water, would decompose gradually to yield sodium metaborate and hydrogen peroxide.

Nutting and Poe (1963) described a technique whereby bleaching occurs between appointments and which they called the “walking bleach”. Initially, their technique was similar to Pearson’s (1958) in that a cotton pellet saturated with Superoxol was placed into the tooth between visits without the use of any heat or light to activate the hydrogen peroxide. After reviewing Spasser’s (1961) work, these authors later modified their technique by placing a mixture of Superoxol and sodium perborate into the pulp chamber. Their rationale was that hydrogen peroxide and sodium perborate would be more effective in combination than either one used separately. This technique, known as the “combination walking bleach” has proven to be the most common technique because of its reliability to bleach discoloured teeth.

It has been suggested that acid etching the pulp chamber with 30-37% phosphoric acid, to remove the smear layer and open the dentinal tubules, would allow better penetration of the bleaching agent increasing its effectiveness (Howell 1980; van der Burgt & Passchaert 1986). However, Casey *et al.* (1989) and Horn *et al.* (1998) found no significant differences between teeth that were etched prior to a “walking bleach” compared to those that were not etched in terms of improving the results of intra-coronal bleaching. The effects of removal of the smear layer from the dentine of the pulp chamber prior to bleaching has not been fully investigated.

Studies have shown that root fillings do not effectively prevent diffusion of bleaching agents from the pulpal chamber to the apical foramen (Costas & Wong 1991; Smith *et al.* 1992). In none of the clinical reports of post-bleaching root resorption was a protective barrier used (al-Nazhan 1991; Cvek & Lindvall 1985; Friedman *et al.* 1988; Gimlin & Schlinder 1990; Goon *et al.* 1986; Harrington & Natkin 1979; Heithersay *et al.* 1994; Lado *et al.* 1983; Latcham 1986). Therefore, placement of a protective base over the root canal filling to prevent penetration of bleaching agents into the cervical periodontium has been recommended by many authors (al-Nazhan 1991; Friedman *et al.* 1988; Goon *et al.* 1986; Grossman *et al.* 1988; Ho & Goerig 1989; Lado *et al.* 1983; MacIsaac & Hoen 1994; Rotstein *et al.* 1991c; Rotstein *et al.* 1992b; Smith *et al.* 1992).

The aim of the present research was to (1) evaluate the effect of acid etching the pulp chamber prior to intra-coronal bleaching of blood-stained root-filled teeth and (2) to determine the effect of a base during the intra-coronal bleaching using a combination mixture of hydrogen peroxide and thiourea on blood-stained root-filled teeth.

Ninety-four extracted, single canal premolar teeth were stripped of their periodontal ligaments, the pulp tissue extirpated and the root canals debrided. Eighty of these teeth were stained with blood using an adaptation of a technique devised by Freccia *et al.* (1982). These teeth were then obturated with AH26 (De Trey, Switzerland) and gutta-percha (Progress, Australia) and the obturation was finished either at the CEJ or at a level 3mm below the CEJ to accommodate a 3mm protective base of either Cavit (ESPE, Norristown, PA), Fuji VII (GC Corp., Tokyo, Japan), Tetric Flow Chroma (Ivoclar Vivadent, Schaan, Liechtenstein) or a polyether impression material, Permadyne (ESPE, Norristown, PA). The teeth were suspended in a bath of terephthalic acid and the product of the reaction between hydroxyl radicals and terephthalic acid, namely hydroxyterephthalate, was detected using a microplate reader and high performance liquid chromatography (HPLC).

All of the teeth sampled generated the reaction product of hydroxyl radicals (hydroxyterephthalate). There was no statistically significant difference between the quantity of hydroxyl radicals generated between groups comparing acid etching or between groups comparing the different bases.

It was concluded from this research that the use of acid etching and the effect of protective bases in the bleaching protocol remains unclear and that further research is required to develop a standardised bleaching protocol.

## CONTENTS

<b>DECLARATION</b>	<b>i</b>
<b>DEDICATION</b>	<b>ii</b>
<b>SUMMARY</b>	<b>iii</b>
<b>ACKNOWLEDGEMENTS</b>	<b>vii</b>
<b>TABLE OF CONTENTS</b>	<b>ix</b>
<b>1.0 INTRODUCTION</b>	<b>1</b>
<b>2.0 AETIOLOGY OF INTRINSIC DISCOLOURATION</b>	<b>4</b>
<b>2.1 LOCAL FACTORS</b>	<b>4</b>
<b>2.1.1 PULPAL HAEMORRHAGE</b>	<b>4</b>
<b>2.1.1.1 TRAUMA</b>	<b>5</b>
<b>2.1.1.2 FAILURE TO CONTROL</b>	
<b>BLEEDING</b>	<b>6</b>
<b>2.1.2 PULP NECROSIS</b>	<b>7</b>
<b>2.1.3 INADEQUATE ENDODONTIC</b>	
<b>TREATMENT</b>	<b>7</b>

2.1.3.1	NECROTIC DEBRIS	7
2.1.3.2	ROOT CANAL MEDICAMENTS	8
2.1.3.3	ROOT CANAL SEALERS	9
2.1.4	RESTORATIVE MATERIALS	9
3.0	THE CHEMISTRY OF BLEACHING	10
4.0	SUCCESS RATES OF THE VARIOUS INTRA-CORONAL BLEACHING TECHNIQUES AND AGENTS	12
4.1	<i>IN-VITRO</i> STUDIES	12
4.2	<i>IN-VIVO</i> STUDIES	15
5.0	FACTORS AFFECTING THE SUCCESS OR FAILURE OF INTRA-CORONAL BLEACHING	20
5.1	STABILITY OF HYDROGEN PEROXIDE	20
5.2	ADEQUACY OF ROOT FILLING	20
5.3	RECURRENCE OF DISCOLOURATION	21

5.4	ACID ETCHING OF THE DENTINE	22
5.5	PLACEMENT OF A PROTECTIVE BASE	24
5.5.1	COMPARISONS OF VARIOUS TYPES OF BASE	26
5.5.2	LEVEL OF THE BASE	29
6.0	BLEACHING-RELATED INVASIVE CERVICAL RESORPTION	33
6.1	INCIDENCE	34
6.2	AETIOLOGY	36
6.2.1	TRAUMA	36
6.2.2	THERMOCATALYTIC TECHNIQUE	37
6.2.3	DIFFUSION OF HYDROGEN PEROXIDE	38
6.2.4	IMPLICATION OF HYDROXYL RADICAL	40
6.2.5	ALTERED DENTINE AND CEMENTUM	41
6.3	PREVENTION	42
6.3.1	SODIUM PERBORATE	42
6.3.2	CARBAMIDE PEROXIDE	43
6.3.3	CALCIUM HYDROXIDE	44



6.3.4	CATALASE	45
6.3.5	THIOUREA	46
7.0	DETECTION OF HYDROXYL RADICALS	48
7.1	HYDROXYLATION OF SALICYLATE BY HYDROXYL RADICALS	49
7.2	HYDROXYLATION OF TEREPHTHALIC ACID BY HYDROXYL RADICALS	50
8.0	MATERIALS AND METHODS	52
8.1	MATERIALS	52
8.2	METHODS	54
8.3	DETECTION OF REACTION PRODUCTS	66
8.3.1	FLUORESCENCE	66
8.3.2	HPLC	66
8.4	STATISTICAL ANALYSIS	67
8.5	CONTROL EXPERIMENTS	68
8.5.1	FLUORESCENCE	68

8.5.1.1	CONTROL GENERATION OF HYDROXYL RADICALS	68
8.5.1.2	EFFECT OF TEREPHTHALIC ACID CONCENTRATION ON THE GENERATION OF HYDROXYL RADICAL PRODUCTION	69
8.6	STANDARD CURVES	70
8.6.1	FLUORESCENCE	70
8.6.2	HPLC	70
9.0	RESULTS	71
9.1	STANDARD CURVES FOR HYDROXYTEREPHTHALATE	71
9.1.1	FLUORESCENCE	71
9.1.2	HPLC	74
9.2	CONTROL GENERATION OF HYDROXYL RADICALS	77

9.3	EFFECT OF TEREPHTHALIC ACID CONCENTRATION ON THE GENERATION OF HYDROXYL RADICAL PRODUCTION	77
9.4	HYDROXYL RADICAL PRODUCTION IN BLEACHED ROOT FILLED TEETH	81
9.4.1	FLUORESCENCE	81
9.4.2	HPLC	82
10.0	DISCUSSION	85
10.1	STANDARD CURVES FOR HYDROXYTEREPHTHALATE	85
10.1.1	FLUORESCENCE	85
10.1.2	HPLC	86
10.2	CONTROL GENERATION OF HYDROXYL RADICALS	87
10.3	EFFECT OF TEREPHTHALIC ACID CONCENTRATION ON THE GENERATION OF HYDROXYL RADICAL PRODUCTION	87

<b>10.4 HYDROXYL RADICAL PRODUCTION IN</b>	
<b>BLEACHED ROOT FILLED TEETH</b>	<b>88</b>
<b>10.4.1 FLUORESCENCE</b>	<b>88</b>
<b>10.4.2 HPLC</b>	<b>88</b>
<b>10.4.3 THE EFFECT OF THIOUREA</b>	<b>89</b>
<b>10.4.4 THE EFFECT OF ACID ETCHING</b>	<b>90</b>
<b>10.4.5 THE EFFECT OF USING A BASE</b>	<b>91</b>
<b>10.5 DESIGN OF THE MODEL</b>	<b>94</b>
<b>11.0 CONCLUSIONS</b>	<b>95</b>
<b>12.0 BIBLIOGRAPHY</b>	<b>97</b>
<b>APPENDIX 1 Sources and components of chemicals</b>	<b>106</b>
<b>and materials</b>	
<b>APPENDIX 2 Preparation of test solutions</b>	<b>112</b>

<b>APPENDIX 3</b>	<b>Raw data</b>	<b>114</b>
<b>APPENDIX 4</b>	<b>Statistical analysis of the raw data</b>	<b>118</b>