Thesis Summary:

Comparative study of different antiseptic solutions used during preparation.

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Introduction

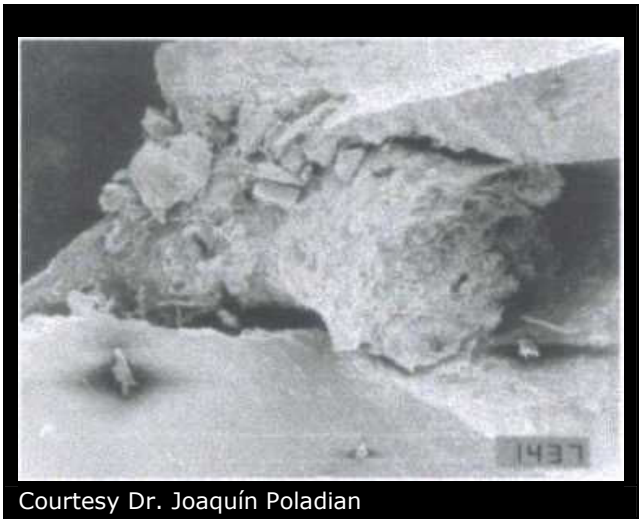
It is generally accepted that periapical pathosis is due to the presence of microorganisms or bacterial by – products in the root canal which must be removed to achieve success.

However, root canal anatomy is complex with irregularities areas that contain pulpal tissues and microorganisms that cannot be approached by instruments.

Therefore, an antiseptic and proteolytic fluid is necessary to disinfect and clean these areas. The way this irrigant spreads onto the canal and reaches the non-instrumented areas is of primary importance in root canal treatment.

Two essential parameters must be taken into account to understand fluid dynamics in root canals. First, fluid surface tension as it influences the spreading properties of the irrigant on dentine surfaces. When adding a surfactant into an irrigant, the liquid surface tension decreases with increasing surfactant concentration, until reaching the critical micellar concentration. Second, fluid viscosity as it describes the internal resistance to root canal irrigant flow deformed by either shear or tensile stress. When flowing, the different layers of the liquid slide against each other at different velocities with a transfer of energy. In fluid dynamics, two main types of flow exist: laminar flow, characterized by smooth and constant fluid motion, and turbulent flow which has chaotic eddies, vortices and other flow instabilities

The aim of this study is to measure the surface tension of solutions of sodium hypochlorite, hydrogen peroxide, EDTA and chlorhexidine for penetration and capillarity teeth.


Courtesy Dr. Joaquín Poladian

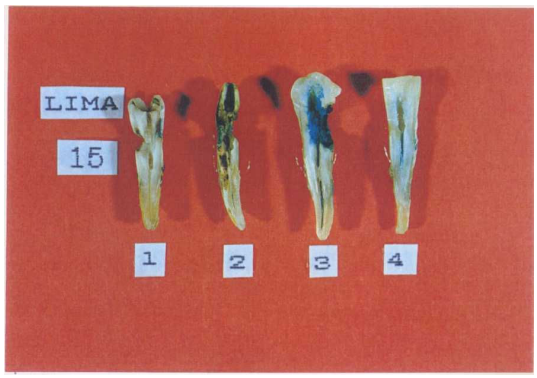
Material and Methods

In a first step surface tensions of each solution were measured and tinged:

- Sodium Hypochlorite: 67.96 dyn/cm
- Peroxide: 72.50 dyn/cm
- Chlorhexidine: 40.27 dyn/cm
- EDTA: 50.58 dynes/cm.

Then proceeded to prepare access to 40 pieces and divided them into four groups. The first piece from the first group was shaped with a flexible lime Nº 15, and irrigated with one of the tinged solutions. Once the piece was treated, the same process was applied on the second tooth with the same solution group increasing the shaping with an Nº 20 lime and so on until Nº 60 lime. Subsequently the same procedure was repeated with the remaining solutions. Then performed them a cross-section; due to appreciate the irrigant's penetration into the root canal. To achieve the statistical analysis, the measurement ranged from the tooth apex to the spot where it started to show antiseptic staining on the magnifying glass. As a result the chlorhexidine obtained very significant penetration values.

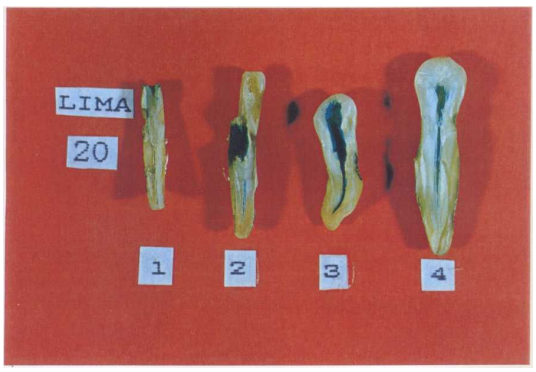
File #15 results:



File # 15

(1) H_2O_2 : 12 mm
(2) SODIUM HYPOCHLORITE: 10 mm
(3) CHLORHEXIDINE: 3,5 mm
(4) EDTA: 4 mm

File #20 results:



FILE # 20

(1) H_2O_2 : 6 mm
(2) SODIUM HYPOCHLORITE: 2,5 mm
(3) CHLORHEXIDINE: 2,5 mm
(4) EDTA: 3 mm

File #25 results:

FILE # 25

(1) H_2O_2: 12 mm
(2) SODIUM HYPOCHLORITE: 10 mm
(3) CHLORHEXIDINE: 3,5 mm
(4) EDTA: 4 mm

File #30 results:

FILE # 30

(1) H_2O_2: 15 mm
(2) SODIUM HYPOCHLORITE: 6 mm
(3) CHLORHEXIDINE: 2 mm
(4) EDTA: 2,5 mm

File #35 results:

FILE# 35

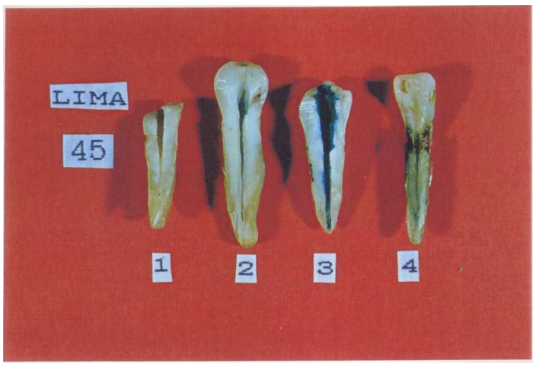
(1) H_2O_2: 15 mm
(2) SODIUM HYPOCHLORITE: 5 mm
(3) CHLORHEXIDINE: 0,5 mm
(4) EDTA: 1 mm

File #40 results:

FILE# 40

(1) H_2O_2: 7,5 mm
(2) SODIUM HYPOCHLORITE: 2,5 mm
(2) CHLORHEXIDINE: 2 mm
(3) EDTA: 1,5 mm

File #45 results:



FILE # 45

(1) H_2O_2: 15 mm
(2) SODIUM HYPOCHLORITE: 8 mm
(2) CHLORHEXIDINE: 2 mm
(3) EDTA: 1,5 mm

File #50 results:

FILE # 50

(1) H_2O_2: 10 mm
(2) SODIUM HYPOCHLORITE: 6 mm
(2) CHLORHEXIDINE: 0,5 mm
(3) EDTA: 1 mm

File #55 results:

FILE # 55

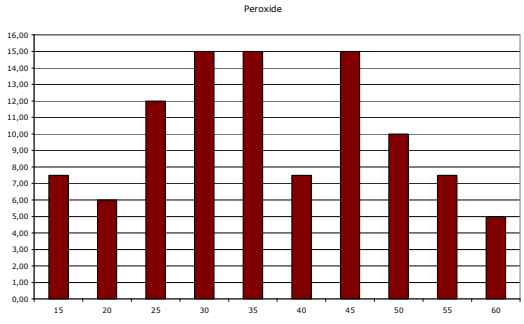
(1) H_2O_2: 7,5 mm
(2) SODIUM HYPOCHLORITE: 5 mm
(3) CHLORHEXIDINE: 0 mm
(4) EDTA: 0,5 mm

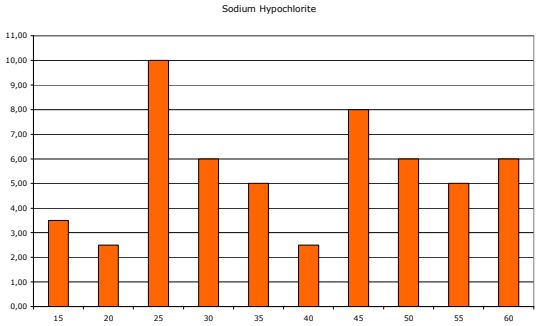
File #60 results:

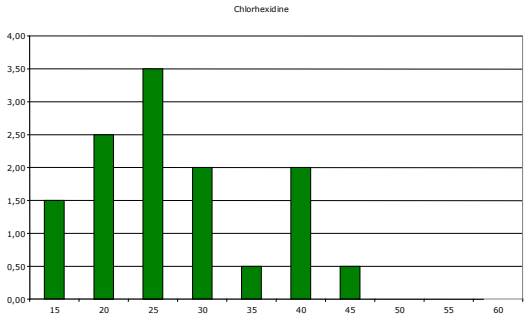
FILE # 60

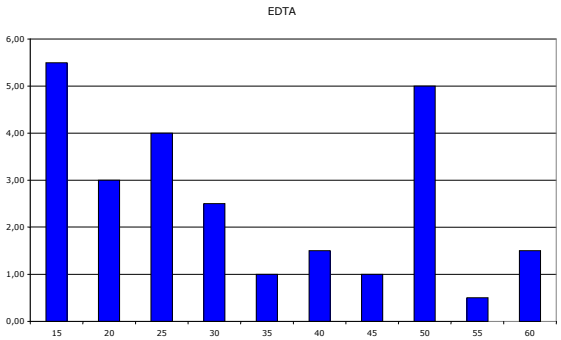
(1) H_2O_2: 5 mm
(2) SODIUM HYPOCHLORITE: 6 mm
(3) CHLORHEXIDINE: 0 mm
(4) EDTA: 1,5 mm

File	Peroxide	Sodium Hypochlorite	Chlorhexidine	EDTA
15	7,5 mm	3,5 mm	1,5 mm	5,5 mm
20	6 mm	2,5 mm	2,5 mm	3 mm
25	12 mm	10 mm	3,5 mm	4 mm
30	15 mm	6 mm	2 mm	2,5mm
35	15 mm	5 mm	0,5 mm	1 mm
40	7,5 mm	2,5 mm	2 mm	1,5mm
45	15 mm	8 mm	0,5 mm	1 mm
50	10 mm	6 mm	0 mm	5 mm
55	7,5 mm	5 mm	0 mm	0,5 mm
60	5 mm	6 mm	0 mm	1,5 mm

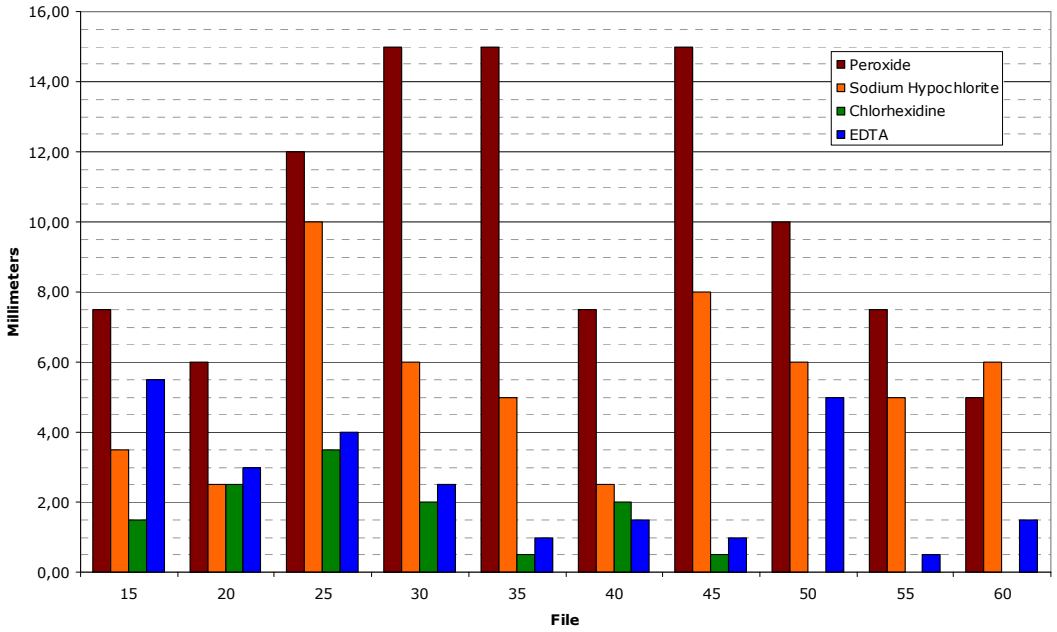








- **Dark Red:** hydrogen peroxide
- **Orange:** Sodium hypochlorite.
- **Green:** Chlorhexidine.
- **Blue:** EDTA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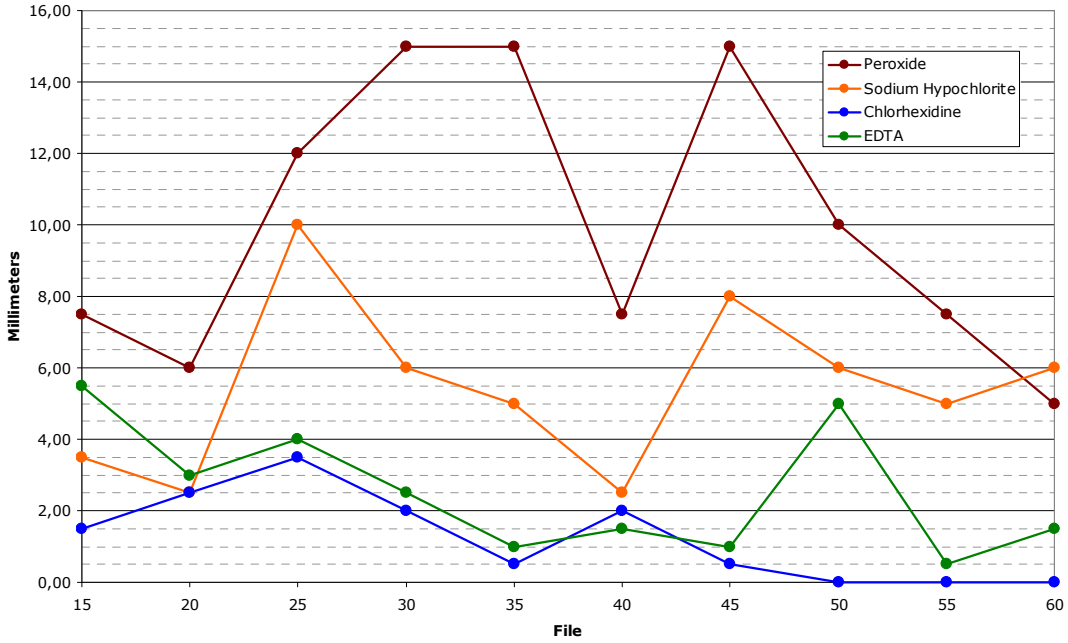
Sodium Hypochlorite
Chlorhexidine
EDTA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Chlorhexidine
EDTA

Conclusion

After working on the fourty teeth, all canals were performing in the same surgical preparation with irrigation agents as hydrogen peroxide, sodium hypochlorite, EDTA and clorexidine in equal for all working conditions.

The following results were deducted:

- Hydrogen peroxide and sodium hypochlorite, having a very high surface tension, fail to properly address the apical area. Cleaning difficult by mechanical entrainment of the canal, if the parts are hardly implemented, as these solutions fail to penetrate when the canal is further widened
- EDTA is a quite recommended irrigation agent and achieve advance into the canal for his double trigger: for dentin capacity to chelate calcium ions and its low surface tension.

Perhaps it is allowed to combine with hypochlorite, and synergism of two, achieving penetration with EDTA and antisepsis with hypochlorite.

- Hydrogen peroxide is an antiseptic, with a low power, and his high surface tension can not access either the canal; but certainly will consider it in cases of hemorrhage.
- For to have a strong antibacterial and proteolytic action, eliminating disorganized remnants of pulp; Sodium hypochlorite is recommended for use in the surgical preparation agent, given the realization of a good canal extension.
- Clorexidine digluconate has a great antiseptic power.

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