

Irrigation trends among members of the Chilean Endodontic Society.

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Abstract: Introduction: The aim of this study is to determine the current trends of irrigation during root canal therapy by specialists who are members of the Chilean Endodontic Society. Materials and Method: A survey (Survey Monkey®-*SurveyMonkey.com*) was e-mailed to the 485 members of the Chilean Endodontic Society. The instrument was translated and adapted from the survey "Irrigation trends among American Association of Endodontists members: A web-based survey" applied in the USA in 2012. Participants answered a set of 16 questions that included irrigant selection, irrigant concentration, the adopted protocol, techniques or devices for irrigant activation. Results: 99% of respondents use sodium hypochlorite as the main irrigant. Data indicate that 74% of respondents use hypochlorite at a concentration of 5%. Most respondents (94%) also include EDTA in their usual practice. In addition, 90% of respondents reported that they activate the irrigating agent, and 94% confirmed that they perform a final irrigation protocol. Conclusion: The majority of respondents use sodium hypochlorite as the main irrigant at a concentration of 5%, use ethylenediaminetetraacetic acid (EDTA) as a smear removal agent, activate the irrigant, and perform a final irrigation protocol.

Keywords: endodontics; surveys and questionnaires; smear layer; edetic acid; root canal irrigants; irrigation adjuncts smear layer.

INTRODUCTION.

The main objectives of endodontic treatment are to debride and disinfect the complex root canal system in order to maintain or restore the health of the periapical tissues.^{1,2} To achieve these objectives, mechanical and chemical preparation and shaping are key.^{2,3} In recent years, the application of thermal treatments based on a nickel-titanium alloy has contributed to the development of a wide range of instruments that allow for better and faster shaping of the canals.⁴ Despite these advances in metallurgy and design, around 10% to 50% of surfaces are not reached by these instruments.⁵⁻⁸ Consequently irrigation plays a major role in the debridement of the areas not reached by mechanical conformation.⁹ An ideal irrigation agent should be organic and able to dissolve necrotic tissue, bactericide, lubricant, biocompatible, non-toxic and non-caustic for periapical tissues.⁶ Several irrigation solutions have been widely studied, such as sodium hypochlorite, chlorhexidine, ethylenediaminetetraacetic acid (EDTA), and a mixture of a tetracycline isomer with an acid and a detergent (MTAD), to determine whether they have all these properties or comply with most of them. Sodium

hypochlorite is the most commonly used irrigant^{10,11} as it has most of the aforementioned characteristics, of particular importance is its ability to dissolve organic tissue, which is superior to all the other agents described above.^{1,6,12,13}

As such, the action of the irrigant has been improved upon by techniques and devices such as laser, sonic, and ultrasonic activation of the irrigating agent; and on the other hand, irrigation protocols have been developed, such as combinations of solutions to be used in a specific sequence during the mechanical and chemical preparation of the canals, in order to achieve a greater degree of removal of microorganisms, organic remains, smear, and thus increase the success rate of root canal therapy.

There is no information on the use or acceptance of different irrigants, techniques or irrigation protocols by Chilean endodontists. Consequently, the purpose of this study is to determine the current trends in irrigation among endodontists who are members of the Chilean Endodontic Society.

MATERIALS AND METHODS.

A descriptive cross-sectional study was carried out through a survey (Survey Monkey®-*SurveyMonkey.com*) e-mailed to the 485 members of the Chilean Endodontic Society. The instrument was translated and adapted from the survey "Irrigations trends among the American Association of Endodontists members: a web-based survey", with authorization from the author, Dr. Joseph Dutner. Face and content validity was evaluated by a group of 25 professors specialized in endodontics from the Universidad San Sebastian, Santiago, Chile. A pilot questionnaire was carried out and the answers analyzed to assess its presentation and content, with comments made when content was not clear. Results were reviewed and the standard survey was sent.

Participants answered a survey containing between 12 and 16 questions depending on their particular answers. They were asked about irrigant selection, irrigant concentration, and irrigation devices, among other topics (Figure 1). Two reminders about the survey were sent, within a period of two months.

SPSS 21 (Statistics 21, IBM Corporation, Armonk, IL) was used for data analysis. A descriptive analysis was

performed for the distribution by years of professional practice, specialty degree and additional training courses. A series of logistic regression models was performed to evaluate factors associated with routine root canal therapy (use of irrigant and its concentrations), new technologies (activation of irrigation and its adjuncts) and continuing education courses (final irrigation protocol).

RESULTS.

Of the 485 survey invitations sent, 158 were successfully answered 32.5%. The sample was randomized to 140 participants to reach a confidence range of 95% and a 7% error.

The average years of professional practice was 14, with a SD of 10 years (a minimum of 2 years and a maximum of 43 years of professional practice); 91% of respondents had a specialty in root canal treatment.

There is no relationship between the age of the dentists and the irrigation protocol used, chi square $p=0.471$, 95% confidence. In addition, the multivariate analyses carried out showed that there was no statistically significant relationship between the variables studied $p>0.05$.

Responses of the members of the Endodontic Society indicate that 99% of the respondents use sodium hypochlorite as their main irrigator.

Seventy-four per cent of the respondents reported that the most commonly used concentration of sodium hypochlorite was 5%. Most respondents 94% also indicated they use EDTA in their usual practice (Figure 2).

When asked about the main reasons for the choice of irrigant, they pointed out that the antibacterial effect is the most important, followed by tissue dissolution, biocompatibility, substantivity and cost (Figure 3).

81.4% of respondents indicated that the type of pulpal pathology did not determine the type of irrigation used. Even so, the remaining 18.6% reported that if they have to choose the irrigant depending on the type of pathology, they would opt for sodium hypochlorite as the irrigant of choice in all cases (Figure 4).

Regarding the removal of the smear layer, almost 80% of the specialists indicated they always remove it, while 17.1% removed the smear layer only in the presence of a periapical pathology (Figure 5).

Ninety per cent of the respondents reported the

use of techniques or devices along with the irrigant for its activation, 94% stated that they carry out a final irrigation protocol. Of the specialists who perform irrigant

activation in their usual practice, manual dynamic activation accounted for 69.3%, followed by ultrasonic activation 56.4%, and subsonic activation 33% (Figure 6).

Figure 1. Questionnaire type.

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|---|---|
| <p>1. ¿Hace cuantos años ejerce la profesión de cirujano dentista?
_____años</p> <p>2. ¿Es Usted especialista en endodoncia?</p> <p>a) Si
b) No</p> <p>3. ¿Cuándo fue la última vez que asistió a un curso de actualización?
_____años</p> <p>4. ¿Qué irrigantes usa durante la terapia endodóntica?</p> <p>a) Hipoclorito de Sodio
b) Clorhexidina
c) Suero fisiológico
d) H₂O₂
e) Ethylenediaminetetraacetic acid (EDTA)</p> <p>5. En caso de utilizar Hipoclorito de Sodio. ¿A qué concentración lo utiliza?</p> <p>a) 0.5%
b) 1%
c) 2.5%
d) >5%
e) no utilizo Hipoclorito de Sodio</p> <p>6. En caso de utilizar Clorhexidina. ¿A qué concentración lo utiliza?</p> <p>a) 0.12%
b) 2%
c) >2%
d) no utilizo Clorhexidina</p> <p>7. Seleccione las características en orden prioritario que debe tener el irrigante para su selección.</p> <p>a) Antibacteriano
b) Biocompatibilidad
c) Disolución de tejidos
d) Sustentabilidad
e) Costo</p> <p>8. ¿Seleccione Usted el irrigante de acuerdo a si la patología es pulpar o periapical? (Si su respuesta es no saltar a pregunta 13)</p> <p>a) Si
b) No</p> <p>9. Que irrigante usa en caso de biopulpectomía</p> <p>a) Hipoclorito de Sodio
b) Clorhexidina
c) Suero fisiológico</p> | <p>d) H₂O₂
e) Ethylenediaminetetraacetic acid (EDTA)</p> <p>10. ¿Que irrigante usa en caso de necropulpectomía?</p> <p>a) Hipoclorito de Sodio
b) Clorhexidina
c) Suero fisiológico
d) H₂O₂
e) Ethylenediaminetetraacetic acid (EDTA)</p> <p>11. ¿Que irrigante usa en caso de evidencia radiográfica de una lesión periapical?</p> <p>a) Hipoclorito de Sodio
b) Clorhexidina
c) Suero fisiológico
d) H₂O₂
e) Ethylenediaminetetraacetic acid (EDTA)</p> <p>12. ¿Qué irrigante usa en caso de retratamiento de endodoncia?</p> <p>a) Hipoclorito de Sodio
b) Clorhexidina
c) Suero fisiológico
d) H₂O₂
e) Ethylenediaminetetraacetic acid (EDTA)</p> <p>13. ¿Realiza Usted activación de la irrigación?</p> <p>a) Si
b) No</p> <p>14. En caso de realizar activación ¿Con que elementos los ejecuta?</p> <p>a) Activación Ultrasónica
b) Activación Sónica
c) Activación Sub-Sónica (Endoactivador)
d) Presión Negativa (EndoVac)
e) Otros</p> <p>15. ¿Remueve frecuentemente el barro dentinario?</p> <p>a) Siempre
b) Nunca
c) Sólo en patología pulpar
d) Sólo en patología periapical</p> <p>16. ¿Realiza Usted un Protocolo de irrigación final?</p> <p>a) Si
b) No</p> |
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Figure 2. Irrigants used by members of the Chilean Endodontic Society.

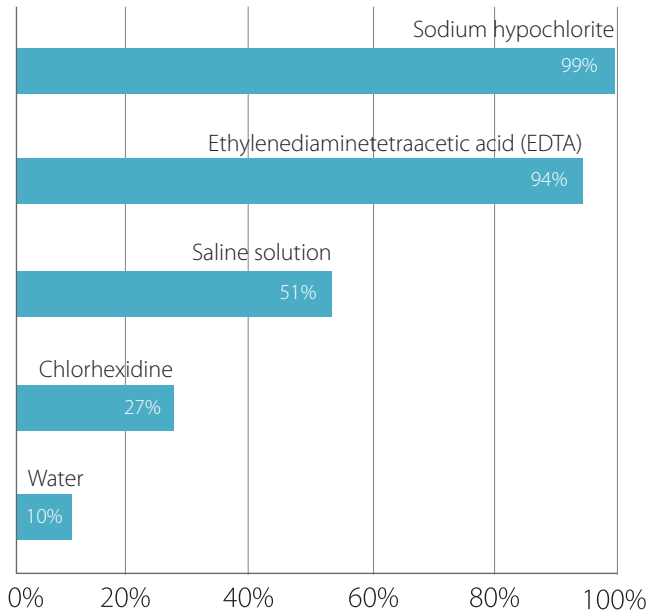


Figure 3. Ranking of characteristics for irrigant selection.

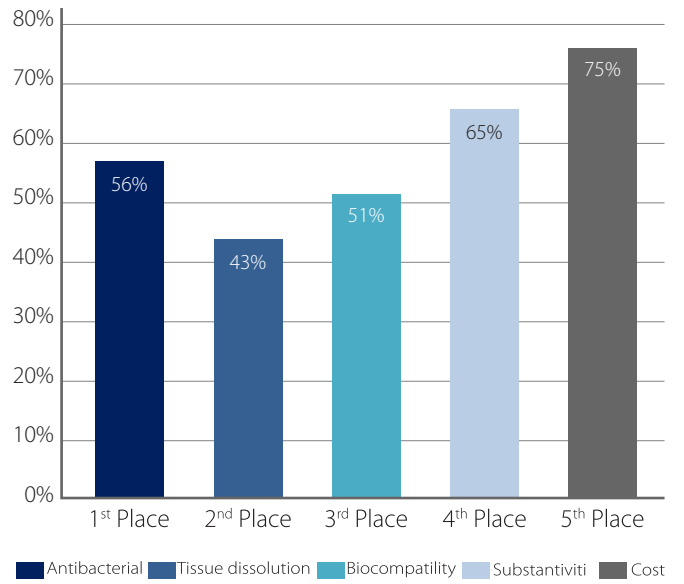


Figure 4. Irrigant selection depending on the type of pulpal or periapical diagnosis.

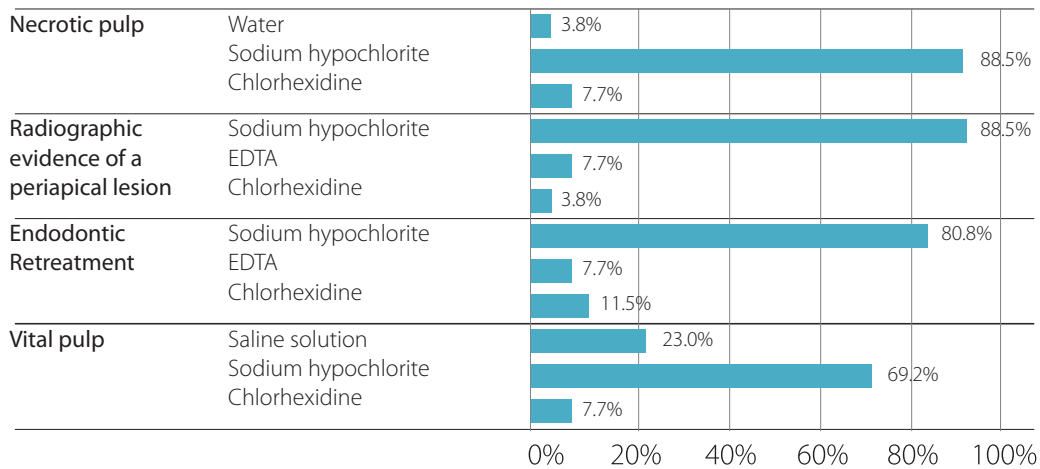


Figure 5. Smear layer removal during endodontic treatment.

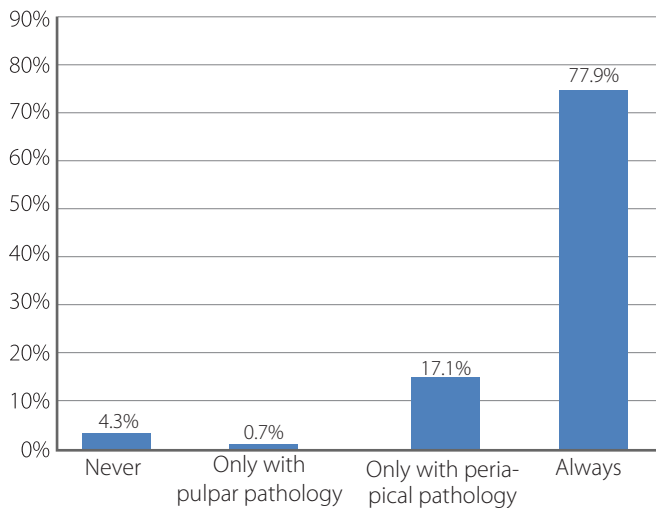
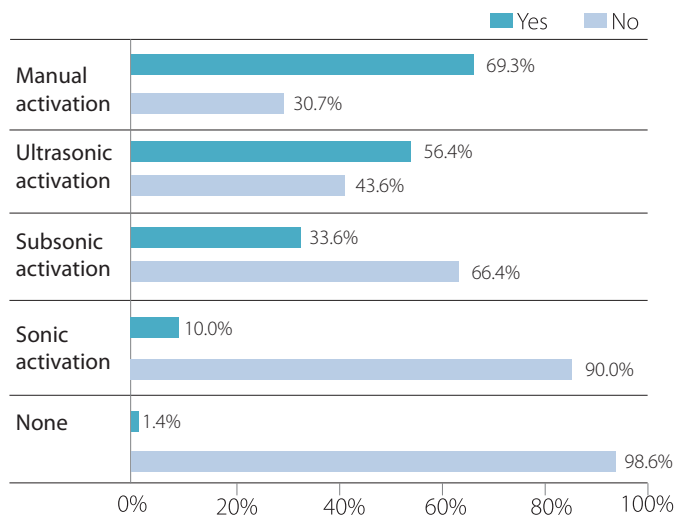


Figure 6. Devices or techniques for irrigant activation.



DISCUSSION.

This is the first study conducted in Chile on current trends in irrigation, and results showed that 99% of respondents and members of the Endodontic Society of Chile use sodium hypochlorite as their main irrigant. The most common concentration of hypochlorite is 5%, accounting for 74% of respondents. These findings are similar to those obtained by Dutner *et al.*,¹⁴ in the United States, in which 91% of specialist respondents reported the use of sodium hypochlorite as the main irrigator, at a concentration greater than 5%. Similar results were also obtained by Savani *et al.*,¹⁵ in a study conducted on general dentists in the United States, in which 93% of respondents reported to use hypochlorite. It also agrees with the study conducted by Clarkson *et al.*,¹⁶ in Australia, where 94% of specialists reported the use of hypochlorite as their main irrigating agent, but differences were found regarding the concentration used; 80% of respondents used a concentration of 1%, stating that this irrigator complies with the two most important characteristics for its selection, *i.e.*, antibacterial properties and tissue dissolution. Their perception is far from being based on scientific evidence, as current studies indicate that its ability to dissolve organic tissue is directly proportional to its concentration.^{1,12}

Gopikrishna *et al.*,¹⁷ reported in their study that 92.8% of the respondents used NaOCl as a primary irrigator. But unlike the findings of this study, 49.3% used 2.6-4.0% of NaOCl as their highest concentration, and only 14% of them reported the use of concentrations higher than 4%. Low concentrations are also documented in a study conducted in Germany by Willershausen *et al.*¹⁸ where it was shown that most German dentists mainly used a NaOCl solution at a concentration of 3%, and that only a considerably smaller percentage reported the use of a concentration of NaOCl higher than 5%.

When specialists participating in this study were asked about irrigant selection in different pulp and periapical diagnoses, 81.4% of them answered that their choice was the same regardless of the pathology, revealing that hypochlorite leads regarding preferences. These results do not agree with Dutner *et al.*,¹⁴ who reported that 34% of the respondents stated that their irrigant selection was different depending on the type of pathology, *i.e.*, pulpal

or periapical; nonetheless, hypochlorite was their irrigant of choice irrespective of diagnosis.

A chelating agent is commonly used as a final irrigation solution or in combination with other irrigants to remove the smear layer.¹ In this study, 94% of respondents included EDTA in their usual practice, a figure that is higher than the 80% reported by Dutner *et al.*¹⁴ With respect to the frequency of smear removal, 77.9% of the specialists in this study indicated that they always do it, a figure similar to the 77% and 73% reported by Dutner *et al.*,¹⁴ and Savani *et al.*,¹⁵ respectively. Likewise Willershausen *et al.*,¹⁸ indicate that the majority of dentists (81%) consider smear removal important, and that 53% use EDTA, followed by 31% who use citric acid.

The use of devices or techniques for irrigation revealed that 69% of the respondents used manual activation, followed by 56% who perform ultrasonic activation, 34% who use subsonic activation (Endoactivator), and only 10% who activate with negative pressure. These results differ partially from those obtained by Dutner *et al.*,¹⁴ in which 48% perform ultrasonic activation, and 34% use sonic or subsonic activation. However, both studies are in agreement regarding the use of negative pressure, which accounts for 10% in both surveys. The study conducted by Willershausen *et al.*,¹⁸ in Germany found that only 45% use ultrasound as a complementary procedure for disinfection.

The high percentage of answers obtained from the Chilean specialists who still perform manual activation may be due to the fact that the question was open, so that participants could choose more than one option, or simply perhaps because it is a low cost technique that does not require special devices.

When respondents were asked about whether they perform a final irrigation protocol in their treatments, 94% responded affirmatively. There are no studies that analyze a final irrigation protocol to compare findings or results, and that is one of the reasons that motivated this study, so that it can stimulate further research in this field.

This study did not find a relationship between the years of professional practice and the irrigation protocol used, since most of the respondents use sodium hypochlorite as main irrigator at a concentration of 5%, and perform smear layer removal during the root canal treatment. In

addition, most respondents use some technique or device to make irrigation more effective and perform a final irrigation protocol.

One of the limitations of the study was the low percentage of participants (32.5%), which is explained by the type of instrument used, and also because it was sent by e-mail, so people feel no pressure to participate. The same situation is reported in other studies, such as the one conducted by Savani *et al.*¹⁵ Of the 2000 surveys sent to dentists, 479 completed surveys were sent back to researchers, accounting for a response rate of 24%. Gopikrishna *et al.*,¹⁷ informed a response rate of 33.23%, Willershausen *et al.*,¹⁸ in Germany reported a response rate of 27.2%, of 4240 surveys, only 1155 were evaluated.

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From the abovementioned rates, it can be concluded that researchers should opt for another type of methodology to obtain this valuable data, as it undoubtedly affects the success of root canal treatments.

CONCLUSION.

Based on the results, it was established that there is no relationship between the years of practice of the profession and the irrigation protocol used. The majority of the respondents use sodium hypochlorite as their main irrigator at a concentration of 5% and perform smear layer removal during root canal treatment. In addition to this, most of the respondents use some adjunct to aid with irrigation. technique and perform a final irrigation protocol.

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