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Original Research Article

Endodontic Irrigation: A Survey among Tunisian Dentists Practicing in Private Clinic

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Abstract: The purpose of this study is to focus on the practice of canal irrigation during endodontic treatment in Tunisia through an epidemiological survey among general dentists practicing in private clinics in order to elaborate recommendations and optimize the use of canal irrigation. *Materials and methods:* Three hundred and fourteen general dentists completed the survey. The data obtained were processed and analyzed by Excel 2007 and SPSS statistics 21.0. *Results:* The surveyed dentists do canal irrigation during their endodontic treatment. Eighty-nine point two percent of them used sodium hypochlorite at the recommended concentration (between 2.5 and 5.25%).Only 7.9% of practitioners respected the NaOCl dilution and storage rules. Thirty-eight percent used a volume of 10 ml per canal during endodontic treatment. Eighty- six percent used chelator. Thirty-eight percent of surveyed dentist did the last irrigation following the appropriate chronology and only 18.2% used endodontic syringes. *Conclusion*: The main directions and the criteria of an adequate endodontic irrigation were not respected by most of Tunisian dentists.

Keywords: Sodium hypochlorite, EDTA, irrigation sequence, endodontic needle, irrigation activation.

INTRODUCTION

Successful root canal treatment based on the endodontic triad: disinfection in three dimensions, shaping and feeling root canal systems (Abuhaimed TS *et al*., 2017) (Adou-Assoumou NM *et al*., 2010).

Shaping the root canal system is an essential step to remove contents and prepare the canal for filling. This step will remove organic debris and create the necessary path for irrigants that ensure chemical disinfection by bringing the irrigant to the root canal system renewing and activating it to get complete disinfection and increase the success rate (Abuhaimed TS *et al*., 2017) (van der Waal SV *et al*., 2014).

Irrigation is an essential step in endodontic treatment, it reduces the number of bacteria and contributes to the healing of root canal area (Haapasalo M, *et al.*, 2014)

Hence, our goal is to check current trends of irrigation among dentists practicing in private clinics, discuss some of the mistake made during root canal treatment to provide some recommendations.

MATERIALS AND METHODS

A self-prepared survey was shared via Google forms to five hundred and twenty Tunisian doctors practicing in private clinics.

The survey was made of 32 questions. The first part was about the profile of dentists who accepted to share their experiences. The second part was about endodontic treatment, irrigant selection, concentration and smear layer removal, materials used in irrigation, and final irrigation. Questions consisted of numeric ranking, QCM and multiple selections to express and write about background knowledge.

The survey ended after three months and ten days. The data were compiled and analysed by statistical software SPSS and EXCEL 2007.

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RESULTS

Out of 520 Google forms links were e- mailed and sent via social media only 314 were received. The return rate was about 60.38%.

Informations about irrigants used by Tunisian dentist

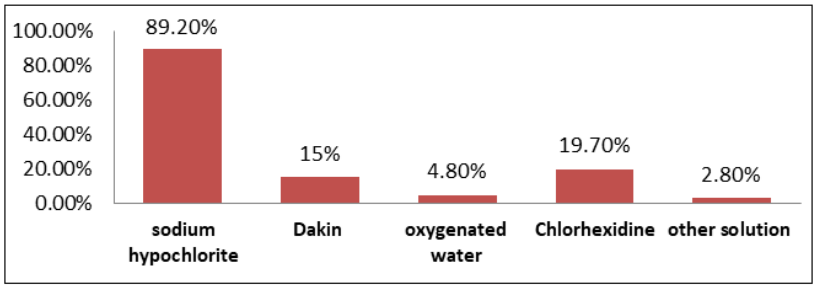

Figure 1: Distribution according to irrigation solution

Table 1: Main *characteristics* of sodium hypochlorite used by the majority of surveyed dentists

Sodium hypochlorite (SH)	Percentage
Knowledge of Method of dilution	60%
Product of dilution =distiled water	29%
Storage time =24 hours	53%
Concentration =3%	31.2%
Opac trank for SH storage	60%

According to this survey, sixteen percent of dentists who used sodium hypochlorite diluted admitted their grasp of the method of dilution .60% used tap water for dilution and only twenty nine percent used distilled water and twelve percent used physiological serum for dilution. Our survey showed that 31.2% Used sodium hypochlorite with Three percent concentration, 27% used 2.5%, 13.9% used 2.25% and 27.1% ignore the concentration of sodium hypochlorite that they used.

53% kept sodium hypochlorite for one day and 60% used an opac trank for storage of SH but 4% used a metallic trank for storage (Table 1).

Table 2: Cross-tables: method of dilution * (storage environment + storage time + dilution product)

Sodium Hypochlorite	Opaque trank +storage time :One day +dilution product:distilled watter
Dillution method:Yes	7.9%

In this survey, 7.9% among 60% of practitioners admitted their grasp of SH dilution method, used distilled water for dilution and kept SH in an opac trank for one day (Table 2).

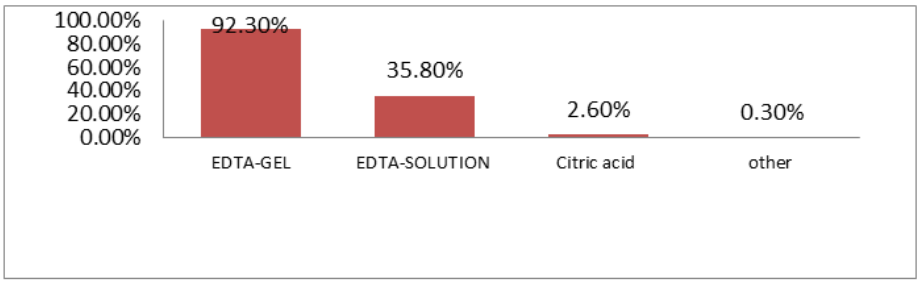

Figure 2: Distribution according using chelator

Also, it showed that 92.3% used EDTA-GEL as a chelator, 35.8% used EDTA solution, 2.6% used citric acid and 0.3% used other solution (Figure 2).

58% used EDTA gel for root canal negotiation and 51% Used EDTA-SOLUTION in final irrigation.

Informations about materials used

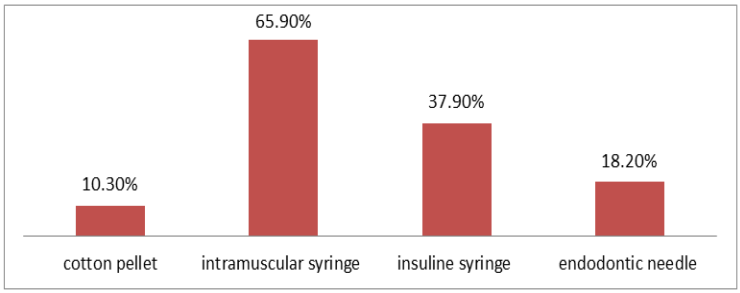

Figure 3: Information about materials of irrigation

65.9% used intramuscular syringe, 37.9% used insulin syringe, 18.2% used endodontic needle and 10.3% used cotton pellet for irrigation (Figure 3).

Informations about irrigation method

In this study 90.8% announced that they did root canal irrigation in every stage of endodontic treatment and only 37.9% used final irrigation. 38% of surveyed dentist used 10 ml of irrigant per root canal and only 38% of practitionrs did a final irrigation. 41% of the dentists activated the irrigant (Figure 4), 67.9% used manuel activation, 31.1% used ultrasonic and only 9.8% used laser (Figure 5).

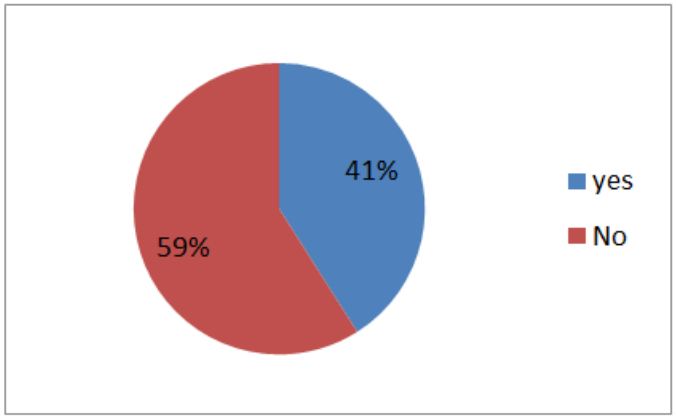

Figure 4: Distribution according to irrigant activation

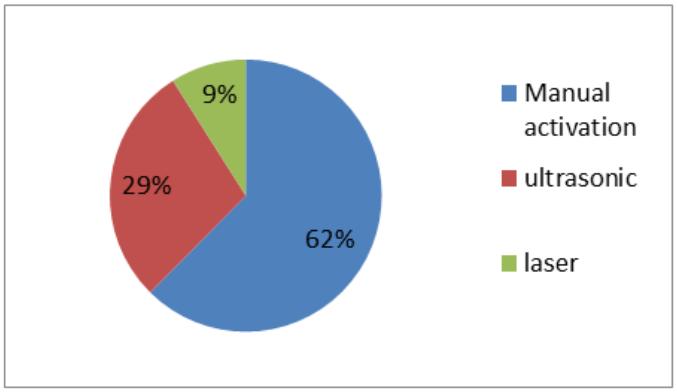

Figure 5: Distribution according to activation technique

DISCUSSION

Informations about irrigant used by Tunisian dentist:

The majority of Tunisian dentist used SH as a principal irrigant. These results were in agreement with reports from the literature, Turkish survey in 2012, German survey 2014 (Willershausen I *et al*., 2015) (Kaptan RF *et al*., 2012). The majority "31.2%" stated they used 3% NaOCl solution, similar results ‘’55.4%’’ were reported by German survey in 2014. (Willershausen I *et al*., 2015) Indeed, the effectiveness of SH depends on the quantity of hypochlorous acid available, which is directly related to the concentration of the solution. For disinfection, the minimum concentration of NaOCl solution was 0.5% and 1% for the dissolving effect (van der Waal SV *et al*., 2014) The concentration used varied between 2.5 and 5.25%. A

concentration of 2.5 to 3% seems to be the most adequate to limit the cytotoxic effect of NaOCl solution (6).

According to our survey, 29% used rubber dam, this result was compared with other studies in the USA, China, Saudi Arabia, Virginia as shown in the following table:

Table 3: Comparison of similar surveys regarding the use of the rubber dam

Countries	USA (Lawson NC, 2015)	China (Zou H *et al.*, 2016)	S.Arabia (Madarati AA., 2016)	Virgina (Imbery TA, 2019)
Year of study	2014	2016	2016	2019
The use of rubber dam	60%	63.3%	21.6%	37.2%

The use of a rubber dam is still not used as required, although it has been taught at the dental faculty of Monastir.

According to our survey, only 9.7% of surveyed dentists who admitted their understanding of dilution method used distilled water for dilution, kept SH in an opak non-metallic trank for one day. In fact, SH is an unstable solution because several parameters accelerate the degradation of available chlorine, namely (Université Laval, 2020).

- The presence of metals and impurities in the solution. A metal tank is therefore not recommended.
- The pH of the solution.
- The temperature of the solution.
- Exposure to sunlight (ultraviolet rays).
- Storage time of the solution, which should be as short as possible.

Our study showed that 86% of dentists used a chelator during root canal treatment. Most of practitioners used EDTA gel with a percentage of 92.3% while only 35.8% used EDTA-solution.

A survey of members of the American Association of Endodontists showed that 80% of them used EDTA during root canal irrigation (Guivarc'h M *et al*., 2015). In fact, SH is inactive on the smear layer, because it is unable to dissolve the mineral parts. Therefore, it must be coupled with a chelating agent such as EDTA (Mohammadi Z *et al*., 2017).

Our study showed that more than half of the dentists ("58%") who used chelator agent used EDTA gel during catheterization.

The real contribution of these products during catheterization or preparation of thin and/or calcified canals is well documented and its use must be reserved with instruments that present sharp edges (Guivarc'h M *et al*., 2015).

According to this survey 51% used EDTA – solution in final irrigation this result can be explained by the high cost of this liquid or the ignorance of its clinical interest in final irrigation.

Indeed, once the root canal shaping is completed a chelating solution can be used to remove the smear layer (Guivarc'h M *et al*., 2015). Liquid EDTA is generally used at a concentration of 17%, the solution can remove the smear layer when it comes into contact with the root canal walls within 1min (Doumani M *et al*., 2017).

Informations about material of irrigation

This survey showed that 18.2% used endodontic needles in irrigation .similar result was reported by a survey conducted in Abidjan, the minority, only 7%, used endodontic needles. Indeed, the use of non-endodontic syringes is strongly not recommended (Adou-Assoumou NM *et al*., 2010).

Concerning the choice of the syringe, currently, the "Luer Lock" model is the only one recommended because it avoids the detachment of the needle during root canal irrigation and secures its refill (Nastorg AM, 2019).

Informations about method of irrigation

The frequence of renewal of the irrigant after using each file observed in this study for 90.8% in accordance with HAS (haut autorité de la santé).Similar results is reported by a survey conducted in Abidjan in 2010 (Adou-Assoumou NM *et al*., 2010).

Only 38% percent of surveyed dentist used 10ml of irrigant per canal which is in accordance with HAS recommendations which call for 1 ml to be renewed after each file (Adou-Assoumou NM *et al*., 2010). Thirty-eight percent of surveyed dentist who do final irrigation following the appropriate chronology and only 41% of surveyed dentists activate the irrigant, similar result 34% was reported by a survey was conducted in Nouvelle Aquitaine in 2019 (Kaptan RF *et al*., 2012).

In fact, Activation improves the penetration of the solution into the root canal system, especially in areas that cannot be instrumented by mechanical shaping. Activation of the irrigation solution also promotes the renewal of the solution and improves its Functions.

RECOMMENDATIONS

- The ruber dam must be used before endodontic

treatment.

- SH must be used with concentration varies between 2.5%and 5.25%.
- SH must be dilueted with distilled water and kept in dark for 24 hours.
- After using SH netrelize the root canal with saline solution before using EDTA or Chlorhexidine.
- Use EDTA-solution 17% in final irrigation to eliminate smear layer.
- Use an endodontic needle with a diametre 28 or 30 /100 of millimiters with luer lock syringe for irrigation.
- Activate root canal irrigation.
- A final irrigation could be done as shown in the following diagram.

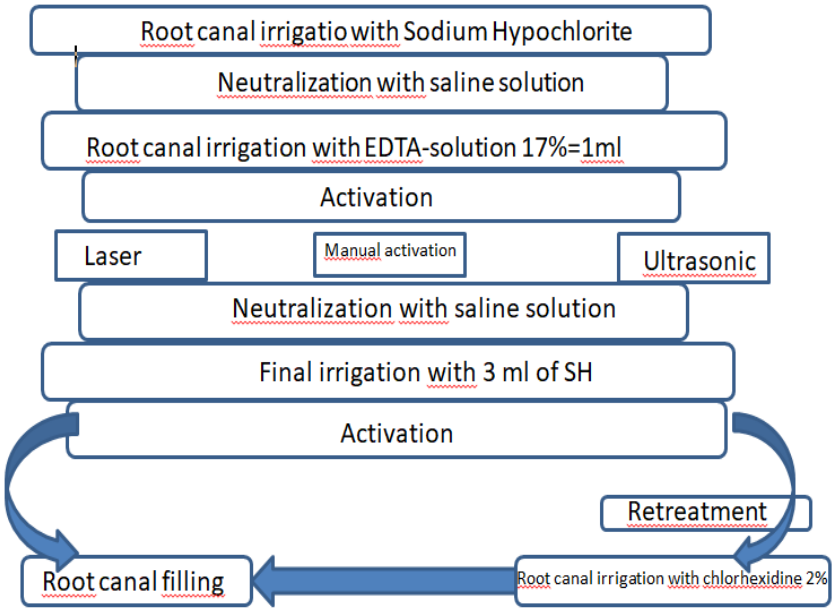

Figure 6: Final irrigation sequence

CONCLUSION

The main directions as well the criteria of an adequate endodontic irrigation were not respected by the majority of Tunisian dentists.

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