

Full Length Research Paper

An evaluation of ethical aspects concerning endodontic instrument fracture

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The aim of this study was to address and analyze several ethical issues relating to the behavioral conduct of general practitioners and endodontists towards instrument fracture during root canal treatment. Data was collected from a group of general practitioners and endodontists and other specialist from other field who perform root canal treatment, using an open ended questionnaire, which was later reviewed and analyzed statistically using chi-square test. 88% of the respondents claimed to have encountered instrument fracture. 59.1% of the participants affirmed that they would inform the patient in case of an incident. 23.4% claimed to refer the case to an endodontists. The results of this survey indicated that most of the professional are still hesitant from informing the patient about the incident that occurred. This may be due to the fear that it might affect their day to day practice.

Key words: Ethics, endodontists, files, procedural accident.

INTRODUCTION

Dental ethics is a systemic study of what is right and good with moral principles or virtues that governs the character and conduct of an individual or group (Weinstein, 1993). A clinician may encounter procedural errors and obstacles like a fractured instrument inside the root canal during routine endodontic practice which may alter the course of treatment (Torabinejad and Lemon, 2002). A fractured endodontic instrument during a non-surgical root canal treatment is a recognized complication, which is frequently considered to be a failure of the treatment. Fracture of the instrument does not affect the objective of endodontic treatment. Prognosis of the treatment should be determined with the

time of fracture during treatment and by the presence of infection in the canal. Fracturing a file during endodontic treatment is not a malpractice, but it is professional and ethical to inform the patient about this (Kia, 2013). Procedural accidents or failures during endodontic treatment usually excite the patient due to their fear of treatment becoming a failure. Thus, it would be appropriate to inform the patient about the incident, its consequences, treatment plan, and prognosis for a proper cooperation to complete the case. However, very few studies on instrument fractures and its management have assessed the ethical conduct by dentists and specialists.

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Therefore, the aim of this article is to address the ethical aspects of dentist's behavior towards endodontic instrument fracture, as this is a main concern relating to the success of endodontic treatment. This study addresses several ethical aspects regarding the behavior of general practitioners, endodontists and other specialists regarding instrument fracture during root canal therapy.

MATERIALS AND METHODS

The study was registered with the research centre of Riyadh Colleges of Dentistry and Pharmacy and was given the registration number FRP/2015/144.

Sample selection

All the hospitals, both government and private clinics in and around Riyadh Kingdom of Saudi Arabia, were chosen.

Design

An open ended questionnaire was modified and framed, based on one used by Rhonan et al. (2008). The questions assessed the ethical aspects of dentists and specialists conduct in endodontics. A form stating the confidentiality of the data and their usage for research purpose only was also filled out.

Three hundred and fifty questionnaires were distributed to dentists and specialists in the city of Riyadh, KSA. The questionnaires were distributed in person to all the doctors by 2 investigators. The questionnaires were filled and returned back to the investigators. The collected data was reviewed and analyzed statistically by Statistical Package for Social Sciences (SPSS) software Version 18. The level of significance was set at $p < 0.05$. The null hypothesis was that there was no association between the variables assessed in the questionnaire.

RESULTS

From the total of 350 questionnaires, a response rate of 86.5% ($n=303$) was obtained. Based on the data collected from the responses, it was observed that 62% ($n=190$) of the respondents were general practitioners, 28% ($n=87$) were endodontists, 8% ($n=26$) were specialists from other field who perform root canal treatment in their practice (Table 1).

With regards to the question on incident of instrument fracture, 88% ($n=267$) of the respondents affirmed that they do have instrument fracture in the canal. When a correlation was made between area of specialization or professional qualification and instrument fracture, it was found out that 87% ($n=167$) of general practitioners and 93% ($n=81$) of endodontists, have already experienced instrument fracture ($p=0.021$), the other 19 participants were specialists from other field performing endodontic treatment (Table 2).

When questioned about the first act of occurrence of

instrument fracture, 23% ($n=72$) respond they would inform the patient about the accident and continue the treatment and 22.4% ($n=68$) responded they will try to solve the issue without informing the patient. And 35.3% ($n=107$) will inform the patient about the accident and finish treatment in another appointment (Table 3).

A statistical analysis by Pearson chi-square, showed a significant association ($p=0.007$) between professional qualification and ethical conduct (informing or not informing the patient and first treatment). A significant difference was found between the area of specialization or professional qualification and referral case to an endodontist ($p=0.000$). 27.8% of general practitioners ($n=53$), would refer the case to an endodontist. In case of failure to remove the fractured segment, 80% of the endodontist would inform the patient and finish the treatment in another appointment. Thus, the null hypothesis was rejected, because of the statistical significant difference between the variables in the questionnaire.

When questioned about saving or preserving a broken or defective instrument removed from canal, 28.5% ($n=57$), answered yes, they would save the broken or defective files. A statistical difference ($p=0.000$) was found between the professional qualification and saving the broken file. 8% ($n=7$) of the general practitioners and 45% ($n=38$) of the endodontists and 38% ($n=12$) of the practitioners from other specialties preserve the broken files.

DISCUSSION

Informing the patient preoperatively of the options and risks of root canal treatment as a part of consent procedure is an important step in good clinical practice. Theoretically, therefore, every patient undergoing root canal treatment or retreatment should be warned of the possibility of file fracture. However, it is questionable as to whether this happens in real practice today. Hence, in the present study, it was evaluated and reviewed whether the doctors both general practitioners and specialists, do follow the correct ethical aspects concerning endodontic instrument fracture. Generally, the incidence of instrument fracture is reported to be relatively low (0.7 to 7.4%) (Crump and Natkin, 1970; Parashos and Messer, 2006; Bergenholtz et al., 1979; Pettiette et al., 2001; Spili et al., 2005). However, the occurrence of this can lead to problems between the patient-doctor relationships. On analysis of the results in the present study, it was found out that among the endodontist, 93% affirmed to already have an experience of fractured instrument. This is in accordance with the statement by Cohen (1988), that even the most careful and skilled dentist can fracture an endodontic file during root canal preparation eventually. A fractured instrument pose a challenge to every dentist

Table 1. Area of specialization.

Variable	Frequency	Percent	Valid (%)	Cumulative (%)
Valid	General practitioner	190	62.7	62.7
	Endodontist	87	28.7	91.4
	Specialists in other fields	26	8.6	100.0
	Total	303	100.0	-

Table 2. Do you encounter with instrument fracture.

Variable	Do you encounter with instrument fracture		Total
	Yes	No	
Area of specialization	General practitioner	167	190
	Endodontist	81	87
	Specialists in other fields	19	26
	Total	267	303

Table 3. Frequency of professional qualification when related to the act in case of instrument fracture.

Variable	Inform patient and finish in another appointment	Inform patient and continue the treatment	Try to solve without telling the patient	Refer to endodontist	Will not inform the patient and finish treatment
P	0.000	0.000	0.000	0.000	0.000
General practitioner	23 (12.1%)	11 (5.7%)	12 (6.3%)	53 (27.8%)	8 (4.2%)
Endodontist	69 (79.3%)	45 (51.7%)	38 (43.6%)	2 (2.2%)	30 (34.4%)
Other specializations	15 (57.6%)	16 (61.5%)	18 (69.2%)	16 (61.5%)	16 (61.5%)

whether a general practitioner or a specialist. The probability of an occurrence is linked to the difficulty of each case and to the practitioner's skill and experience (Kia, 2013). In an event of instrument fracture, the patient should be informed about what has occurred. A pre-warning of the possibility of instrument fracture was given; thereby making this explanation becomes much easier. An excuse or apology made by the dentist is not an admission fault, but rather, acknowledgement of the concern and inconvenience the mishap may cause to the patient. In addition, the patient should also be informed about the case sequence and prognosis of the treatment (Leite, 1962; Cohen, 1988; Imura and Zuolo, 1988). In the present study, an analysis on the decision of informing the patient in occurrence of an instrument fracture, it was found out that only 8% of the general practitioners will not inform the patient about the incident and an higher rate was found among the endodontist (30%). Still, whether a general practitioner or a specialist, it is mandatory to follow the ethical conduct to inform the patient about the incident (Leonardo and Leal, 1998). It is therefore necessary to find the right explanatory words and fulfill our ethical obligations without worrying the patient unnecessarily. This information must take into

account the following factors: the timing of the fracture during treatment; the level of contamination of the canal prior to treatment; and the degree to which the instrument will compromise the seal of the canal (Simon et al., 2008).

With regards to the ethical behavior, if the fragment could not be removed, results indicated that 12.1% of the general practitioners and 79.3% of endodontist would inform the patient and continue in another appointment. These findings demonstrate that after an unsuccessful attempt of fractured instrument removal, treatment was continued in another appointment, which avoids any delayed appointments and increased physical and emotional stress to the patient.

An essential skill of risk management is the ability to know when a case is beyond your level of expertise. To achieve this evaluation, the potential risks involved was assessing the case preoperatively and to analyze whether you can successfully complete the case and mainly whether the patient will be served better by your care. It is always preferable to refer a case if you feel it is beyond your expertise, before initiating treatment, which can in turn reduce the likelihood of malpractice claim. In the present study, referral to an endodontist was found to

be higher by the general practitioners (27.8%), which is in accordance with the earlier study by (Ree et al., 2003). In a survey held amongst general practitioners (Saunders et al., 1999), it was shown that the decision to refer was influenced by certain factors. For example, the presence of a perforation was considered an important factor to refer by 87.1% of the respondents, followed by the need for retreatment (76%) and periradicular surgery (73.8%). With regards to saving or preserving the broken or defective instrument, it was found out that most of the practitioners do not do this. In occurrence of a claim, the instrument manufacturer may be liable, because the product was defective, rather than the clinician being liable for the dental negligence. Electron microscopy spectrographic analysis can determine if manufacturer defect with contaminants caused the breakage, rather than the clinician excessively stressing the instrument (CAN Health Pro, 2005).

The risks of file separation can be reduced by carefully inspecting files on a frequent day to day basis. Assuming proper techniques were used, instrument fracture is not considered a dental malpractice. It is the dentist's immediate response to the fractured files that determines whether the standard care protocol has been met. Most of the lawsuits results from the dentists failing to inform the patient about the separated file.

Conclusion

If the clinician performs endodontic treatment within the standard of care, there should be little concern that a lawsuit for professional negligence will be successful.

Endodontic instrument fracture may bring forth problems to patients and dentists, in different ways. Immediate notification of such an occurrence to the patient is a desired and proper conduct to be followed by dentists. The best way to prevent lawsuits in Dentistry is having an ethical and clear attitude towards the patient mainly in situations involving accidents related to dental treatment. It is also necessary to keep accurate and updated dental records (e.g. radiographs, contracts, prescriptions, casts).

The results of this survey based study indicated that most of the professionals are still hesitant from informing the patient about the incident occurrence. This may be due to the fear that it might affect their day to day practice.

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Conflicting interest

The author declares no conflict of interest.

REFERENCES

- Bergenholtz G, Lekholm U, Milthorpe R, Heden G, Ödesjö B, Engström B (1979). Retreatment of endodontic fillings. *Scand. J. Dent. Res.* 87:217–224.
- CAN Health Pro (2005). Manage your endodontic Risks. Available at: <https://www.protectorplan.com/wp-content/uploads/documents/benefits/risk-management/Endodontics.pdf>
- Cohen S (1988). Endodontic treatment: avoid these malpractice traps. *Dent. Manag.* 28:36-40.
- Crump MC, Natkin E (1970). Relationship of a broken root canal instrument to endodontic case prognosis: a clinical investigation. *J. Am. Dent.* 80:1341-1347.
- Imura N, Zuolo ML (1988). *Procedimentos clínicos em endodontia*. São Paulo: Pancast.
- Kia P (2013). Broken files in root canal treatment. *Smile solutions*. Available at: <http://www.smilesolutions.com.au/blog/broken-files-in-root-canal-treatment/>
- Leite VG (1962). *Odontologia legal*. Bahia: Era Nova.
- Leonardo MR, Leal JM (1998). *Endodontia: tratamento dos canais radiculares*. Third Edition, São Paulo: Panamericana.
- Parashos P, Messer HH (2006). Rotary NiTi instrument fracture and its consequences. *J. Endod.* 32:1031-1043.
- Pettiette MT, Delano O, Trope M (2001). Evaluation of success rate of endodontic treatment performed by students with stainless-steel K-files and nickel-titanium hand files. *J. Endod.* 27:124-127.
- Ree MH, Timmerman MF, Wesselink PR (2003). Factors influencing referral for specialist endodontic treatment amongst a group of Dutch general practitioners. *Int. Endod. J.* 36:129-134
- Rhonan FS, Sávio DRP, Eduardo DJ, Luiz FJ, Cláudia DMP, Carlos E (2008). Ethical aspects concerning endodontic instrument fracture. *Braz. J. Oral Sci.* 7:1535-1538
- Saunders WP, Chestnutt IG, Saunders EM (1999). Factors influencing the diagnosis and management of teeth with pulpal and peri-radicular disease by general dental practitioners. *Br. Dent. J.* 9:492-497.
- Simon S, Machtou P, Tomson P, Adams N, Lumley P (2008). Influence of fractured instrument on the success rate of endodontic treatment. *Dent Update* 35(3):172-174, 176, 178-179.
- Spili P, Parashos P, Messer HH (2005). The impact of instrument fracture on outcome of endodontic treatment. *J. Endod.* 31:845–850.
- Torabinejad M, Lemon RR (2002). Procedural accidents, In: Walton R, Torabinejad M (eds.), *Principles and practice of endodontics*. Philadelphia: WB. Saunders company pp. 310-330.
- Weinstein BD (1993). *Dental ethics*. Philadelphia, Lea & Febiger.