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Knowledge and clinical judgment of Iranian general dentists on vertical root fracture

Peyman Mehrvarzfar DDS, MSc¹, Pooneh Mohebbi DDS, MSc²,
Mojdeh Akrami-Afshari³, Sohrab Tour-Savadkouhi DDS, MSc²

Original Article

Abstract

BACKGROUND AND AIM: This study was conducted with the aim to investigate the knowledge and clinical judgment of Iranian general dentists and related factors on the diagnosis and treatment plan of vertical root fracture (VRF).

METHODS: A questionnaire was distributed among 300 general dentists who attended in Iranian General Dentists Association (IGDA) congress in 2015. The questionnaire comprised of demographic information and nine closed-end questions on the knowledge on VRFs and different treatment options and seven photographs for clinical judgment evaluation. The answers to all questions were assessed and data were analyzed by chi-square test.

RESULTS: 271 individuals (50.7% men and 49.3% women) participated in the study and responded the questions of the questionnaire correctly. Of the subjects, 88.3% and 76.3% had low to moderate clinical judgment and knowledge about vertically fractured teeth, respectively. The correlation between knowledge of participants attending in short endodontic courses was higher than that of those not attended in these courses; the difference between these two groups was statistically significant ($P = 0.0005$). The correlation between clinical judgment, gender, past clinical activity, attendance in short endodontic courses, and field of clinical interest among participants was not significantly different ($P = 0.1900$).

CONCLUSION: It seems that knowledge and clinical judgment are weak among general dentists requiring serious improvement. Fortunately, short endodontic courses may improve their knowledge of diagnosis and interventions related to teeth undergoing VRF.

KEYWORDS: Surveys and Questionnaires; Judgment; Dentists; Tooth Fractures; Tooth Root

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Vertically fractured teeth may cause post-endodontic complications, leading to immature tooth loss and many expensive alternative treatments. The vertical root fracture (VRF) may be a longitudinally or diagonally oriented root fracture.¹ A complete VRF extends from one external root surface to the other side and causes endodontic and periodontal communications.^{2,3} The diagnosis of VRF is a challenge among general dentists and even endodontists, since its signs, symptoms and

radiographic features are not definitive or completely pathognomonic and may imitate periodontal disease or endodontic reinfection.^{4,5} Two common causes of VRFs in root-filled teeth are improper post placement and excessive use of force during root canal filling procedures.^{6,7} In addition, a vertically fractured tooth has been reported in non-endodontically treated teeth.⁸

Management of VRFs usually has a poor prognosis and the selection of a suitable treatment procedure can be confusing for

1- Associate Professor, Department of Endodontics, School of Dentistry, Dental Branch, Islamic Azad University, Tehran, Iran

2- Assistant Professor, Department of Endodontics, School of Dentistry, Dental Branch, Islamic Azad University, Tehran, Iran

3- Student of Dentistry, Department of Endodontics, School of Dentistry, Dental Branch, Islamic Azad University, Tehran, Iran

Correspondence to: Sohrab Tour-Savadkouhi DDS, MSc

Email: s_savadkouhi@yahoo.com

most clinicians. Treatment of multi-rooted teeth compromised with VRF can be performed by resecting the involved root.⁹ Conversely, single-rooted teeth usually are along with a poor prognosis, leading to tooth loss.¹⁰ Furthermore, the time of VRF detection is also important since proper and early diagnosis may help prevent rapid bone loss and periodontal destruction, which has very negative impact on implant placement.¹¹ Appropriate and immediate diagnosis would prevent the waste of time and money for patients and dentists. Thus, one of the most important learning objectives in endodontics is training of general dental practitioners (GDPs) to detect and manage VRFs.¹² This study was undertaken to investigate the

Iranian GDPs' knowledge and clinical judgment and related factors on the diagnosis and treatment plan of the VRF.

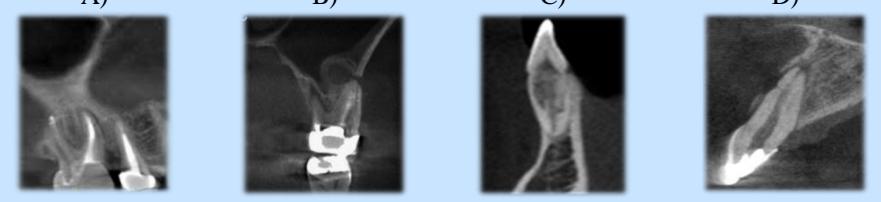
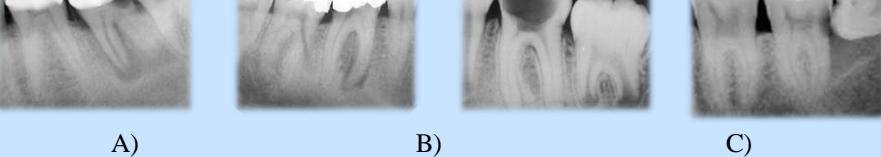
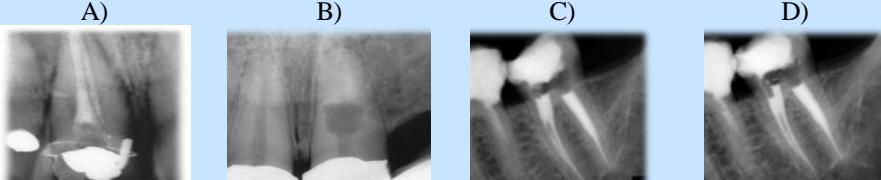
Methods

In this descriptive cross-sectional study, 300 Iranian general dentists attending Iranian General Dentists Association (IGDA) congress in 2015 were assessed. A questionnaire was prepared and distributed among them in the 3-day period of the congress program. The questionnaire included demographic information and 9 closed-ended questions to check the knowledge of the subjects on the VRF and its treatment options and seven photograph-related questions for clinical judgment evaluation (Table 1).

Table 1. The questioner focusing on the knowledge and clinical judgment of general dental practitioners (GDPs) on vertical root fracture (VRF)

| | |
|--|---|
| Which sentence can introduce the VRF better? | A) a vertically fracture which propagates from the root B) a vertically fracture which propagates from the crown C) a vertically fracture that always occurs in the endodontically treated teeth D) a vertically fracture which always seen in mesial-distal direction |
| Answer (A) | A) Full ceramic bridges B) Cantilevers C) Teeth with intra-canals posts D) Single crown PFM in incisors |
| Which one is the most important predisposing factor of VRF in endodontically treated teeth with full crowns? | A) Root canal therapy B) Intra-canals post C) Age D) Para functional habits |
| Answer (C) | A) Pain on chewing B) Rebound pain when the force is removed from the teeth C) Sensitivity to cold D) Sensitivity to percussion test |
| Which one is the least important predisposing factor for VRF? | A) Periapical radiographs B) CBCT radiographic image |
| Answer (C) | C) Surgical flap removal and trans illumination D) Vitality, percussion and palpation tests |
| What is the most prevalent symptom in VRF teeth? | A) Surgical removal the fractured teeth or root B) Wait and see C) Apicoectomy surgery |
| Answer (A) | D) Preventing the crack propagation by crown placement |
| Which one is the definitive diagnostic method for VRF? | A) Bucco-lingual direction B) Mesial-distal direction |
| Answer (C) | C) Both bucco-lingual and mesial-distal directions |
| What is the treatment of choice in vertically fractured teeth? | D) Depends on tooth position |
| Answer (A) | A) Mandibular molars B) Maxillary molars C) Mandibular premolars D) Maxillary premolars |
| Which direction of crack propagation is most prevalent in vertically fractured teeth? | |
| Answer (A) | |
| Which one of the following teeth is more subjected to VRF? | |
| Answer (A) | |

Table 1. The questioner focusing on the knowledge and clinical judgment of general dental practitioners (GDPs) on vertical root fracture (VRF) (continue)

| | |
|---|--|
| What is the first diagnostic step in a patient with pain on chewing over an endodontically treated tooth with perfect post and crown? | A) Bite wing radiograph B) CBCT radiograph C) Crown and post removal and direct detection for cracks visually D) Surgical flap removal and trans illumination |
| Answer (A) Which one the figures can better show the VRFs feature? Answer (A) |  |
| Which one should be extracted secondary to VRF? Answer (B) |  |
| Which one the periapical radiographs can better show the VRFs feature? Answer (A) |  |
| Which one has the poor prognosis for endodontic treatment? Answer (A) |  |
| Which one has the poor prognosis for periodontal treatments? Answer (A) |  |
| Which one is the pathognomonic feature of VRF? Answer (D) |  |
| Which one has the hopeless prognosis? Answer (A) |  |

VRF: Vertical root fracture; CBCT: Cone beam computed tomography; PFM: Porcelain-fused-to-metals

The questions were designed in a multiple-choice format, in addition, the correct and incorrect answers were given a score of 1 and 0, respectively. The total scores of the knowledge or clinical judgment were obtained as percentage of correct answers to the whole questions. The volunteers who had not clinically practiced for the past two years or had not completely answered the questionnaire, were excluded from the study. The related variation factors like gender, clinical experience (before or after five years), field of interest and recent attendance in short endodontic courses were recorded. Moreover, 7 imaginary vertically fractured cases as photographic or radiographic images were used to determine the clinical judgment of the subjects. The questions were designed based on a review study on VRFs designed in the endodontic treatment, including: diagnostic signs and clinical management, pathogenesis, bone resorption patterns, incidence, clinical signs and symptoms, radiographic features, diagnosis, etiology and management discussed.¹³

The closed-ended questions were related to the diagnostic tools, criteria and treatment plan to collect information on dentists' knowledge regarding the diagnosis and management of vertically fractured tooth. The reliability and validity of the questionnaire has been already pre-tested and modified in a population of Islamic Azad University academic teachers consisting of 20 general dentists, endodontists, oral surgeons and radiologists in an interval of 2 weeks and was calculated to be 83.8% level of reliability. The questionnaire was designed so that the participants could answer the questions in 20 minutes.

The degree of knowledge and clinical judgment of participants were defined to be very good, good, medium and low. The data were analyzed using the chi-square test in the SPSS software (version 20, IBM Corporation, Armonk, NY, USA).

Results

A total of 300 individuals initially participated in the study. 16 individuals were excluded from the study due to the lack of clinical activity and 13 individuals had not completed the questionnaire. Therefore, 271 participants remained, on which the statistical analysis was performed. Of these 271 individuals, 50.7% and 49.3% were men and women, respectively. In addition, 35.0% and 65.0% of the individuals had lower and higher than 5 years of the clinical activity experience, respectively. Regarding the clinical interest of the general dentists, the highest and lowest incidence of attitude among them were endodontics and pediatric dentistry as 20.7% and 5.7%, respectively.

The attitude towards knowledge and clinical judgment with respectively 35.8% and 55.6% was weak among the general dentists. According to figure 1, there is a statistical difference between knowledge and clinical judgment ($P = 0.0100$).

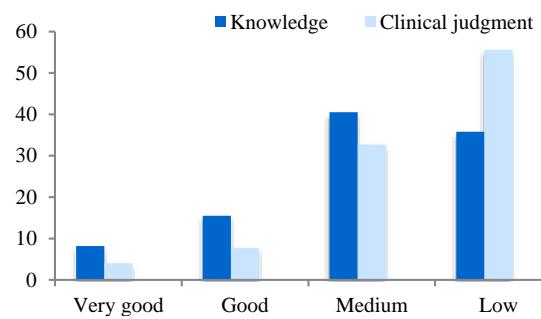


Figure 1. The difference between knowledge and clinical judgment of participants

The correlation between the knowledge, gender, past clinical activity and field of clinical interest of the participants was not significantly different ($P = 0.1800$), however, participants with an experience of attending the short endodontic courses had higher knowledge on VRF than others ($P = 0.0005$) (Table 2). It is noteworthy that, the correlation between the clinical judgment, gender, past clinical activity, attendance in short endodontic courses and field of clinical interest was not significantly different among the participants ($P = 0.1900$) (Table 3).

Table 2. Correlation between knowledge and demographic properties of the participants

| Demographic properties | | Knowledge | Good and very good (%) | Medium and low (%) | P |
|-----------------------------|-------------------|-----------|------------------------|--------------------|---|
| Gender | Men | 57.1 | 48.3 | 0.1800 | |
| | Women | 42.9 | 51.7 | | |
| Clinical activity | More than 5 years | 45.7 | 30.9 | 0.2000 | |
| | Under 5 years | 54.3 | 69.1 | | |
| Attendance in short courses | Yes | 68.6 | 56.6 | 0.0005 | |
| | No | 31.4 | 43.4 | | |
| Field of clinical interest | Endodontics | 37.1 | 18.5 | 0.1800 | |
| | Pediatrics | 2.9 | 6.0 | | |
| | Restorative | 11.4 | 14.3 | | |
| | Prosthodontics | 8.6 | 12.8 | | |
| | Periodontics | 20.0 | 11.3 | | |
| | OMF surgeries | 5.7 | 11.7 | | |
| | Orthodontics | 2.9 | 12.5 | | |

OMF surgeries: Oral and maxillofacial surgeries

Discussion

The main idea behind all the questions designed for knowledge assessment contained definition of VRF, predisposing factors, patients' signs and symptoms, radiographic features, other diagnosis tests and treatment options. Moreover, the photograph-related questions for assessing the clinical judgment were based on clinical features, periapical x-ray and cone beam computed tomography (CBCT) radiographs. According to the results of the present study, the level of the participants' knowledge and their clinical judgment on VRF was unacceptable.

Valenca et al. evaluated the knowledge on crown-root fractures among academic professors and their students of a school of

dentistry. They concluded that all professors and students who attended in any endodontic and surgery disciplines had a suitable degree of knowledge; however, students who had not attended any disciplines presented a poor knowledge.¹⁴ Furthermore, the importance of short endodontic courses for improvement of dentists' knowledge on diagnosis and management of root fractures was remarked in this study compared with the present study.

In a clinical study on the evaluation of the endodontically treated vertically fractured teeth, it was found that only one-third of GDP could correctly diagnose the vertical fractured teeth. This study indicated a poor knowledge of GDP on diagnosis of vertically fractured teeth compared to our study.¹⁵

Table 3. Correlation between clinical judgment and demographic properties of participants

| Demographic properties | | Clinical judgment | Good and very good (%) | Medium and low (%) | P |
|-----------------------------|-------------------|-------------------|------------------------|--------------------|---|
| Sex | Men | 56.3 | 47.2 | 0.1900 | |
| | Women | 43.7 | 52.8 | | |
| Clinical activity | More than 5 years | 22.5 | 35.8 | 0.2000 | |
| | Under 5 years | 77.4 | 46.2 | | |
| Attendance in short courses | Yes | 78.9 | 51.5 | 0.1900 | |
| | No | 21.1 | 48.5 | | |
| Field of clinical interest | Endodontics | 28.2 | 18.3 | 0.1800 | |
| | Pediatrics | 2.8 | 6.6 | | |
| | Restorative | 15.5 | 13.5 | | |
| | Prosthodontics | 11.3 | 12.7 | | |
| | Periodontics | 16.9 | 10.9 | | |
| | OMF surgeries | 7.0 | 12.2 | | |
| | Orthodontics | 4.2 | 13.5 | | |

OMF surgeries: Oral and maxillofacial surgeries

Re et al. evaluated the knowledge of Italian dentists on treatment of traumatic dental injuries. They concluded that the level of knowledge in the group of dentists working in hospitals and those who attended in post-graduate courses in traumatology was heterogeneous. In fact, the management of traumatic dental injuries was problematic based on the type of injuries.¹⁶ This study shows the importance of post-graduate courses to increase GPD's knowledge on the diagnosis and management of dental traumatic injuries.

In an in-vitro study conducted by Hassan et al. on the detection of vertically fractured teeth endodontically treatments by a CBCT scan, it was demonstrated that the accuracy of CBCT (0.86) for detection of vertically fractured teeth was higher than the periapical radiographs (0.66).⁹ Therefore, we considered both types of radiographs in our questions.

This type of study is required in any dental society to determine the status of knowledge and clinical judgment among general dentists who are in the first front in diagnosis and treatment of vertically fractured teeth. Definitively, the higher level of the related

knowledge and clinical judgment among the general dentists can improve the quality of dental treatment and prevent waste of time and money in the condition of improper diagnosis and management of VRFs.

Although the number of dentists participating in the study ($n = 300$) is relatively high, results cannot be generalized to the entire Iranian general dentists; moreover, further studies are required to evaluate the knowledge and clinical judgment of dentists who have followed different educational experiences in order to compare their effectiveness.

Conclusion

It seems that the knowledge and clinical judgment of general dentists are in low levels needing serious improvement. Fortunately, short endodontic courses may improve their knowledge of diagnosis and management of vertically fractured teeth.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgments

None.

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