Medicolegal Aspects of Vertical Root Fractures

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Lars Bjørndal and Henrik Nielsen

Abstract

The vertical root fracture may appear in conjunction with a physical or occlusal trauma or iatrogenic complications often encompassing endodontic and prosthodontic treatments involving the placement of a post. Under certain circumstances, this complex scenario may trigger a wish from the patient for economic compensation. The determination of a fractured root is complicated and challenging as it is often not distinctly objective and more a prediction rather than a definitive diagnosis. In case a vertical root fracture is suspected, a timely decision regarding the diagnosis is required to avoid unnecessary bone loss and ensuing legal claim. In many parts of the world, the patient would have to take the practitioner into a civil court to get compensation. However, in a number of countries, there is legislation which deals with injuries in relation to medical treatment or compensation. Medicolegal considerations are in a few countries particularly detailed. Within these countries, dental complaints and insurance cases are relatively frequently occurring. A subcategorization of endodontics-related complaints shows that the inadequate root filling represents a major risk for complaints. In combination with the occurrence of vertical root fractures, it represents a challenging complication clinically as well as medicolegally, because inadequate root filling may mask the presence of a vertical root fracture. Statistics about claims may indicate where risk management and educational

L. Bjørndal, DDS, PhD, Dr. Odont (✉)
Cariology and Endodontics, Faculty of Health Sciences, University of Copenhagen, NørreAllé 20, Copenhagen DK-2200, Denmark
e-mail: labj@sund.ku.dk

H. Nielsen, DDS, OMS, PhD
Department of Oral and Maxillofacial Surgery, Centre of Head and Orthopaedic, Rigshospitalet, Blegdamsvej 3, Østerbro, Copenhagen DK-2100, Denmark
e-mail: henrik.paul.nielsen@regionh.dk

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efforts can be most effectively directed to improve the standard of dental care. A continuous improvement of preventive treatment concepts including the development of diagnostic tools seems warranted, as an accurate diagnosis may prevent or reduce the risk of complications in particular related to vertical root fractures.

Malpractice in a General Dental Practitioner Environment

The ability to raise concerns regarding the dental care quality as carried out by a practitioner [1] is a relatively modern concept [2]. Several recent reports provide information about the management of liability claims between patients and dental practitioners. The proportion of endodontic-related complaints is relatively high compared to other dental specialties and is comparable worldwide. In the context of vertical root fractures, in particular, whether a vertical root fracture has taken place before or after extensive dental treatment may be difficult to diagnose. Seldom, even the complete vertical root fracture appears as obvious as illustrated in Fig. 9.1. General recommendation about the medicolegal consequences may be a task, as the system differs within various countries. In this chapter, some general medicolegal considerations are presented, including an example of how a particular medicolegal system is organized with focus on the so-called Nordic model. Finally, emphasis is made to improve the diagnostic tools for detecting incomplete as well as complete vertical root fractures. An accurate diagnosis is crucial in order to avoid not only the loss of more bone as a result of the infection accompanying the fractured root but

Fig. 9.1 An upper premolar with a vertical root fracture. The apical part of the root filling is not apparent. A potential medicolegal case will be based on the evaluation of the clinical procedures carried out (Courtesy DDS Vibe Rud)

also to avoid additional hours in the dental chair (spending on clinical procedures that will not cure a vertical root fracture), including the extra cost for the patient. All these elements will increase the risk for medicolegal considerations.

The Global Medicolegal System

In several countries, having a general dental practitioner (GDP)–related insurance is an obligation. In other countries, the GDPs are encouraged to be associated with an insurance company [2].

In some countries, like Israel and Italy [3, 4], most of the dental practitioners are obligated to report any incidence or suspicion of a legal action against them, as part of their professional liability insurance terms. In the USA, the GDPs are encouraged by their insurance company to report dental incidents [5]. In the Nordic countries, there is a complaint management and insurance system described below as "The Nordic Model." This model is relatively unique and includes both complaint management and insurance systems.

The Nordic Model Complaint Management System

In Denmark and Sweden, where the Nordic model is applied, the medicolegal system is closely related to health legislation [2]. Complaints are managed by local committees or regional dental complaint boards (DCBs) consisting of members from the dental association and officials. The committee makes administrative decisions based on best clinical practice and legislation [6–8]. Patients' complaints are evaluated by the DCB, followed by a decision whether malpractice exists or not. If the DCB states that there is malpractice, the practitioner is obligated to return the fee for the treatment to the patient [2]. The DCB may also propose a settlement, where the practitioner accepts to cover the patients' expenses for retreatment provided by another practitioner. Both the practitioner and the patient may appeal the decision to a national board (NDCB) that includes a civil court judge. The NDCB may accept or change the regional DCB decision. The involved part's have the option to appeal the NDCB decision to a civil court [2].

The Nordic Model Insurance System

In Denmark, patient insurance system has been a part of health care legislation since 1992, covering both private and public treatments. The dental insurance system is founded by the government and dental practitioners which pay's a premium depending on their revenues [2].

The insurance system in Denmark is considered a "no-fault insurance" which means that the insurance is based on the clarification to which extent the patient suffers from an injury in relation to treatment. It is not a focus to esthablish malpractice. This would

be handled in the complaint system. Diagnosing vertical root fracture in conjunction with a root filling may be very difficult due to whether the fracture was present before the start of the dental treatment or the root fracture occurred as a consequence of the treatment. Taking the concept of "no-fault insurance" into account, it is important to establish if the treatment *per se* leaves the patient in a situation where the status of the dentition has been deteriorated. Additionally, a retreatment would not possibly reestablish the patient's tooth/dentition integrity and functionality (Fig. 9.2). Finally, four principles are used to distinguish between well-known complications to a particular treatment and injuries [2]:

1. Would another specialist/dentist have done it differently?
2. Could another method have been used?
3. Is the injury caused by a technically inadequate procedure?
4. Must the patient tolerate more discomfort than the average patient?

To describe the content of the four principles, the following should be observed:

Ad 1. It is possible to think of a hypothetical GDP who would have chosen another treatment based on best evidence and by that avoided the injury.
Ad 2. It is possible to treat the patient with another method and achieve the same result but without the risk of injury.
Ad 3. For example, the injury is caused by an inadequate post space preparation (Fig. 9.2).

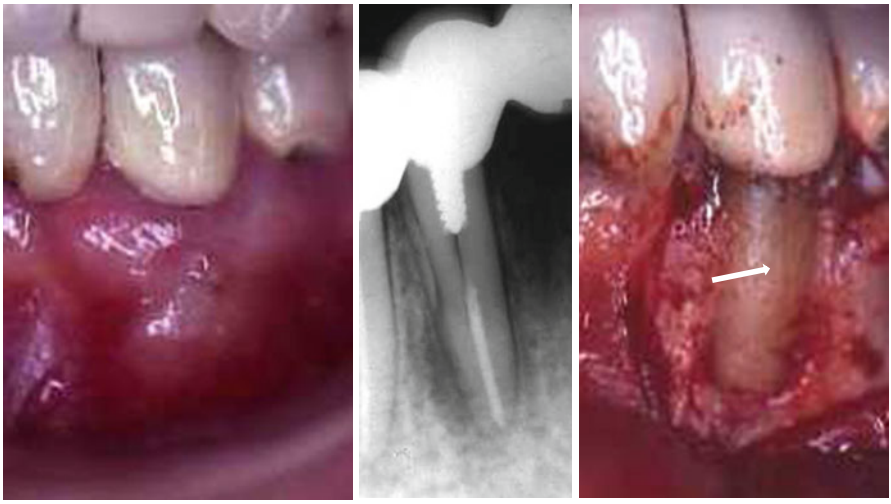

Fig. 9.2 An example of a VRF of a canine involved in a bridge construction. The pin of the post is too short and the post space preparation sub-optimal; consequently, this region has been deteriorated. It is not possible to reestablish the tooth by an endodontic retreatment. Along the buccal surface of the root, the VRF is apparent (*white arrow*). An injury as shown would in the Nordic model be categorized as a type 3 case. This is based on the expectation that another specialist would have prepared a sufficient post space in order to avoid a suboptimal load on the canine

Ad 4. It is a well-known fact that treatment often implies discomfort. However, a nerve injury in relation to conventional endodontics would be anticipated as more discomfort than the average patient would experience.

In Sweden, a "no–fault" compensation system was also introduced, aimed to provide the patient the right to be compensated in case of treatment-related injury, regardless of whether the injury is related to a practitioner's negligence or not [9]. However, the system can still pursue practitioners where they were responsible for medical negligence under tort law [2].

In cases where patients would like to appeal regarding the insurance system decision, they can do so by the Danish appeal board and later even bring that decision to a civil court [10].

Prevalence and Dental Areas of Malpractice Claims and Vertical Root Fractures

Should we expect vertical root fractures in conjunction with endodontic treatments? Facts are presented, indicating that the dentist needs to pay attention and awareness about this topic:

- The frequency of root canal treatment has increased over the last decades [11], therefore the number of endodontically related malpractice claims are still a matter of concern.
- Endodontically treated teeth are structurally more susceptible to root fractures [12].
- From prevalence studies, vertical root fractures range between 8.9 and 10.9 % of the reasons for endodontic retreatments and extractions [13, 14].
- From various observational studies world wide, root fillings are often of poor technical quality in a GDP environment [15–17] rarely performed with the use of rubber dam [18, 19], and a high frequency of persistent periapical inflammatory lesions is noted. This complicates the history and diagnosis of vertical root fractures.
- Nowadays, the molar is the most frequent tooth that receives endodontic treatment, and if only a few endodontic specialists are available to refer complicated cases to (as in countries without endodontic specialist training), malpractice claims are expected to reflect this situation and to a substantial part be associated with the results of defective root fillings and technical treatment complications.
- Malpractice claims in relation to vertical root fractures are complex, as the cause of fracture may be due to several different causes, and typically the vertical root fractured tooth has been extracted prior to onset of complaint.

Prevalence of Dental Malpractice Claims

The prevalence of dental treatment-related malpractice claims seems to increase over the years, depending on the specific country being evaluated:

In Sweden, malpractice cases occurred in less than 1 case per 1,000 dentists, over the period from 1977 to 1983 [7]. However, in the USA, the number of malpractice cases per 1,000 dentists seems to increase over the years, from 11 to 27 malpractice cases in the period from 1988 to 1992 [20], and more recent studies from 2007 show that dentists with at least one filled claim increased from 27 per 1,000 dentists to 40 per 1,000 dentists in the USA [21].

In Denmark, the number of malpractice cases increased from 4 to 5 per 1,000 dentists, between 1995 and 2004 [8]. Dental malpractice claims evaluated per patient has been relatively constant over a the period from 1995 to 2004. However, in urban areas, the prevalence of claims was greater than the overall mean of the country (24.7 versus 13.1, respectively) [8]. A similar difference between urban and rural areas was reported also in Sweden [2, 7].

It can be concluded that regarding the claims prevalence, the medicolegal system varies between countries, and therefore direct comparisons are difficult to make, but in general complaints from patients about dental treatments are internationally rising [2].

Dental Areas of Malpractice Claims

Endodontic treatment–related claims are among the top three frequent reported complaint areas [2], and among specific causes for these complaints, are vertical root fractures [4].

Several subcategories of endodontic claims have been reported. Inadequate root filling quality is a major contributor to endodontics-related claims [8], Specifically, short root fillings appear's to dominate. Iatrogenic root perforations represent another high-risk category followed by separated instruments. Also, the inappropriate use of outdated endodontic materials such as paraformaldehyde application was represented. In all reported cases in Denmark it led to a decision of malpractice [2, 8]. Altered nerve sensation following surgical and nonsurgical endodontic treatments is also associated with malpractice claims. A typical profile for a complaint of altered nerve sensation is a female patient having a second mandibular molar treatment associated with overfilling [22].

Vertical Root Fractures in Root Filled Teeth

Vertical root fracture in root filled teeth is a challenging complication clinically as well as medicolegally and seldom not as obvious as illustrated in Fig. 9.1. Analysis of vertical root fracture's in endodontically treated teeth has shown that premolar and mandibular molar teeth are more prone to medicolegal claims. Moreover, an inadequate root filling complicates and delays the correct diagnosis of vertical root fracture, thus extending the required time for obtaining an accurate diagnosis and hereby increasing the medicolegal risk [23]. Analysis of data from the dental insurance appeals board in Denmark from 2008 to 2012 [10] listing the number and the reasons

of all the appeals revealed that the prevalence of endodontics-related appeals comprise 20.2 % ($n=163$) of all the cases ($n=806$) and of these root fractured roots in root filled teeth accounted for only a very small fraction of the cases [2].

The Fate of the "Complaint Tooth" in Relation to Vertical Root Fractures

The gender of the practitioner and the complainant are important factors for the emergence of a complaint. Several studies reported an over-representation of male practitioners and of female complainants [8, 22]. These data support the importance of the patient–practitioner communication in these potential malpractice cases and indicates that the professional communication may have a gender aspect [2, 24–27]. Patient-centerd communication, being more frequent among female practitioners [25], might decrease the risk of being involved in liability claims. A "frustrating patient visit" [28] may develop when a treatment decision regarding the "complaint tooth" has to be carried out, and in case of a crucial relationship deterioration between the practitioner and the patient, irrational treatment solutions, such as to extract the tooth, may be chosen [2]. For example, it had been reported that almost 50 % of teeth with a short root filling, almost 90 % of perforated teeth, and all teeth diagnosed with a separated instrument were extracted [4]. However, for the vertical root fracture, it may be the opposite way around—the tooth has typically been extracted because it is untreatable and then a medicolegal scenario may arise shortly after.

Advances of Diagnostic Tools Is Crucial from a Medicolegal Viewpoint

There is no high-level evidence for which diagnostic tools should be used for proper diagnosis for incomplete as well as complete vertical root fractures [29]. However, many recent papers have examined various radiographic and tomographic methods [30, 31]. In vitro data shows improvement by the use of CBCT for detecting vertical root fractures [32, 33]. However, within a clinical setting, the results are not that clear and convincing [34]. Several variables may influence the interpretation of these diagnostic tools: presence or not of root filling and postmaterial [30, 31, 35, 36], various parameters used for interpreting the digital images [32], as well as the voxel size used when evaluating the tomographic field of view [30].

Conclusion

Vertical root fracture is a very difficult topic with respect to medicolegal considerations. First and foremost, efforts for preventing the vertical root fracture should be highlighted and relate's to (1) proper root canal treatment and (2) analysis of the actual need for a post, including the dimension of the post preparations as well as the material of the post.

In particular, an inadequate root canal treatment may jeopardize an accurate diagnosis and hereby increase the medicolegal risk as time may be extended, before the vertical root fracture becomes obvious. Future improvements and the diagnostic efficacy of digital periapical radiography and Cone Beam computed tomography are therefore needed since their current limitations still confound the clinical diagnosis of VRF [34].

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