



## Original Research Article

## The attitude of Abidjan dentists towards complications during endodontic treatments

Marie-Chantal Avoaka-Boni<sup>1,\*</sup>, Wendpoulomé Aimé Désiré Kaboré<sup>2</sup>,  
Stéphane Xavier Djolé<sup>1</sup>, Koffi Thomas D'Aquin Kouadio<sup>1</sup>

<sup>1</sup>Dept. of Conservative Dentistry and Endodontics, Félix Houphouët Boigny University, Abidjan, Ivory Coast

<sup>2</sup>Dept. of Conservative Dentistry and Endodontics, Research Center of Health Sciences/Joseph KI-ZERBO University, Ouagadougou, Burkina Faso



## ARTICLE INFO

## Article history:

Received 24-11-2020

Accepted 22-01-2021

Available online 16-03-2021

## Keywords:

Root canal filling

Complications

Management

Survey

Dentists of Abidjan

## ABSTRACT

**Background:** The aim of this study was to evaluate the attitude of Abidjan dentists towards the treatment of complications linked with the operative time of endodontic treatments.

**Materials and Methods:** This was a descriptive, cross-sectional, prospective study. A survey form, distributed to 135 dentists, allowed relevant information to be collected, such as practitioner characteristics (the type of practice, the number of years in practice), the frequency of performing canal treatments, the complications encountered, and the attitude of the practitioners towards complications.

**Results:** Faced with an instrument fracture, 34% of the practitioners proceed to avulsion of the tooth concerned if it is symptomatic. For a perforation of the chamber floor and/or of the chamber wall, 40.74% obture the lesion. In case of bleeding while shaping the canal, 82.96% of the practitioners postpone the session. With an overfilling of the gutta cone and/or of the cement, 47.4% perform disobturation. With inflammatory or infectious flare-ups, the majority of the practitioners (81%) opt for placement of the tooth in subocclusion, prescription of an analgesic, and monitoring.

**Conclusion:** When a complication occurs, managing it is indispensable. However, the main objective of therapeutic endodontics is not to manage the complications, but to know how not to "generate" them.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

### 1. Introduction

Endodontic treatment is a procedure that is often performed as a result of delayed consultations. It consists of the elimination of the canal content and of its three-dimensional and hermetic filling.<sup>1</sup> Its aim is to treat irreversible pulp pathoses so as to prevent or eliminate periapical pathologies. Its success is predictable in 86 to 98% of cases.<sup>2</sup> Over the years, the techniques for canal preparation and obturation have been improved concomitantly with technological innovations in the machining of instruments and the improvement of materials. A consequence of this has been an improvement in operative times and optimization of the success of this therapeutic. There are,

nonetheless, always situations that hamper the normal course of the treatment. These comprise the peri- or postoperative complications. Mainly operator-dependent, the peri-operative complications are incidents or accidents that occur while an endodontic procedure is being carried out. The postoperative complications comprise all of the inflammatory phenomena that occur after the endodontic treatment. When complications occur, treatment is indispensable to keep the tooth in the dental arch and to allow it to continue to provide the various functions that it has in the manducatory apparatus. Even so, there has been a clear rise in such complications with, on the other hand, little data regarding how to manage a situation involving a peri- or postoperative complication. The professionals involved should hence have the means

\* Corresponding author.

E-mail address: [mchavoaka@gmail.com](mailto:mchavoaka@gmail.com) (M. C. Avoaka-Boni).

to ensure management of these situations that can arise at any moment.<sup>3</sup> In Ivory Coast, a study has reported that endodontic treatment represents the most often performed daily procedure.<sup>4</sup> Whence the relevance of this study for which the aim was to evaluate the attitude of Abidjan dentists regarding the treatment of complications linked with the operative time of endodontic treatment by means of a survey so to devise good practice guidelines.

## 2. Materials and Methods

### 2.1. Ethical considerations

This study was approved by the National Ethics Committee for Life Sciences and Health (US DPT OF REGISTRATION #2: IRB000111917 N°090-15/CNESVS).

### 2.2. Sampling and execution of the survey

This was a descriptive, cross-sectional, prospective study. The data were collected using a form devised for this purpose. The survey took place over a period of six months from January to June 2016. The study was in regard to the following variables: the socio-professional characteristics of the practitioners (type of practice, number of years in practice), the frequency of performing endodontic treatments, the complications encountered, and the attitude of the practitioners toward these complications. A pre-test was carried out among 10 practitioners to evaluate the understanding of the questions and the level of difficulty with completing the form. The analysis of the data collected during this pre-test allowed the questions that resulted in confusion to be corrected and reorganized. The survey was then carried out by self-administration of the questionnaires. The dentists answered directly on the survey form that was collected either immediately or at another appointment. One hundred and fifty dentists were selected based on the table of the advisory board of the National College of Dental Surgeons of Ivory coast. This selection was made by a random draw using the formula of Schwartz.<sup>5</sup> The practitioners were engaged in both the private sector and the public sector of ten municipalities of the town of Abidjan and its suburbs were included in the sample. The collected information was analyzed using EPI-INFO version 06.01 software (Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America).

## 3. Results

The forms were distributed to 150 dentists, and 135 of them replied (a participation rate of 90%). The analysis of the data collected from the 135 practitioners is presented as tables made using Excel and Word 2013 software for Windows XP professional.

### 3.1. Characteristics of the sample

The distribution according to the type of practice allowed it to be shown that all years of experience were represented, with a sex ratio of 2.5. The majority of the practitioners (61.19%) were in the private sector and 39.25% were in the public sector. They had mostly been trained in Ivory Coast (88.89%), in France (11.90%), and in Senegal (2.80%).

### 3.2. The number of endodontic treatments performed per month

The majority (65.9%) of the practitioners surveyed performed 10 canal treatments in a month and 30.4% between 11 and 20. There were 3.7% who performed more than 20 endodontic treatments over the course of a month.

### 3.3. The frequency of complications

The practitioners (92.7%) stated that they encountered between 1 and 4 cases of complications in a month while undertaking endodontic treatments. Some (4.1%) encountered at least 5 complications per month. Those who did not encounter any complications represented 3.2% of the surveyed sample.

### 3.4. The type of complications

Different types of complications were encountered by the practitioners peri-operatively and postoperatively (Table 1).

### 3.5. Attitudes towards peri-operative complications

#### 3.5.1. Endodontic instrument fracture

In case of an instrument fracture, 34% proceeded to avulsion of the tooth concerned if it was symptomatic, whereas 16% of the practitioners chose to leave the fragment as is and to perform an obturation over it, 33.33% of them opted for a “by-pass” that consisted of bypassing or avoiding the fractured fragment to end the treatment. Some (17%) decided to refer to a specialist. The means used for the “by-pass” were: files and scrapers for 64% of them, a contra-angle, Gates drills associated with files and scrapers for 10.37%. One (1) practitioner used a HERO 642 system and another a Masserann kit.

#### 3.5.2. Perforation of the chamber floor and/or of the chamber walls

Faced with a perforation of the chamber floor and/or of the chamber walls, 31.11% of the practitioners consider extraction of the tooth involved, while 40.74% proceed with obturation of the perforation. Of these, 32.59% perform hemostasis and then apply a temporary antiseptic, while 9.6% perform an obturation with biodentine. Ten percent refer to specialists (Table 2).

### 3.5.3. Bleeding of the canal

In case of bleeding during the shaping of the canal, 82.96% of the practitioners postpone the session without a specific procedure, while 8.14% perform a temporary obturation with calcium hydroxide.

### 3.5.4. Deglutition of an endodontic instrument

Faced with deglutition of an endodontic instrument during the catheterization, 100% of those surveyed propose monitoring.

### 3.5.5. Overfilling of the cone and/or the paste or the canal cement

Faced with overfilling of the gutta cone and/or of the sealing cement or the obturation paste, 47.4% of the surveyed practitioners perform a disobturation and postpone the obturation to a subsequent session (Table 3).

### 3.5.6. Postoperative pain

With an inflammatory or infectious flare-up, the majority (81%) of the practitioners opt for placing the tooth in subocclusion, prescription of an analgesic, and then monitoring. Or they proceed with resumption of the treatment.

### 3.5.7. When faced with a subcutaneous emphysema

When faced with a subcutaneous emphysema, 77.03% of those surveyed proceed by stopping the treatment followed by monitoring of the change in the condition until its resorption (Table 4).

**Table 1:** The complications encountered by the practitioners

Types of complications	Percentage (%)
Weakening of the walls	54.68
Perforation of the floor	17.17
Instrument fracture	55.47
Canal bleeding	28.91
Deglutition of an instrument	1.57
Overfilling of the gutta cone and/or cement	55.47
Postoperative pain	81.49
Paresthesia	4.83
Subcutaneous facial emphysema	1.61

## 4. Discussion

Of the 150 forms distributed, 135 were retained due to the unavailability of some of the practitioners and due to information errors. Notwithstanding this fact, the study allowed the attitude of the practitioners of the town of Abidjan to be noted in regard to complications encountered during endodontic treatments. As in the study by Kaboré et al. (2016),<sup>6</sup> this study reports that endodontic treatment is a common procedure in daily practice due, in all

**Table 2:** Attitudes recommended by the practitioners towards perforation of the chamber floor and/or of the walls.

Attitudes	N/135	Percentage %
Hemostasis + temporary dressing depending on the endodontic pathology	44	32.59
Hemostasis + obturation with calcium hydroxide	29	21.48
Hemostasis + obturation with Mineral Trioxide Aggregate	1	0.74
Hemostasis + obturation with biodentine	13	9.62
Hemostasis + dressing + referral to a specialist	10	7.40
Extraction	38	28.12

**Table 3:** Distribution of the practitioners according to their attitudes toward overfilling of the obturation material

Attitudes	N/135	Percentage %
Informing the patient	58	42.96
Abstention	11	8.14
Endodontic retreatment	75	55.56
Perform peri-apical surgery	14	10.37
Administration of steroidal anti-inflammatory and antibiotic	62	45.92
Send them to a specialist	9	6.67
Avulsion	18	13.33

**Table 4:** Distribution of the practitioners according to their attitudes towards subcutaneous emphysema

Attitudes	N/135	Percentage %
Informing the patient	69	51.11
Abstention plus monitoring	104	77.03
Postpone the treatment	48	35.55
Application of an ice pack	19	14.07
Introduction of an antibiotic prophylaxis	52	38.51
Prescription of analgesic	32	23.70
Antihistamine	1	0.74
Corticosteroid	1	0.74
Send them to a specialist	3	2.22
Extraction of the tooth	2	1.48

likelihood, to delayed consultations and self-medication. Generally, the manual preparation technique is used the most.<sup>7</sup> Nowadays, the continuous rotation or reciprocal mechanized canal preparation technique allows for greater efficacy and considerable time savings,<sup>8</sup> with less of a risk of complications. In general, when complications arise, practitioners use various management procedures. Thus, when faced with an instrument fracture during canal preparation, 16% of the practitioners choose to leave the fragment as is and then proceed with obturation, as

recommended by a number of studies.<sup>9,10</sup> This attitude must depend on the position of the instrument in the canal and on the phase of the treatment. According to McGuigan et al. (2013),<sup>11</sup> an instrument fracture complicates the endodontic treatment and hence impedes debridement and delays completion of the treatment. The attitude of the surveyed dentists is questionable, as it can have a negative impact on the prognosis of the treatment. However, according to other authors, it would appear that retained instrument fragments do not reduce the prognosis of teeth treated endodontically if there is no associated apical periodontitis.<sup>10,12,13</sup> Given the risks associated with the removal of instrument fragments, this should only be attempted in the presence of apical periodontitis. In this case, a by-pass or circumvention is recommended, as was also mentioned by 33.33% of the practitioners. To do so, several conditions need to be considered.<sup>13</sup> Amongst others, these are (1) the constraints of the canal involved, (2) the stage of the preparation during which the instrument fractured, (3) the expertise of the practitioner, (4) the armamentaria available, (5), the strategic importance of the tooth involved and the presence/or absence of periapical pathosis.<sup>12,13</sup> Few practitioners have sufficient means available to manage fractured instruments. This is one of the reasons that may have prompted the practitioners (17%) to refer to specialists. Similarly, 48% of the practitioners refer the patient in case of perforation, while 32.59% proceed to hemostasis, in situ, and then employ a temporary calcium hydroxide medication, as reported in the study by Zancan et al. (2016).<sup>14</sup> Perforation of the chamber floor or of the root of the tooth by a bur or an endodontic instrument is a common accident when preparing the access cavity and also when shaping the canal. The instrument thereupon crosses the root dentin as well as the cement and creates a gap that artificially connects the canal network with the desmodentium or the oral cavity<sup>15</sup>. These are complications due to iatrogenic errors that, in the worst-case scenario, result in extraction of the tooth. However, more and more products nowadays have been tested and shown to be useful for managing chamber and root perforations. In particular, these are calcium hydroxide (the oldest), Mineral Trioxide Aggregate (MTA), and Biodentine. The latter product is used by 13% of the surveyed practitioners to seal the perforations, as reported by several authors.<sup>16–18</sup>

Moreover, faced with situations involving bleeding during the shaping of the canal, 82.96% of the practitioners postpone the session after employing a temporary medication. The adequate attitude to be observed is to seek to understand the reason for the bleeding that in the majority of cases may be linked, amongst others, to non-compliance with the apical limit of preparation, a persistent apical pathology, an absence or lack of caution in regard to an unidentified general pathology, or to an incorrect route. In this case, postponing the obturation is warranted,

after use of a temporary medication with antiseptic and hemostatic properties, such as calcium hydroxide.<sup>18</sup> When all of the favorable conditions are met, the obturation can be performed in a subsequent session. At this phase of the endodontic treatment, the complications noted by the practitioners are essentially overfillings. In these cases, 47.4% of the practitioners surveyed disobturate the canals and postpone the obturation to a subsequent session. While 46.6% of the practitioners leave the obturation as is while also prescribing of anti-inflammatories. This attitude is not recommended. Even though some canal cements and pastes are resorbable, this is not the case for gutta-percha, which will form an irritative backbone and compromise apical healing.<sup>19</sup> This is sometimes followed by postoperative pain or inflammatory flare-ups, which is why removal is essential. It allows the same objectives of the initial treatment to be attained, if and only if the principles are adhered to; particularly asepsis, by the implementation of a suitable surgical field, with the use of a dam, which is the ideal surgical field in endodontics.<sup>20–22</sup> It is not commonly employed by practitioners<sup>4</sup>, as two cases of instrument inhalation have been reported. Faced with this complication, the practitioners propose stopping the treatment and then monitoring. Nonetheless, other than monitoring, it is further recommended that the patient is taken to the hospital for extraction of the foreign body. This type of incident can occur to anyone, however, and the practitioner needs to know how to deal with it;<sup>9,23</sup> such as in a situation of involving subcutaneous emphysema, which was also reported in this study. With such an accident, the majority of the practitioners (77.03%) stop the treatment taking place and monitor the progression of the emphysema. It is the most acceptable attitude, as recommended by Battum et al. (1995).<sup>24</sup> Corticosteroids and antihistamines can be prescribed in order to reduce the inflammatory phenomenon.<sup>24,25</sup> However, when one does not have the necessary equipment to treat a complication, one needs to know how to “hand things over”.<sup>19,26</sup>

## 5. Conclusion

Endodontic treatment is a procedure that requires a lot of attention as the various stages of the treatment are carried out. Due to the complexity and the specificity of this therapeutic, dentists are faced with various complications at all of the phases of its execution. When a complication arises, managing it is paramount. However, the main objective of endodontic therapy is not to “manage” complications, but to know how not to “generate” them. Nevertheless, to avoid these complications that can arise despite the precautions taken, it is best to strictly abide with the treatment protocols.

## 6. Conflicts of Interest

All contributing authors declare no conflicts of interest.

## 7. Source of Funding

None.

## References

- Laurichesse JM, Santoro JP. Physiopathologie du tiers apical de l'organe dentaire et thérapeutiques biologiques. Le cône d'arrêt. *Actual Odontostomatol*. 1971;95:319–58.
- Song M, Kim HC, Lee W, Kim E. Analysis of the cause of failure in nonsurgical endodontic treatment by microscopic inspection during endodontic microsurgery. *J Endod*. 2011;37:1516–9.
- Estrela C, Holland R, de Araújo Estrela CR, Alencar AHG, Sousa-Neto MD, Pécora JD, et al. Characterization of Successful Root Canal Treatment. *Braz Dent J*. 2014;25(1):3–11. doi:10.1590/0103-6440201302356.
- Avoaka-Boni MC, Gnagne-Koffi NY, Adou NMA. Survey of general practitioners in Abidjan on the use of the surgical field in dentistry. *Rev Odontostomatol Trop*. 2009;127:15–8.
- Schwartz D. La méthode statistique en médecine : les enquêtes étiologiques. *Rev Stat App*. 1960;8(3):5–27.
- Kaboré WAD, Ouédraogo CDW, Konaté A, Traoré RG, Chevalier V, Boisramé S, et al. Automédication au cours des affections bucco-dentaires à Ouagadougou, Burkina Faso. *Médecine Buccale Chirurgie Buccale*. 2016;22(4):277–84. doi:10.1051/mbcb/2016042.
- Faye B, Sarr M, Leye F, Touré B, Kane AW. Study of root canal filling techniques used in Dakar. *Rev Iv Odonto-Stomatol*. 2009;11:24–30.
- Fabbro MD, Afrashtehfar KL, Corbella S, El-Kabbaney A, Perondi I, Taschieri S, et al. In Vivo and In Vitro Effectiveness of Rotary Nickel-Titanium vs Manual Stainless Steel Instruments for Root Canal Therapy: Systematic Review and Meta-analysis. *J Evid Based Dent Pract*. 2018;18(1):59–69.
- Dahan S, Quiz. Quiz : Le retrait des instruments fracturés. *Inf Dent* . 2013;95(17/18):1–3.
- Hülsmann M. Removal of silver cones and fractured instrument using the canal finder system. *J Endo*. 1990;16(12):596–600.
- McGuigan MB, Louca C, Duncan HF. The impact of fractured endodontic instruments on treatment outcome. *Br Dent J*. 2013;214(6):285–9. doi:10.1038/sj.bdj.2013.271.
- Mantri S. Management of fractured root canal treated mandibular molar with separated endodontic instrument extending in periapical region. *SAGE Open Med Case Rep*. 2018;6:1–3. doi:10.1177/2050313x18809253.
- Madarati AA, Hunter MJ, Dummer PMH. Management of Intracanal Separated Instruments. *J Endod*. 2013;39(5):569–81. doi:10.1016/j.joen.2012.12.033.
- Zancan RF, Vivian RR, Lopes MRM, Weckwerth PH, de Andrade FB, Ponce JB, et al. Antimicrobial Activity and Physicochemical Properties of Calcium Hydroxide Pastes Used as Intracanal Medication. *J Endod*. 2016;42(12):1822–8. doi:10.1016/j.joen.2016.08.017.
- Aidasani GL, Mulay S. Management of iatrogenic errors: Furcal perforation. *J Int Clin Dent Res Organ*. 2018;10(1):42–6. doi:10.4103/jicdro.jicdro\_2\_18.
- Torabinajad M, Pariroch M, Dummer P. Mineral trioxide aggregate and other bioactive endodontic cements: an updated overview - part I: vital pulp therapy. *Int Endod J*. 2018;51(3):284–317. doi:10.1111/iej.12841.
- Estrela C, de Almeida Decurcio D, Rossi-Fedele G, Silva JA, Guedes OA, Borges AH, et al. Root perforations: a review of diagnosis, prognosis and materials. *Braz Oral Res*. 2018;32(1):73–86. doi:10.1590/1807-3107bor-2018.vol32.0073.
- Singla M, Verma KG, Goyal V, Jusuja P, Kakkar A, Ahuja L. Comparaison of Push-out Bond Strength of furcation Perforation Repair Matériaux - Glass Ionomer Cement type II, Hydroxyapatite, Mineral Trioxide Aggregate, and Biodentine: An in vitro study. *Comtemp Clin Dent*. 2018;9(3):410–14.
- Likubo M, Kagawa T, Fujisawa J, Kumasaka A, Nishioka T, Kojima I, et al. Effect of exposure parameters and gutta-percha cone size on fracture-like artifacts in endodontically treated teeth on cone-beam computed tomography images. *Oral Radiol*. 2019;.
- Al-Abdulwahhab BM, Al-Ashgai A, Al-Ghamdi S, Al-Harhi A, Al-Qabbani F, Al-Taher R, et al. The attitudes of dental interns to the use of the rubber dam at Riyadh dental colleges. *Saudi Endodontic J*. 2012;2(2):75–9. doi:10.4103/1658-5984.108153.
- Peters OA, Peters FC, Fokke C. Ethical principles and considerations in endodontic treatment. *ENDO-Endod Pract Today*. 2007;1(2):101–2.
- Cohen S, Schwartz S. Endodontic complications and the law. *J Endod* . 1987;13(4):191–7. doi:10.1016/s0099-2399(87)80139-5.
- McGuigan MB, Louca C, Duncan HF. Clinical decision-making after endodontic instrument fracture. *Br Dent J*. 2013;214(8):395–400. doi:10.1038/sj.bdj.2013.379.
- Battrum DE, Gutmann JL. Implications, prevention and management of subcutaneous emphysema during endodontic treatment. *Dent Traumatol*. 1995;11(3):109–14. doi:10.1111/j.1600-9657.1995.tb00470.x.
- Adouko-Aka JA, Djolé SX, Kouyaté V, Assouan C, Koffi-Gnagne Y, Angoh Y, et al. Emphysème sous-cutané facial d'emphysème sous-cutané facial d'origine dentaire: A propos d'un cas Clinique. *Rev Col Odonto-Stomatol Afr Chir Maxillo-fac* . 2015;22(3):23–7.
- Friedman S, Machtou P. La sélection du cas en vue du traitement endodontique. *Real Clin*. 1996;7(3):265–9.

## Author biography

**Marie-Chantal Avoaka-Boni**, Associate Professor

**Wendpoulomé Aimé Désiré Kaboré**, Assistant Professor

**Stéphane Xavier Djolé**, Assistant Professor

**Koffi Thomas D'Aquin Kouadio**, Attached Assistant

**Cite this article:** Avoaka-Boni MC, Kaboré WAD, Djolé SX, Kouadio KTDA. The attitude of Abidjan dentists towards complications during endodontic treatments. *IP Indian J Conserv Endod* 2021;6(1):25-29.