

# Attitudes of general dental practitioners towards endodontic standards and adoption of new technology: Literature review

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## SUMMARY

Research data regarding attitudes of general dental practitioners towards endodontic therapy is rare. The present review summarizes existing literature and analyzes human factors that could potentially influence the outcome of endodontic treatment in general dental practice.

Root canal treatment usually fails when treatment falls short of acceptable standards. The results of questionnaire surveys from several countries indicate that differences between daily general practice and academic teaching exist. The results of studies indicated that majority of general practitioners disregard the most basic principles of endodontic treatment. The most striking finding is the generally negative attitude amongst general dental practitioners towards performing endodontic treatment and adoption of new technologies in a daily endodontic practice.

The results confirm that root canal treatment is technically demanding and in general practice is carried out under less than optimal conditions. This review shows the importance of continuous dental education for practitioners in order to update their knowledge.

**Key words:** general practitioner, root canal treatment, questionnaire survey.

## INTRODUCTION

Numerous clinical and epidemiological studies were published evaluating the frequency of apical periodontitis and the outcome of root canal treatment. In an effort to provide patients with the most recent and predictable treatment planning, clinicians must be well informed about the outcome of endodontic treatment. However the existing data on endodontic therapy success or failure rates must be interpreted with a caution. Discrepancies are evident when results of longitudinal follow-up and cross-sectional epidemiological studies are compared. Results of studies which are performed by experts and highly devoted personnel under favorable conditions far from routine clinical reality show success rates of initial endodontic treatment of around 95% [1].

The picture changes radically when cross-sectional epidemiological studies evaluating the frequency of apical periodontitis and outcome of root canal treatment are taken into consideration. These studies have demonstrated that more than 50% of the teeth are inadequately treated and approximately 30–50% of these examined teeth show radiographic signs of apical periodontitis [2, 3, 4, 5]. It must be taken into consideration that results from epidemiological studies can reflect the results which could be expected in daily general dental practice.

In a Lithuanian population, the frequency of apical periodontitis was 35%, in a Belgian population it was observed in 40% of root-filled teeth [2, 6]. Kirkevang et al. has shown that in Denmark approximately 50% of the root-filled teeth showed signs of apical periodontitis [3]. In two selected Canadian populations the prevalence of post-treatment apical periodontitis was 44% and 51% [7]. Results of these studies suggest that the failure rate could be expected distinctly higher for teeth treated by dentists who are not endodontic specialists [8]. It is important to acknowledge that outcome of root canal treatment is dependent not only on specific factors like root canal infection, complexity of root canal morphology, etc, but is also very much influenced by less specific, more distinct causes such as dentist's skills and attitudes,

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patient's behavior and priorities. These factors may be even more important causes of failure of endodontic therapy than directly related endodontic pathogens.

The number of specialists focusing on clinical endodontics is negligible in European countries and higher in United States and Canada. In some countries, like Denmark, there is no recognized postgraduate specialist training in endodontology. Therefore in majority of cases patients seeking emergency or root-canal treatment primarily consult general dental practitioner and endodontic treatment in adults is almost exclusively performed by them. Endodontics represents a fundamental step in the multidisciplinary dental treatment and it is important to realise that general dental practitioners are making big impact on success rate of dental treatment.

There are many opinions on how to accomplish the goals of endodontic treatment in the best manner. The viewpoint of academic staff and endodontic societies is clear, data which shows approach of general dental practitioners to endodontic therapy is rare [9, 10, 11].

The purpose of this review was to complete the search of published literature related to the studies on attitudes of general practitioners towards root canal treatment procedures and adoption of new technologies.

#### ROOT-CANAL TREATMENT PROCEDURE IN GENERAL DENTAL PRACTICE

The frequency of radiographically verified post-treatment apical periodontitis varies from 35% to 51% [2, 3, 6, 7]. Scientific evidence indicates that there are factors associated with the unsatisfactory outcome of treated root canals. They include extraradicular and/or intraradicular infections, intrinsic or extrinsic nonmicrobial factors, quality of endodontic treatment and coronal restoration [12, 13]. Quality is the essential component of any service and it does not exist in isolation. There has to be entity, the quality of which is being discussed. This entity is endodontic treatment standards which are implemented in university study programmes and their realization is supervised by trained specialists or experienced general practitioners [9]. After graduation dentists work independently in unsupervised dental practices where attitude towards existing treatment standards differs. This can lead to the errors that impede the healing process or make impossible to accomplish appropriate endodontic treatment according to aseptic principles which are essential in order to maximize the success of endodontic treatment. There is no reason to prove the fact that root canal treatment usually fails when treatment falls short of acceptable standards [14].

During last two decades questionnaire surveys concerning attitudes to root canal treatment procedures and adoption of new technologies in general dental practices

were carried out in several countries. The results indicate that differences between daily general practice and academic teaching exist. It is interesting to note that majority of general practitioners disregard the most basic principles of endodontic therapy.

Rubber dam isolation is considered the standard of care in modern endodontics. A survey amongst American general dental practitioners showed that 59% of respondents always used rubber dam [10]. While 64.5% of practitioners in Belgium did not use rubber dam routinely during root canal treatment [15, 16]. Only 3.4% of them reported using rubber dam as a standard procedure [16]. In the United Kingdom frequency in use of rubber dam had increased 10% over ten years period [17, 18]. The last one study from UK showed that less than 19% of individuals used rubber dam routinely while 44.5% of practitioners replied that they never used it [11]. In Denmark rubber dam was irregularly used. Only 4% applied it often and 14% occasionally [19].

In teeth with intracanal infection over-instrumentation induces the displacement of infected dentine or debris into the periradicular tissues and can impaired healing. The working length is a very important factor in assessing the quality of endodontic treatment. Optimal working length appears to be 1-2 mm from the radiographic apex [20]. In Flemish study 38.9% of the respondents prepared root canals 1mm short of the radiographic apex [16]. Such result maybe due to the Belgian health insurance authority stating that root canals "must be filled minimally up to 1 mm short of the radiographically visible end of the root canal", which must be substantiated by a radiograph which the patient has to furnish to the insurance company prior to reimbursement [16]. Another study from Belgium by Hommes et al. reported that the most common apical limit of preparation was 1mm short of the radiographic apex (44.3%), followed by 0.5 mm short of the radiographic apex (19.9%) [15]. Only 1.6% of respondents used a working distance 0.5 mm beyond the radiographic apex, whilst 16.9% prepared as far as the radiographic apex and only 3.9% ended the canal preparation 2-3 mm short of the radiographic apex [15]. Whitten et al. reported that 75% of the respondents from UK stated that they would instrument 0.5 mm short of the radiographic apex [10].

Successful root canal therapy requires a thorough mechanical preparation that the most widely used instruments among general dental practitioners were conventional hand instruments such as reamers, K-files and Hedstromfiles, mostly in combinations [11, 15, 16]. Homes et al. showed that amongst the root canal instruments, K-files were used solely or in combination with other instruments by 60.3% of the respondents, reamers were used solely or in combination with other instruments by 55.4% [15]. Jenkins et al. showed that nearly

a quarter of clinicians in UK reported that they always or generally used a reamer to prepare the apical portion of the root canal, another 20% used K-Flex files and a further 16% used K-files [11]. Seventy five percents of Danish practitioners relied on conventional stainless steel files or reamers to shape root canals [19]. Results of surveys showed that nickel-titanium files are seldom used in general dental practice and this could influence the accuracy in keeping the natural curvature of root canal.

Beside mechanical preparation sodium hypochlorite has been proven to be the first-choice root-canal irrigant. Such opinion was shared by 59.2% of general dental practitioners in Belgium [16]. In another study carried by Hommez et al. among Flemish dentists sodium hypochlorite was the most popular choice as a canal irrigant with 82.4% of the respondents using it during treatment [15]. Of that total 70.4% of respondents used only sodium hypochlorite, whereas 29.6% of them used it along with other irrigants. The irrigants used besides sodium hypochlorite were chloramine (16.6%), chlorhexidine (7.5%), distilled water (2.6%), hydrogen peroxide (11.1%) and saline (6.8%) [15]. In UK local anesthetic solution was the most commonly used endodontic irrigant amongst all age groups with 39% of the sample using it routinely; a further 19% used sodium hypochlorite [11, 18]. Many clinicians preferred dilute concentrations of sodium hypochlorite in order to reduce the potential to act as an irritant. Twenty-eight percent of the Flemish general dental practitioners used it in a concentration of 2% [16]. Possibly, the limited use of rubber dam in general dental practice was a factor in the choice of more dilute solutions.

Attitude of general dentists towards the use of an interappointment medicament in between visits differs. For those dentists who used an interappointment medicament in UK, an antiseptic solution, e.g. camphorated monochlorophenol, was the most popular choice with 37% using it to dress the root canal system between the visits. The use of nonsetting calcium hydroxide was more widespread amongst practitioners from age group up to 29 years [11]. Calcium hydroxide as an interappointment dressing was used by 69.7% of the respondents from Flemish survey [21]. Approximately one-third of the respondents did not use any intracanal medicament [21].

Over the years, numerous methods have been advocated to obturate the prepared root-canal system, each with their own claims of ease, efficiency or superior. However the most popular obturation technique among general dental practitioners in European countries was and still is cold lateral condensation and it constitutes around 60% of users among practitioners [11, 15, 16, 21]. Qualtrough et al. statement that cold lateral condensation remained the most popular undergraduate obturation technique may serve as explanation for the popularity of this obturation method [22]. In Belgium 65.8%

of dentists used cold lateral condensation of gutta-percha [21]. Single-cone gutta-percha placement (16%), paste techniques (4.9%) and silver points (3.9%) were still used in this country [21]. Conventional root filling methods (mainly cold lateral condensation) served as standard for 81% of Danish practitioners, whilst 35% of all respondents were clinically familiar with warm gutta-percha techniques, and 19% often used one or more of them [19]. In comparison, warm techniques were found to be used by only 4% in a Flemish sample [16].

Most popular sealers amongst Flemish dentists were resin-based sealers (88.6%), AH26 sealer was used by 29% respondents of total number [21]. Other sealers like paraformaldehyde containing sealers such as Endomethasone and N2 were used infrequently [21]. There was a wide variety of root canal sealers being used among practitioners in UK but Tubliseal (63%) and Endomethasone (Septodont) (15%) were the clear favorites [11].

Temporary restorative materials used in endodontics must provide a high quality seal of the prepared access cavity in order to prevent microbial contamination of the root canal. Fifty-nine percent of the respondents used Cavit as temporary filling material, which under experimental conditions provided superior resistance to bacterial leakage [23]. Cavit (48.2%) and glass-ionomer (31.3%) were the temporary coronal-filling materials used most often by Flemish dentists, followed by zinc oxide-eugenol and IRM [21].

The most striking finding is the generally negative attitude amongst general dental practitioners towards performing endodontic treatment. Slaus & Bottenberg found that only 34% of a sample of Flemish dentists actually liked doing endodontics [16].

## ADOPTION OF NEW TECHNOLOGIES IN GENERAL DENTAL PRACTICE

During last decade many innovative concepts, techniques and instruments have been introduced to daily dental practice. Despite a variety of new instruments and techniques, majority of questioned general dental practitioners used conventional diagnostic, preparation and obturation techniques.

Rare use of magnifying lenses and operating microscope during endodontic treatment procedure is the reason why more than 70% of the dentists never or seldom prepared and filled the fourth root canal in the first maxillary molar [16]. Kulild & Peters indicated that the second mesiobuccal canal was found in the coronal half of 95.2% of the mesiobuccal roots examined [24]. The second root canal in the mesiobuccal root of the first maxillary molar which is not prepared and filled can be a reason of treatment failure.

It is evident that the most precise determination of working length is combination of radiographs and elec-

tronic apex locators. According to existing data the use of electronic apex locators in general daily practice is limited. Approximately 80% of Flemish respondents had never used electronic length determination, 16.0% of them it used occasionally and 4.9% seldom [15]. Twenty-three per cent of Copenhagen dentists often incorporated electronic measurement to determine working length [19].

New developments are slowly being incorporated into daily practice. Amongst Flemish practitioners Slaus & Bottenberg and Hommez et al. found that 47% and 50% of respondents, used NiTi handles at least sometimes [15, 16]. Engine-driven instruments were used by 27.7% of the respondents, 64.5% of them used only hand files for root canal preparation, 26.0% used a combination of hand files and rotary instruments and 1.6% used only rotary instruments [15]. Danish study showed that only 18% of the Copenhagen dentists often negotiated root canals with hand NiTi instruments and 10% often used rotary NiTi instrumentation [19]. In Australian survey rotary NiTi instrumentation was used by 22% of the general dental practitioners, 80% of the users of rotary instrumentation reported a more rapid preparation of root canals [25]. There is no doubt that use of rotary systems was significantly associated with shorter instrumentation sessions as well

as fewer numbers of visits needed to complete a case.

Despite a substantial body of studies showing a superior quality of NiTi instrumentation over conventional, it could be stated that the diffusion of this technology is of an early phase amongst general dentists in many European countries. This could be due to the marketing politics which has focused, not so much on health effects, as on enhancing the simplicity and the time-saving effects of using NiTi technology. However, in order to change from conventional to rotary instrumentation technique the 'trialability' and the 'complexity' aspects seem crucial. Significantly more individuals willing to adopt a rotary system to the daily practice was among dentists when hands-on training was included in the educational package, as compared with just lectures and written information [19].

## CONCLUSIONS

It might be concluded that root canal treatment is technically demanding and is often in general practice carried out under less than optimal conditions. This review shows the importance of establishing higher specialist training or continuing dental education for practitioners to update their knowledge.

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