Comprehensive evaluation of previous root-canal therapy

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I recently received an e-mail from a general dentist with the image of tooth #15 (Fig. 1). The e-mail read: “I have an X-ray of our son’s #15 root-canal treatment done five years ago by an endodontist. He has pain. I would like your opinion on the re-treatment?” There was no additional information.

The e-mail gives rise to several additional questions. It directly and indirectly addresses several important clinical and treatment-planning principles. These questions include:

1. Which teeth with previous root-canal treatment can and should be re-treated or have endodontic surgery, and which should be extracted?
2. If re-treatment is the best option, how should this be accomplished?
3. If surgery is the immediate best option, is it also the best long-term option?
4. What clinical and radiographic features of the root canal pictured are needed to decide the answers to Questions 2 and 3 above?
5. What additional subjective and objective information is needed to address fully the question asked by the clinician in the e-mail?

This article was written to answer these questions in a clinically relevant manner, addressing the needed treatment-planning concerns and strategies for clinical management.

There is vital information that has a direct bearing on the management of this case that is not provided. For example, it would be helpful to know the reason this tooth was not restored after the root canal. The answer is unknown. Valid questions include whether the patient may have had significant pain after the procedure that led to the delay in coronal restoration. Is the patient non-compliant? Did the patient move and neglect the coronal restoration for that reason? Is there another possible reason for failure besides coronal leakage? Could another tooth be involved? These questions (and a host of others) have implications for clinical management. These include knowing whether the patient will follow up with the restorative recommendations of the general dentist if this tooth is re-treated. As an aside, if the patient is non-compliant, given all of the other considerations, extraction is indicated. It is wholly unproductive to retreat the tooth to later find out that the patient did not have the tooth restored a second time.

It would also be ideal to have more digital radiographs from different angles and ideally, a Cone-beam Computed Tomography scan of the tooth to determine whether there is a vertical root fracture and/or possibly a perforation. It is reckless to make judgments about clinical situations without a comprehensive understanding of the situation from multiple radiographic angles and without correlating the clinical examination with the symptoms. A correct diagnosis involves blending the findings with regard to percussion, palpation, mobility, probing and radiographic interpretation with the subjective examination in order...
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to determine a diagnosis. Such diligence can ensure
that should treatment be undertaken, the patient
would understand the procedure, alternatives and
risks, and have his questions answered in a way that
gives him a realistic expectation of probable success or
failure. Based on this standard, it is not possible to
judge the treatment as a failure and make decisions
based on this one image without a clinical history and
subjective and objective examination.

The above notwithstanding, the provided image
yields significant information. The radiographic in-
terpretation of this film demonstrates the following:

1. There is no coronal seal. In the endodontic litera-
ture, coronal leakage is highly correlated with
failure of root-canal treatment. The tooth has not
been crowned nor has the pulp chamber been
restored. This radiographic appearance is diag-
nostic of coronal leakage. If accessed, the canals
would almost certainly show overt evidence of such
leakage, manifested as odour, discoloured gutta-
percha, moisture and possible purulence, amongst
other signs. Microbiologically, it is virtually certain
that evidence of bacterial biofilm would be located
alongside the existing gutta-percha in fins, cul de
sacs and other inaccessible areas of the root-canal
space.

2. There is a lack of continuity in the preparation
and obturation in the taper from the crown to the
apex of all three roots. The coronal halves of the
disto-buccal (DB), mesio-buccal (MB) and palatal
canals have greater taper than the apical halves do.
It appears that the prepared shape in the coronal
halves was made with Gates Glidden drills.

A more predictable canal shape could have been
prepared using an instrument like the Twisted File (TF;
SybronEndo). For this particular tooth, TF would have
prepared the palatal canal in approximately two to
three insertions to a 0.10/25 after the creation of a
glide path. The MB and DB canals (and MB2 if present)
could also have been prepared to a 0.08/25 in three
to four insertions after the creation of a glide path.
While a comprehensive discussion of TF is beyond
the scope of this article, using TF in this clinical case
would have provided an optimal taper with relatively
few insertions and preserved root structure. It would
also have minimised the possibility of vertical root
fracture and strip perforation. The degree of dentine
removal at the distal aspect of the MB root and the
essential aspect of the DB root indicates that the re-
main ing root wall is very thin. While it does not appear
that a strip perforation has occurred, the radiographic
information at hand is limited and it is not possible
to determine whether there is a perforation. Such
excessive dentine removal is correlated with long-
term risk of vertical fracture.

3. There is a radiographic lesion at the apex of the
palatal root. It is unknown from this one radiographic
view whether additional lesions are present at the
apex of the MB and the DB roots.

4. There are obturation voids in the palatal and MB
root. The root-canal spaces have not been filled
three-dimensionally. Such voids in obturation
(aside from a lack of coronal seal) would give rise to
questions about the quality of the cleaning and
shaping.

5. Although not based on an empirical radiographic
observation, the working length of the cleaning,
shaping and obturation appears to be appropriate
as does the master apical diameter, but this may have
little to do with the clinical reality, ideal true work-
ing length and/or master apical diameter.

_Clinical considerations_

Clinically, that the patient has
pain—assuming that #15 is the
offending tooth—would demand
treatment. Treatment options in-
clude extraction, root resection
and root filling, or re-treatment.
Part of the missing clinical history
is a confirmation that #15 is the
offending tooth, but it may not be.
As mentioned, it is imperative that
the patient have percussion, palpa-
tion, mobility and probing deter-
mined for teeth #14 and #15
(amongst other teeth) in order
to reproduce the patient’s symp-
toms. Clinically, this means that
if there is pain (for example, in
reaction to chewing in the upper
left), tooth #15 would be expected

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Fig. 2. Twisted Files (0.12/25, 0.10/25, 0.08/25, 0.06/25, 0.04/25; SybronEndo).

Fig. 3. Elements Obturation Unit (SybronEndo).

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**Clinical management**

While limited to one radiographic view, given what appears to be coronal leakage as the primary source of failure, re-treatment would be the most practical, efficient and economical solution. The tooth appears to have adequate bone support. With a lack of coronal seal, assuming that a proper pre-operative radiographic and clinical examination did not suggest another diagnosis or treatment modality, re-treatment is favoured. Clinically, re-treatment would require that unnecessary dentine removal be avoided in order to minimise the risk of strip perforation. Aggressively removing the existing gutta-percha could easily cause strip perforation and/or remove excessive dentine, and as a result lead to long-term vertical root fracture. Using a heat source such as the Elements Obturation Unit (SybronEndo) as a first line of gutta-percha removal would minimise the risk of unnecessary dentine removal and provide a passive means to eliminate the obturation before solvents and/or mechanical means are used. While not directly related to re-treatment, this case is a strong argument for the use of bonded obturation. Relative to gutta-percha, in vitro and in vivo bonded obturation has been shown to either decrease the movement of bacteria in a coronal to apical direction and/or reduce apical inflammation and infection that results from a loss of coronal seal. In this clinical case, it could be argued that if the obturation had been bonded that it could have provided some additional defence against the evident loss of coronal seal. RealSeal (SybronEndo) master cones and/or RealSeal 1 Bonded Obturator (SybronEndo) would both have been excellent choices to provide this bonded obturation clinically.

Finally, apical surgery is contra-indicated in this case for several reasons:

1. The crown-to-root ratio is unfavourable. Removing several millimetres of the apex of each root would make a short tooth (#15) even shorter and risk long-term vertical fracture.
2. The endodontic literature states that endodontic surgery is more successful in the short term than the long term. One of the reasons for this is due to coronal leakage, as evident here. Removing the apices and placing an apical filling might heal in the short term, but the long-term assault by coronal leakage would remain unabated, reducing the probabilities of clinical success.
3. The tooth should be re-treated first (if it is to be retained) and if necessary, apical surgery would be one option for the long term, amongst others.

A clinically relevant look at a failed root canal with regard to treatment planning and several clinical considerations has been presented. Emphasis has been placed on a comprehensive examination that combines both the subjective and objective findings in order to determine the correct clinical diagnosis and the most predictable treatment alternatives. I welcome your feedback.