

Are endodontists invited to the treatment planning party?

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Figs. 1a–e_ Good oral hygiene. Gingival recession of 4 mm on the buccal aspect of UR6 and the UL6. BPE scores of 1 in all quadrants.

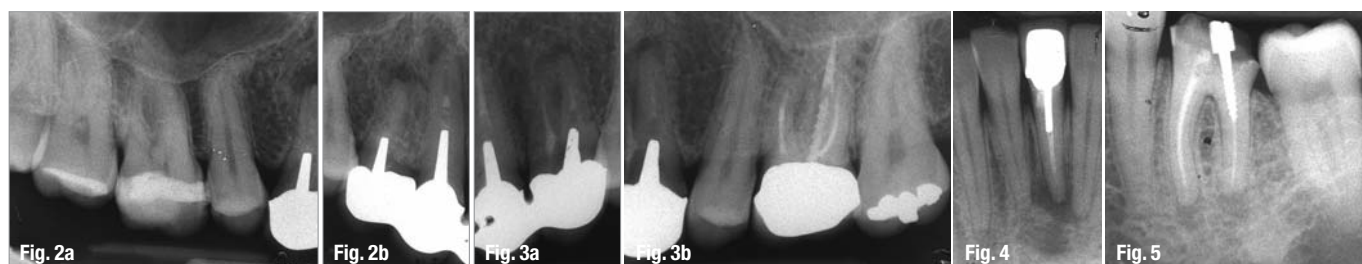
_This is an exciting time to be an endodontist in practice. The availability of advanced technologies aids in the provision of excellent treatment and has transformed the perception of endodontics to that of a dynamic, cutting edge specialty. It is now possible to predictably treat an increasing range of complex cases. Despite this, it is concerning that endodontists only play a limited role in treatment planning in practice.

I have five to ten referrers who regularly send patients for opinions prior to treatment planning. This means, a majority of referrers do not wish to or just do not consider the availability of our specialist skill and knowledge. If a patient presents after the treatment plan has been agreed on, consent signed and a financial plan put in place, it becomes much more difficult to change direction. We need to ensure that we do not become technicians working to the prescription of referring dentists, but instead are actively involved at the crucial initial decision-making stage.

Figs. 2 & 3_ Peri-apical radiographs.

Fig. 4_ Technically inadequate RCT and a peri-apical radiolucency.

Fig. 5_ Peri-apical radiolucencies associated with the mesial and distal roots.



Endodontic treatment planning most often focuses on restoring individual teeth with less attention paid to the role of these teeth in the mouth as a whole. Dentistry has become more specialised over the last decade. This has resulted in a reduced incorporation of all the dental disciplines into treatment planning of patients. Predicting the long-term serviceability of a tooth in the context of a restorative treatment plan is complex. The pendulum has swung over the years from only extracting unrestorable teeth to replacing restorable teeth with dental implants. We need to be knowledgeable about dental implants and gain experience in complex treatment planning. It is encouraging to see that postgraduate courses are increasingly including implant training and complex restorative treatment planning in endodontic programmes. Once these knowledge and clinical skills are present, the endodontist is in the best possible situation to be least biased in decision-making regarding tooth restorability.

The quest to obtain an evidence-based approach for decision-making in dentistry is prominent at the moment. There is no accepted standardisation tool for assessing the overall status of teeth. In practice, decisions are therefore made based on available evidence, previous clinical experiences, intuition and accounts of successful treatments by colleagues or even dental representatives. Social psychologists tell us that human beings are "cognitive misers", that is, we accept that we have limited ability to process all the available information and thus try to devise strategies to deal with complex planning issues.

This is evident when we do treatment planning sessions with general dentists. These sessions are invaluable as a type of focus group so we can under-

stand the needs and wants of local practitioners. These findings, it should be noted, are from a small self-selected group and may not reflect what occurs in practice in a wider context:

1. Many dentists make treatment decisions based on radiographs alone without dismantling teeth and assessing restorability.
2. There is a general perception that root-canal retreatment (RCT) has a 50/50 chance of "not working" and that apicectomies are unlikely to be successful in the long term.
3. Implant treatment has success rates close to 100% and carries a low risk of complications in the long term.



Figs. 6a & b Adequate amount of tooth structure lingually and a little ferrule present buccally.
Fig. 7 Completion and temporisation of LL1 and LL6.
Fig. 8 Temporary bridge.

Heuristics are a simple, rule of thumb strategy for solving problems. Its attractiveness lies in the fact that in a busy practice one does not need to go through a complex decision-making process for each possible alternative. An example I often hear is, "If a failed tooth has been root-canal treated and restored with a post, we need to extract the tooth." Once established it is easy to reaffirm existing views, but it is extremely difficult to change them.

whereas a large number of recent implant studies have ignored biological and technical complications.⁴ As endodontists, implant technology is to be embraced. In fact, the advent of implants has made the endodontist's job a lot easier. It is our duty though to stop the pendulum from swinging too far. We need to disseminate the knowledge and prevent perfectly restorable teeth from being artificially replaced.

It is also striking to note the language used when general practitioners talk about treatment alternatives. Root-canal treatment (especially retreatment) is associated with uncertainty and the possibility of failure, whereas implant treatment is associated with success and predictability.

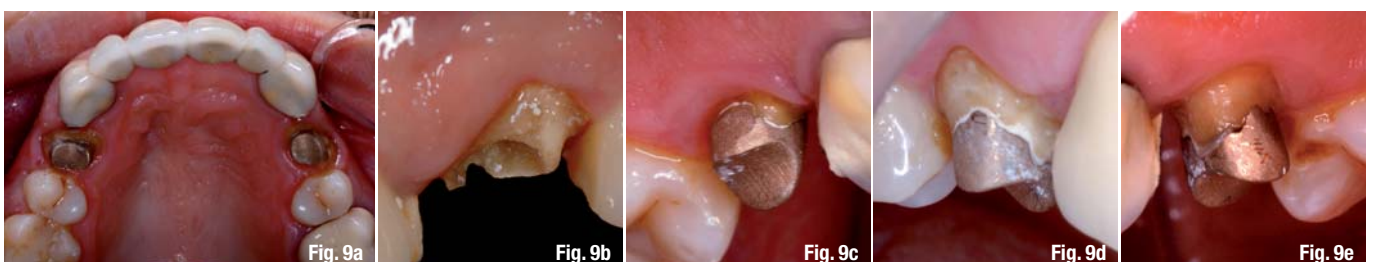
Hard tissues	
Teeth present:	76543 / 34567 87 54321/1234567
Good margins on the PFM crown LL1 and the PFM double-abutted bridge UR4, UR3 to UL3, UL4. Crown de-cemented from LL6.	
Table 1	

These perceptions exist despite excellent studies demonstrating RCT and endodontic microsurgery to be incredibly successful. Systematic reviews show that RCT has a success rate greater than 80% over four to six years,¹ while outcome studies show that endodontic microsurgery has a greater than 91% success rate after five to seven years.² With good case selection, success rates greater than 80% are easily achievable for RCT, as some of the studies included in the systematic review were completed in the past when implants were not an available treatment option and therefore heroic endodontics were attempted in order to save teeth.

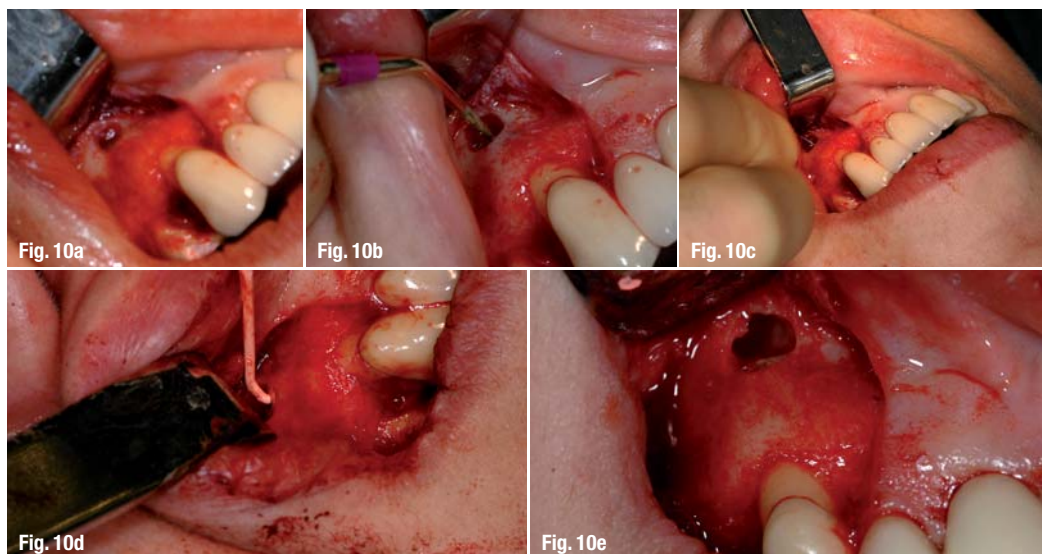
According to Aronson,⁵ once a decision has been made, most people are motivated to justify their actions and beliefs. We seek to justify our actions and tend to focus on the positive aspects of chosen treatment whilst ignoring any disadvantages. Likewise, we downgrade the positives of the treatment option we did not take. This phenomenon—dissonance—occurs for most people following a difficult decision especially, if the decision involved a great deal of time or money. Meanwhile, the theory of irrevocability suggests that once a final decision has been made, we tend to be more certain that it was the right decision than before, when more uncertainty was involved.

Traditional endodontic outcome studies have used stringent criteria³ when evaluating the treatment,

Figs. 9a–e RCT was completed and newly cast post and cores and temporary crowns were placed.



Figs. 10a–e Endodontic micro-surgery (a), resection (b & c), retro-preparation (d & e), obturation with gutta-percha and MTA.



_Case report

I use the following case presentation to promote the possibilities of endodontics in treatment planning. This 36-year-old female patient presented for consultation after she had already seen a restorative dentist for treatment planning. She was highly edu-

Occlusal examination

Class I molar and incisal relationship.

RCP and ICP appeared coincident.

Protrusion was guided by the incisors.

Right side and left side excursions were in group function. **Table II**

cated, demanding and costs were not a limiting factor. In my experience, only a small number of patients chose to get a second opinion. Most accept the first treatment plan proposed.

The patient was asymptomatic on presentation. A traumatic accident at the age of nine resulted in the eventual loss of UR2, UR1, UL1 and UL2. Over 25 years, the upper incisors had been replaced with three

bridges. The current bridge was nine years old. The patient suffered recurrent infections from her UL3/4 region and UR4 tooth. She had taken multiple courses of antibiotics over that period and now wished to determine and resolve the source of the problem. She had a hectic work schedule, but was prepared to take set days off in order to have as much treatment as possible done in a sitting. She was happy with the shape and colour of her existing bridgework and did not wish to appear noticeably different following treatment, as she was involved in work on television. A removable option was not possible at any stage, even as a temporary measure. Cost was not a primary concern, although she desired value for money.

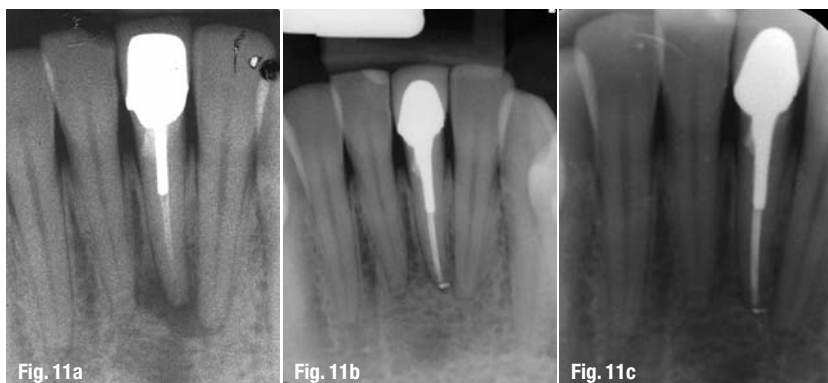
Diagnoses

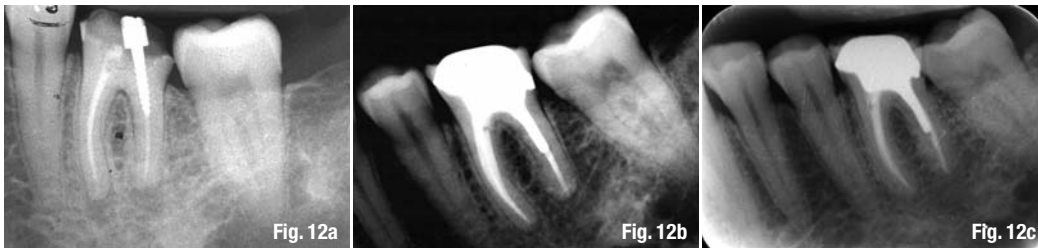
The patient visited the dentist on a regular basis and her medical history was non-contributory. The extra-oral examination revealed a medium to low smile line but no other relevant findings. Besides soft tissues, the intra-oral examination revealed nothing relevant to the treatment. The patient had good oral hygiene. We found gingival recession of 4 mm on the buccal aspect of UR6 and the UL6. Her basic periodontal examination (BPE) scores were 1 in all quadrants (Figs. 1a–e; Tables I & II).

Her radiographic examination showed that UR4, UR3, UL4 and UL3 were the abutments for the double-abutted bridge spanning from UL4 to UR4. Marginal discrepancies were not visible (Figs. 2 & 3). The teeth were restored with post restorations and had technically inadequate RCTs. UL3 and UL6 had no evidence of apical periodontitis. There were peri-apical radiolucencies associated with the UR4, UR3 and UL4.

LL1 was restored with a post/core and a crown. There was a technically inadequate RCT and a peri-

Figs. 11a–c LL1 complete healing: Pre-op (a), 1-year follow-up (b), 3-year follow-up (c).





Figs. 12a–c_LL6 complete healing: Pre-op (a), 1-year follow-up (b), 3-year follow-up (c).

apical radiolucency approximately 5 mm in diameter (Fig. 4). LL6 had been restored with a screw post (Dentatus) and had a technically inadequate RCT. There were peri-apical radiolucencies associated with the mesial and distal roots (Fig. 5).

Treatment plan

The patient's chief concerns were to be infection free, have an identical aesthetic appearance and for the plan to be cost effective. The original treatment plan was extraction of LL6, LL1, UR3, UR4, UL3 and UL4 and replacement with immediately loaded implants at a cost of around £30,000.

In order to determine other possible options, we had to dismantle the teeth and assess the restorability. In this process, communication is vital, as the patient needs to understand the uncertainties involved. It is extremely difficult to give an accurate estimate of treatment costs before initiating this course of action and dismantling teeth will often commit the patient to an expensive reconstruction no matter what the findings.

In order to understand the decisions general practitioners make regarding when to extract or restore a tooth, I completed a small survey to assess treatment decisions for each tooth in this case. Ideally, the decision to restore or extract a tooth should be based on:

1. the quality, quantity and position of remaining dentine;
2. the functional and aesthetic demands that will be placed on the tooth;
3. the quantity and quality of surrounding alveolar bone;
4. a cost-benefit analysis of each treatment option;
5. systemic factors;
6. potential to cause harm or adverse effects; and
7. patient preferences.

In this case, 40% of dentists wished to extract LL6 and replace it with an implant, while 80% wished to extract LL1 based on the information provided above. The reasons cited for extraction included:

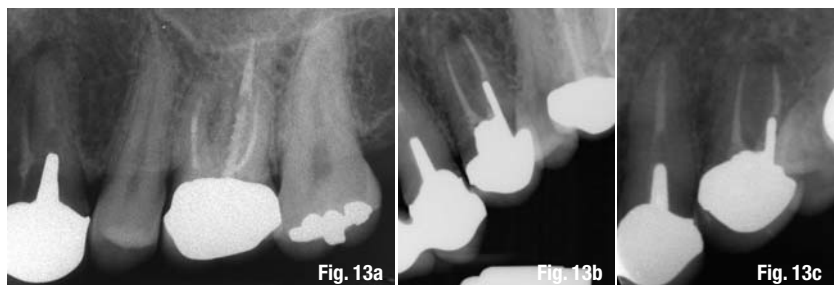
1. A good treatment had already been completed and failed.

2. There was a radiolucency present and a previous root-canal filling.
3. The size of the radiolucency was greater than 5 mm.
4. A post was present and would be difficult to remove.
5. The tooth could be cracked or unrestorable.
6. Restoration would not result in a "predictable" long-term result.

It is important that we address the misconceptions that RCT is unpredictable if there is a radiolucency associated with the tooth and that there is a critical level where the size of the radiolucency has a definite effect on the prognosis of treatment. It would be an interesting research project to reproduce this survey on a much larger scale to ascertain practitioners' treatment decisions.

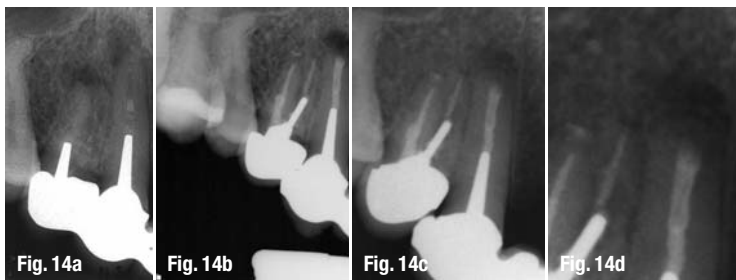
_LL6 and LL1

The teeth were dismantled and LL6 was found to be restorable. However, the LL1 proved a more difficult decision. There was an adequate amount of tooth structure lingually; however, there was a little ferrule present buccally (Figs. 6a & b). I placed great



Figs. 13a–c_UL4 healing: Pre-op (a), 1-year follow-up (b), 3-year follow-up (c).

Special tests	Table III						
Tooth no.	LL6	LL2	LL1	UR4	UR3	UL3	UL6
TTP	N	N	N	N	N	N	N
Soft-tissue tenderness	N	N	N	N	N	N	N
Sinus	N	N	N	N	N	N	N
Mobility	I	I	II	I	I	I	I
Periodontal probing	<3 mm	<3 mm	<3 mm	<3 mm	<3 mm	<3 mm	<3 mm
Sensitivity tests	N	P	N	N	N	N	N



Figs. 14a–d UR3/4 complete healing: Pre-op (a), 1-year follow-up (b), 3-year follow-up (c) and close-up of healing UR3/4 (d).

importance on the fact the restoration had worked in the past with this amount of tooth structure and removal of the post was achieved reasonably atraumatically. The tooth had failed biologically rather than mechanically.

Had this tooth failed mechanically, the treatment of choice would have been a dental implant followed by a resin-bonded bridge. Technically, implant placement would be very difficult in this case, as the interdental space was 5.5mm. There is a requirement of at least 1.5mm of bone between the implant and adjacent teeth, leaving only 3mm for the implant diameter. Not all implant systems have implants this small and technically the treatment would need to be executed ideally.

Surgical endodontics was also a treatment option for LL1. The advantages of a cheaper, quicker solution need to be balanced with long-term biological considerations. Technically, it may be difficult to complete a retro-preparation to the level of the post, as the roots on these teeth are generally lingually inclined. Also, were I to do this case today, I would get a CBCT scan to ensure that no lingual canal had been missed before considering a surgical option, which can be present in up to 40% of cases.

Following completion and temporisation of LL1 and LL6, it was time to move to the upper anteriors (Fig. 7). Aesthetics are critical and was the patient's primary concern. She was adamant that the teeth look the same as her existing bridgework. We elected to construct a laboratory temporary bridge (Fig. 8) prior to dismantling UR4 and UL4, in case some of the

porcelain fractured when sectioning through the base metal substructure.

The bridge was sectioned and the underlying posts and cores were removed with ultrasonic vibration. The teeth were judged to be restorable. Root-canal treatment was completed and newly cast post and cores and temporary crowns were placed (Figs. 9a–e).

The pathology associated with UR3 was treated by surgical endodontics (Figs. 10a–e). This conservative approach allowed us to maintain the existing bridge and aesthetics, which, along with dealing with the infection, was the most critical factor for the patient. As the canine was the patient's longest tooth that had a peri-apical lesion around the root for a period, removing the apical 3mm was unlikely to reduce the ability of the tooth to support the bridge significantly. It also allowed us to make a more favourable bridge design, as double-abutted bridges were no longer desirable. However, that design had worked in this case. Our approach also reduced the cost of treatment significantly. The initial quote for implant treatment was £15,000 to £30,000. The cost of this treatment plan was just over £5,000. The patient had one surgical procedure and recent studies suggest that there is a lower chance of complications following endodontic treatment than following implant treatment.⁶ The bridge must be monitored over time, as sectioning the UL4 and UR4 could result in disruption of the cement layer. The patient, however, had excellent oral hygiene and a low risk of caries.

At the 3-year follow-up, the patient was symptom free and delighted that her objectives had been achieved to date (Figs. 11–14). Of course, it's early days yet and in the fullness of time it may be proved that a more aggressive treatment plan would have been a more appropriate choice. The beauty of a conservative treatment plan is that all the other options are still available in the long term.

Conclusion

I like to use this case to demonstrate that endodontists should not be forgotten in the treatment planning process. Rather than quoting success rates of studies, it may be more effective to engage practitioners with examples for them to plan, demonstrate the endodontic possibilities with long-term follow-ups and let the results speak for themselves. Fear of failure is a powerful emotion. It is a significant challenge for us to spread the message to ensure that the true value of predictable endodontics can be appreciated and that perfectly saveable teeth are not removed.

Editorial note: A complete list of references is available from the author.

about the author



Dr Daniel Flynn qualified from the Dublin Dental School and Hospital, Trinity College (Ireland), in 2002. Dr Flynn recently joined the EndoCare team headed by Dr Michael Sultan. He has lectured in both the UK and Ireland and provides hands-on courses for general practitioners. He also teaches Endodontics at the Eastman Dental Institute for Oral Health Care Sciences. For more information please contact EndoCare at reception@endocare.co.uk or visit www.endocare.co.uk.

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