The Dental Practicality Index – to treat or not to treat

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Key points

- Discusses the relevance of correct treatment planning to improve outcomes, as well as minimise medico-legal issues with patients.
- Provides evidence to corroborate the use of the Index in routine, everyday dental care.
- Provides a revised *aide-mémoire* to assist in treatment planning.

Abstract

The Dental Practicality Index (DPI) has been designed to describe, on a clinical level, the 'practicality' of restoring a tooth versus referring to secondary care or extraction.

The systematic approach of DPI has been shown to improve decision-making and confidence in treatment planning when used by young dentists. In addition, there is good evidence demonstrating that it provides an accurate estimation of the outcome of treatment. The DPI enhances clinician-patient communication and ultimately the consent process.

Introduction

It is essential for dentists to work within their own competency and comfort zone; therefore, it is desirable that case complexity should be recognised before embarking on treatment and, when appropriate, the patient offered a referral for specialist care to enhance the outcome of treatment.[1,2] Furthermore, attempting treatment on teeth with a guarded prognosis may result in their premature loss and in some cases, litigation, unless the patient is fully informed of the risks and benefits of the treatment as well as the options.

The ability to treatment plan is an essential skill for dental practitioners and is a key component to be demonstrated by dentists in order to be considered a safe practitioner.[3] Though there are clear learning outcomes highlighted by the General Dental Council for dental school curricula, there remains limited guidance available on how treatment planning should be taught, which can lead to variations across schools.[4] A survey of recently qualified dentists concluded that they were poorly prepared in treatment planning and found it challenging when deciding when to treat or refer due to their lack of clinical experience.[5,6]

The decision to undertake endodontic treatment, whether it be vital pulp therapy, (re)treatment or periapical microsurgery, referral to secondary care or considering an extraction can be challenging as it requires the clinician to consider many inter-related factors.[1,6,7] The tooth's endodontic and periodontal status, as well as the structural integrity (restorability), must all be assessed. Crucially, these factors must also be contextualised in relation to the patient's medical and dental conditions, as well as the patient's expectations and the clinician's skill level (the context).[8,9] For example, attempting a complex endodontic (re)treatment might result in more frequent failures if carried out by an inexperienced clinician.

Using a treatment planning aid may provide patients with a more accurate estimate of the probability of survival of root canal (re) treatment and will help the patient in making an informed decision, as well as having a positive effect on clinician-patient communication. This may decrease in decisional conflict relating to the patient feeling uninformed.[10,11]

Diagnosis is the very foundation of the healthcare encounter in medicine. But in dentistry, while it is often treatment that is identified as going wrong which may be the trigger for legal challenge, it is quite often a failure of diagnosis and contextualised treatment planning which lies at the heart of that failed outcome. The diagnostic process includes three different steps: forming the diagnosis, communicating it to the patient and recording it.[12] Once an estimate of the probability of survival following the proposed treatment has been made, this needs to be relayed to the patient.

Patients need to be made aware in the communication stage of a diagnosis of the specific risks ie material risks that are relevant and perceived to be of importance to them.[13] These factors need to be teased out in dialogue since what is important to one person may be of little significance to another patient with exactly the same problem. Professional standards require dentists to provide full, clear and accurate information that patients can understand, before, during and after treatment so they can make an informed decision in partnership with the dentist and other healthcare providers.[14]

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Table 1 The DPI index facilitates a systematic assessment of the four domains: Endodontic treatment need, Periodontal treatment need, (structural) Integrity and Context (EPIC) which impact the prognosis of treatment and the longevity of a tooth. The scenarios in each row (weighting) are only examples and therefore are not an exhaustive list

Weighting	Endodontic treatment need	Periodontal treatment need	(Structural) integrity	Context
0: No treatment required	Healthy periapical status	Healthy periodontal status	Sound coronal status	Local: Isolated dental problems where adjacent teeth are healthy General: Replacing of a strategic tooth may be excessively complex History of intravenous bisphosphonates, head and neck radiotherapy
1: Simple treatment required	Accessible root canal system (eg radiographically easily identifiable root canal[s], easily retrievable root canal filling material)	Clinical attachment Loss with pocketing <4 mm and bone loss up to coronal third (eg part of a picture of poor periodontal maintenance where conventional professional mechanical plaque removal is required with or without the administration of local anaesthetic)	Straightforward direct or indirect restoration required	Local: Prosthodontic treatment planned of neighbouring teeth which may influence treatment plan for tooth being assessed Tooth to be used as a bridge abutment Terminal tooth General: Poor oral maintenance Radiotherapy of head/neck planned Immunocompromised patient
2: Complex treatment required (consider referral)	Challenging/complex root canal system (eg sclerosed root canal, acute curvatures, internal/external cervical resorption, incomplete fracture) Complex re-root canal treatment (eg fracture instrument removal, blocked canal[s], perforations) Difficulty in obtaining profound anaethesia	Clinical attachment loss with pocketing >4+ mm and bone loss to the mid-third of the root (eg professional mechanical plaque removal with the administration of local anaesthetic, or more complex surgery with or without a graft procedure)	Limited (<30%) sound, coronal tooth volume and/or inadequate ferrule. May require post- and/or crown lengthening	Local: Prosthodontic treatment planned of multiple teeth, including adjacent teeth General: High caries rate Parafunctional habits Dry mouth Stage III periodontitis: severe disease with potential for additional tooth loss[27]
6: Impractical to treat	Untreatable root canal system Impractical to re-treat (eg complete fracture, inability to achieve patency in a symptomatic tooth)	Untreatable or rapidly progressing periodontal condition (eg bone loss to the apical third with pocketing >4+ mm)	Insufficient coronal tooth volume to support a restoration and/or inadequate ferrule	Local: Retention of the tooth being assessed would constrain and/or compromise an otherwise simple and predicable treatment plan (for example, extensive dental or implant bridgework) General: (Potentially) life threatening medical conditions which should be managed in tertiary care. Stage IV advanced periodontitis with extensive tooth loss and potential for loss of dentition[27]

Evaluating material risk cannot be reduced to percentages.[13] The factors which ultimately determine a patient's decision-making are tailored to their own individual beliefs and values. These are influenced by a multitude of factors beyond the worst-case scenario for the proposed treatment option, which include but are not limited to: the nature of the risk and its impact on quality of life, the extent of the benefits of treatment, and the alternative options and their perceived risks.[13,15] Patient assessment needs to be tailored to each patient and their unique set of characteristics and expectations.

Several treatment planning indices have been proposed to aid clinical decision-making, such as the Dutch Endodontic Treatment Index and Endodontic Treatment Classification Form, Tooth Restorability Index and EndoApp.[2,16,17] However, the majority of these indices only look at one or two aspects of the overall management of the patient and their tooth ie assessing the structural integrity (restorability) of the tooth without considering the endodontic status and vice versa, and none of them have been validated to assess their impact on treatment outcome.

The American Association of Endodontists Endodontic Case Difficulty Assessment is more comprehensive in nature.[18] However, it has been found to be time-consuming to complete, resulting in less than 10% of American general dental practitioners using it.[19] In contrast to this, the simplified Dutch Endodontic Treatment Index takes 1–2 minutes to complete.[16] However, it only focuses on the complexity of endodontic treatment and patient factors (for example, medical history) and does not consider the periodontal status, overall restorability (ie structural integrity) of the tooth or other patient factors, for example, their expectations.

The Dental Practicality Index

When faced with a diagnostic challenge, the seasoned clinician intuitively carries out a process of integrative decision-making, evaluating relevant clinical and non-clinical information and using their knowledge, experience and clinical judgement to consider different possible approaches to treatment and devising a plan based on the available information. For the newly qualified dentist, this intuitive decision-making process may be challenging as they have not yet accumulated sufficient experience or exposure to a breadth of cases. Adaptive decision-making is a key skill derived from intuitive expertise.[20] This

is an iterative process that requires critical thinking and careful evaluation, reflection and consideration of all relevant information.[21]

Algorithmic thinking refers to the ability to break down complex problems and tasks into smaller, more manageable steps.[22] It involves analysing the problem, identifying the key components and devising a logical sequence of operations to solve it, helping individuals approach problems in a systematic and structured manner. By applying algorithmic thinking, less experienced clinicians can analyse patient data and information in a structured manner. This systematic analysis helps them make informed treatment decisions based on a logical progression of steps. This proactive approach allows them to provide personalised and effective care to their patients.

The Dental Practicality Index (DPI) encourages algorithmic thinking, providing a systematic framework for the assessment of the patient in four domains (endodontic, periodontal, structural integrity and context).[9] After assessing the patient's dental problem, the clinician weighs the endodontic treatment need, periodontal treatment need, the (structural) integrity of the tooth, and crucially puts these factors in context with the local and general patient-related factors, such as the state of, and/or absence of, nearby teeth, and the relevant social, dental and medical history details (Table 1). The 'context' domain encompasses modifying factors which may complicate or have an impact on the treatment plan, for example, radiotherapy of the head and neck region, high caries rate, active periodontal disease, intravenous bisphosphonate medication and/or the patient's (unrealistic) expectations.

With the DPI, the Endodontic treatment need, Periodontal treatment need, Structural integrity and Context (EPIC) are individually evaluated. Each domain is scored as '0' if no intervention is required, '1' if simple treatment is required, '2' if the treatment is more complex (ie requiring a treatment by an experienced clinician or referral for specialist care) and '6' if it would not be practical to treat ie leave alone or consider extraction. The DPI score is calculated by adding the individual score of each category to produce an overall score for the tooth and determine the practicalities of providing treatment, with a score <6 indicating treatment should be considered, where as a score >6 suggests treatment may not be advisable.[23]

The DPI was designed to be simple to use, as well as to encourage clinicians to assess the nature of the dental problem systematically and holistically, thus aiding the clinician to confidently decide when to treat, extract or suggest referral to specialist care for appropriate advice and/or management (Fig. 1 and Fig. 2).

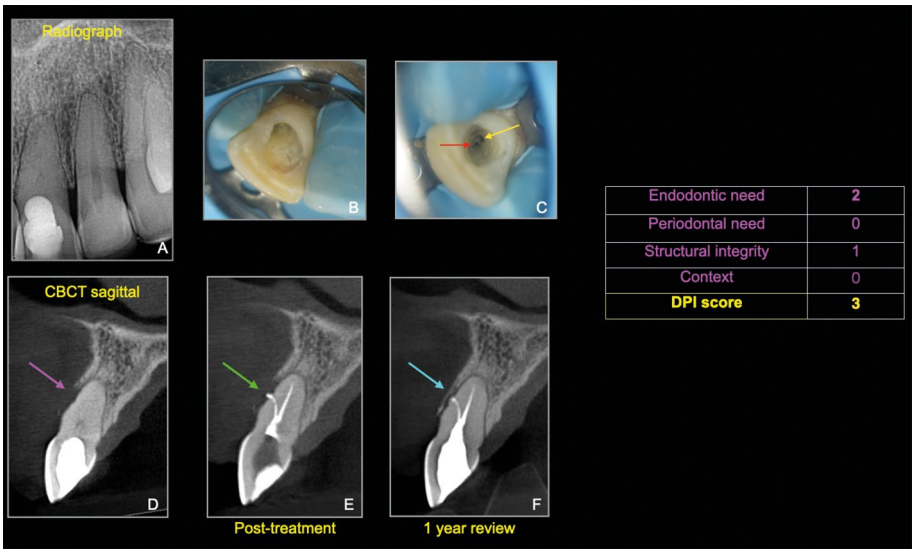

Fig. 1 Root canal treatment of a symptomatic 21 attempted by a dentist who aborted treatment as the canal could not be identified. The patient was advised that the tooth had a poor prognosis and extraction and replacement with an implant-retained crown should be considered. The patient sought the opinion of an endodontist who assessed and managed the tooth. a) Periapical radiograph reveals attempted root canal treatment and a sclerosed root canal(s). b, c) Clinical assessment reveals sufficient sound tooth structure and two canals (red and yellow arrows). d) CBCT sagittal slice reveals a second root canal exiting onto labial aspect (purple arrow) of the tooth. e) Post-treatment CBCT (sagittal) confirms root fillings are to length (green arrow). f) One-year follow-up scan confirms significant healing (compare purple and blue arrows)

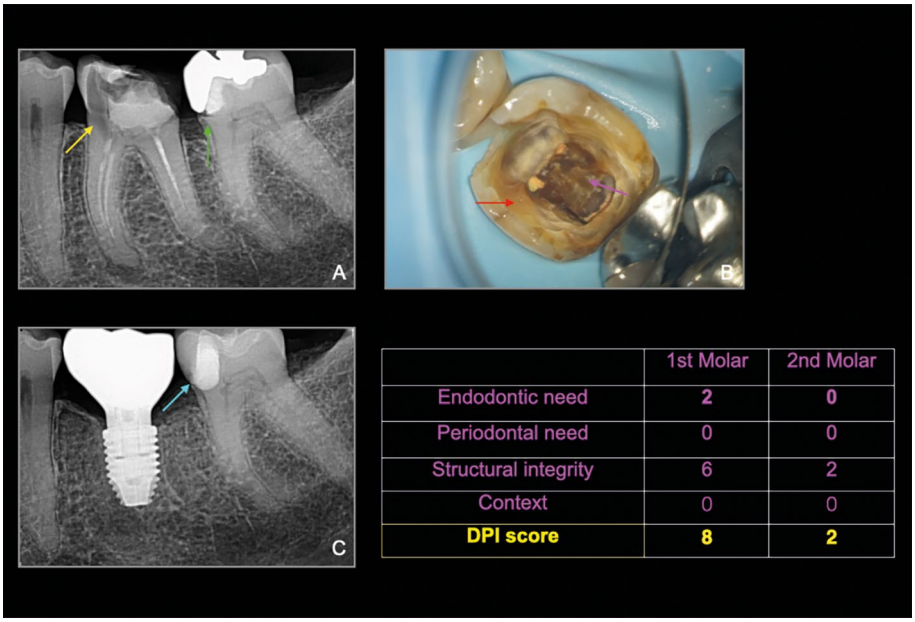

Fig. 2 a) Periapical radiograph reveals significant decay (yellow arrow) in the 36 and a suboptimal root canal filling. Root canal re-treatment was feasible. b) However, the degree of decay in the 36 renders the tooth untreatable (red and purple arrows). c) The tooth was extracted and replaced with an implant-retained crown. The 37 in panel A reveals secondary decay beneath the existing mesial margin (green arrow). This tooth was restored with a composite resin base (DME) and a ceramic (Emax) onlay (blue arrow)

Impact of the DPI on treatment planning and clinical outcomes

The effectiveness of the DPI has been assessed by Hamer *et al.*[23] who compared the treatment planning decisions of 108 undergraduate and postgraduate dental students before and after training with the DPI. A total of 15 clinical cases were treatment planned by a consensus panel of experienced dentists. The students were randomly allotted to the DPI (test) or control group. Both groups were initially asked to assign one out of four treatment plans (no treatment, simple treatment, complex treatment, or extraction), for the 15 cases to establish a baseline for the participants. The groups were then separated to train the test group on how to implement the DPI. In a subsequent session, the two groups were asked to undertake another round of treatment planning of the same cases in a randomised order. It was concluded that the DPI improved treatment planning of restorative dental problems compared to not using the DPI.

The reliability of the DPI to predict the outcome of root canal retreatment has been evaluated.[24] The pre-treatment clinical records and radiographic images of 137 teeth which underwent root canal retreatment were assessed by two experienced endodontists who scored each tooth using the DPI criteria (Table 1) as a guide to determine an overall DPI score. Where a tooth scored <3 on the DPI, it was deemed to have a 96% favourable outcome; however, when the DPI score was >3, the favourable outcome reduced to 74%. A favourable endodontic outcome was confirmed objectively by examiners assessing radiographic images (including cone beam computed tomography [CBCT]) for reduced, resolved, or unchanged healthy periapical status; an unfavourable outcome was indicated by a new, enlarged, or unchanged existing periapical radiolucency.

The current evidence indicates that the DPI is helpful in prognosticating accurate outcomes of endodontic treatment, with a score of <3 indicating a significantly greater chance of a favourable outcome.[23,24] A four-year follow-up of this group of patients demonstrated the effectiveness of the DPI at predicting the survival of root canal-retreated teeth. The survival rate of root canal-retreated molar teeth at four years was 96.1% when the DPI score was <6 compared to 81.2% for teeth with a DPI score >6.[24] To the authors' knowledge, the DPI is the only treatment planning index which not only has been assessed in clinical trials, but also found to be effective at predicting the success and survival of root canal retreatments.

Conclusion

The DPI provides the clinician with a reasoned, evidence-based framework to assess the inter-related aspects of treatment planning which should be evaluated during the dental treatment planning process. By supporting reflection and a holistic approach to patient-centred care, the DPI assists the clinician in the decision-making process on the practicality of managing the patient themselves versus referring to secondary care or suggesting extraction or no treatment.

Where a DPI of 6 is calculated, a patient can make the decision whether to accept extraction or keep the tooth under review without intervention if symptom-free.[25,26] The DPI should provide a degree of confidence that any scrutiny of a treatment planning decision will have been made on a rational, auditable basis.

Ethics declaration

The authors declare no conflicts of interest.

Author contributions

Shanon Patel: conception, writing and critical appraisal of the paper. Andrew Dawood, Len D'Cruz, Francesco Mannocci, Samantha Hamer and Nagris Sonde: writing and critical appraisal of the paper.

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