

**University of Dundee**

## **Top tips for identifying endodontic case complexity**

Sarstedt, Matthew Philip; Ghafoor, Saiba; Kilgariff, Julie K.

*Published in:*  
British Dental Journal

*DOI:*  
[10.1038/s41415-022-4993-0](https://doi.org/10.1038/s41415-022-4993-0)

*Publication date:*  
2022

*Document Version*  
Publisher's PDF, also known as Version of record

[Link to publication in Discovery Research Portal](#)

*Citation for published version (APA):*  
Sarstedt, M. P., Ghafoor, S., & Kilgariff, J. K. (2022). Top tips for identifying endodontic case complexity: part 2. *British Dental Journal*, 233(5), 368-370. <https://doi.org/10.1038/s41415-022-4993-0>

### **General rights**

Copyright and moral rights for the publications made accessible in Discovery Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



# Top tips for identifying endodontic case complexity: part 2

By Matthew Philip Sarstedt,<sup>1</sup> Saiba Ghafoor<sup>2</sup> and Julie K. Kilgariff<sup>3</sup>

## Abstract

There are no universally accepted guidelines for general dental practitioners regarding when endodontic referral to a specialist service may be indicated. UK NHS specialist endodontic services do not have national standardised criteria for which patient cases will be accepted for specialist care, and it is therefore important that more complex cases can be identified by general practitioners and referred accordingly, decreasing the likelihood of avoidable iatrogenic errors occurring, which reduce treatment outcome.

There have been a number of indices developed to help ascertain the complexity of endodontic cases. Part 2 discusses tips for identifying endodontic case complexity and examines indices available to guide clinicians as to when referral to an endodontic specialist service may be warranted.

## Introduction

Part 1 considered various patient-related, clinical and radiographic factors which impact on endodontic case difficulty. Part 2 discusses tools and guides available to further help clinicians assess case complexity.

## Tools available to guide assessing endodontic case complexity

There are various published tools which help with endodontic clinical decision making and treatment planning, providing information on likely risks and their impact on treatment outcome.<sup>1</sup> Using these can help focus patient discussions, enhancing understanding of complexities, risks and benefits, enabling informed consent and the decision as to whether to refer.<sup>2</sup> Additionally, the use of tools and assessments, when recorded in patient records, may provide benefit medico-legally.

Endodontic diagnosis and treatment planning is based upon clinical and radiographic findings. Studies suggest general dental practitioners tend to underestimate the

complexity of endodontic cases.<sup>3</sup> Screening-type tools focus assessment and particularly consider relevant pre-operative radiographs factors. Their use is helpful because dentists' radiographic interpretation of relevant factors is improved by repetition and training.<sup>4,5</sup>

Regular use of structured assessment tools can enhance complexity identification, recommending the use of objective criteria for case assessment and treatment planning.<sup>6</sup>

There are a number of published indices to aid endodontic assessment:

- Case Difficulty Assessment Form (AAECAF)<sup>7</sup>
- Restorative Index of Treatment Need (RIOTN)<sup>8</sup>
- Dutch Endodontic Treatment Index (DETI) leading to the Endodontic Treatment Classification (ETC)<sup>9</sup>

- EndoApp<sup>10</sup>
- The Dental Practicality Index.<sup>11</sup>

The diagnostic criteria for these tools are compared and summarised in Table 1.

## Case Difficulty Assessment Form, *American Association of Endodontics (2005)*

The first version (1997) of The American Association of Endodontists guidelines for 'Evaluating Endodontic Treatment Risk Factors'<sup>12</sup> was revised and re-released as the 'Case Difficulty Assessment Form' (AAECAF) in 2005.<sup>7</sup>

Originally devised in an educational setting to inform case suitability for students or trainees, the tool considers patient, diagnosis and treatment factors in deciding case difficulty. ▶▶

Table 1 Summary comparison of endodontic complexity tools available for use

	AAECAF	RIOTN	DETI	EndoApp	DPI
Difficult diagnosis	✓		✓		
Medical history	✓	✓	✓	✓	✓
Trauma	✓		✓	✓	✓
Mouth opening/access	✓	✓		✓	
Co-operation/special care needs	✓		✓	✓	✓
Structural integrity					✓
Periodontal Condition/endodontic-periodontal lesion	✓	✓	✓	✓	✓
Canal curvature/root morphology	✓	✓	✓	✓	✓
Resorption	✓	✓	✓	✓	✓
Gag reflex	✓	✓		✓	
Retreatment	✓	✓	✓	✓	✓
Iatrogenic damage/perforation	✓	✓	✓	✓	✓
Root development/open apex	✓	✓	✓	✓	✓
Obstruction		✓	✓	✓	✓
Difficulty isolating/pre-treatment required for isolation	✓		✓	✓	
Facial/neuropathic pain	✓	✓			

<sup>1</sup>Clinical Teacher, University of Sheffield, School of Clinical Dentistry, Sheffield, S10 2AT; <sup>2</sup>Dental Core Trainee 3, Dundee Dental Hospital & School, Park Place, Dundee, DD1 4HN; <sup>3</sup>Consultant in Endodontics, Dundee Dental Hospital & School, Park Place, Dundee, DD1 4HN

- ◀ Cases are scored and categorised as:
- Minimal difficulty: Treatment is appropriate for a general practitioner
  - Moderate difficulty: May warrant referral, depending on skill and experience of clinician
  - High difficulty: Meriting consideration of a referral to a dentist with advanced skills in endodontics or specialist.

Although there is no evidence regarding its utilisation in primary care settings across the UK there is some uptake amongst GDPs in the USA. Research into the validity of this system is needed.<sup>13</sup>

#### **Restorative Index of Treatment Need, Royal College of Surgeons of England (2001)**

In the UK, a Restorative Index of Treatment Need (RIOTN) was developed by the Royal College of Surgeons of England<sup>8</sup> using three complexity codes:

1. Treatment able to be performed by any dental graduate
2. Treatment able to be performed by any experienced dentist
3. Treatment able to be performed by any dentist with skills developed following specialist training.

It can be used for assessing the complexity of periodontal, endodontic and fixed and removable prosthodontic cases. Since the RIOTN was developed, there have been huge advances, in particular within microsurgical endodontics, and therefore, for some aspects of endodontics, this recommended scoring no longer reflects up-to-date evidence. It is also reportedly too simplistic, incomplete and with poor reproducibility for endodontic case difficulty assessment.<sup>14</sup>

#### **Dutch Endodontic Treatment Index and Endodontic Treatment Classification, Ree, Timmerman & Wesslink (2003)**

Ree and colleagues (2003)<sup>9</sup> surveyed GDPs in the Netherlands to produce a shortened screening tool for assessing risk and difficulty, named the Dutch Endodontic Treatment Index (DETI). The DETI is quicker and easier to use, potentially overcoming the proposed time-consuming shortcomings of AAECAF.<sup>13</sup>

DETI indicates the difficulty of a case and if found to be potentially difficult, a further index is used – the Endodontic Treatment Classification (ETC) to provide

further information. ETC was well received by practitioners in the Netherlands with the majority finding it helpful in determining if referral is indicated. Endodontic assessments using DETI carried out by both GDPs and specialists also, reassuringly, show high correlations,<sup>13</sup> which is encouraging considering lack of agreement between GDPs and endodontists about which teeth should be referred in other studies (with the exception of periradicular surgery cases).<sup>3</sup>

#### **EndoApp, British Endodontic Society (2018)**

The EndoApp is a structured web-based tool available for use online or download for endodontic evaluation and triage in primary and secondary care.<sup>10</sup> It aims to overcome limitations of other tools, for example, the absence of quantification system with RIOTN and absence of some variables in AAECAF.<sup>10</sup> The tool calculates a case difficulty score from a series of questions answered by the user and recommends which type of dental practitioner is best suited to managing the case. Small scale studies suggest the app is relatively quick to use and preferred by users to AAECAF.<sup>10</sup>

#### **Dental Practicality Index, Dawood & Patel (2017)**

A further recently published tool which takes into account the tooth's restorative state in relation to the patient's dentition, needs, expectation, medical and dental history is the Dental Practicality Index.<sup>11</sup> This has three restorative categories and a 'context' category (ie general oral and patient factors) which are scored out of six where zero means that no treatment is required and six indicates that the tooth is not practical to restore and extraction should be considered. The scores between these extremes guide as to what level of endodontic skill/training is needed to treat the case. Scores can also be totalled; a score of 1–2 implying the case can be simply and predictably treated. An increasing score indicates more complex care needed, with a score  $\geq 6$  indicating the tooth is impractical to treat.

Since the DPI's inception a number of studies have attempted validation. The first<sup>15</sup> retrospectively assessed the DPI from notes, study models and radiographs for 137 teeth and correlated this with the root canal treatment outcome. A moderate level of agreement between the two independent assessing endodontists was

found, demonstrating the tool's subjectivity, however, several advantages of using the DPI were recognised: the DPI encourages the consideration of patient cases holistically and for root canal retreatments, using the DPI has good outcome prediction.<sup>16</sup> Al-Nuaimi *et al.* (2020)<sup>16</sup> used a similar retrospective method and two assessing endodontists. One hundred and forty-four teeth had DPI scores calculated and followed up to identify what happened to the tooth four years later. Teeth with a DPI score of  $>6$  were found to have significantly less chance of survival than teeth with lower scores. This study concluded the DPI can predict which teeth, if endodontically retreated, are likely to be extracted. A recent *BDJ Student* article<sup>17</sup> highlighted confusion regarding whether a tooth can be restored versus whether it is practical to restore it. This paper reported ease of use with the DPI, increasing clinician confidence in assessing tooth restorability.

#### **Discussion**

Endodontic treatment outcomes are affected by the complexity of the case, presence/creation of iatrogenic errors and skill level of the clinician carrying out treatment. Assessing case complexity prior to embarking on treatment will help guide appropriate referral, particularly when directed to NHS funded specialist services, and impact endodontic treatment outcome for patients.

Structured freely available tools are useful aids for assessing endodontic case complexity and can be retained as part of the dental records and guide as to when a referral might be considered. However, clinical reasoning and decision making is complex and multifactorial and the use of indices does not eliminate subjectivity, specifically with regard to the accuracy of radiographic understanding. Repeated use of case complexity guides increases the speed at which these can be completed<sup>9</sup> and regular use may improve endodontic care quality through improved identification of possible problems/challenges before starting treatment; after treatment is started, iatrogenic errors are not always correctable. Using such guides may help structure clinical decisions, treatment planning and discussions, and aid evidence of this process for inclusion in dental records. Of the tools available, there is no consensus on which assessment tool is superior.

The European Society for Endodontology<sup>18</sup> provides undergraduate endodontic ▶▶

► guidelines stating that students should be competent at identifying treatment complexity and suggests the DETI or AAECFAF may be helpful. Speculatively, the use of such structured assessment tools might favourably impact on the suboptimal quality of endodontic treatment identified as being carried out in the UK,<sup>19</sup> which in turn may impact endodontic related medico-legal litigation. Consistency, understanding and agreement between GDPs and those receiving referrals is in the best interests of patients because identifying cases which may be better treated by a specialist clinician and referring appropriately improves treatment outcomes.<sup>1</sup>

### Conclusion

There are several factors to consider when assessing the complexity of an endodontic case and clinicians must also take into account their own experience, skill and the patient's wishes. There are a number of assessment tools freely available to help guide assessing endodontic case complexity and whilst there is no current consensus on which assessment tool is superior, each provides some benefit

in structuring and steering assessment, which can aid discussions, informed consent processes and when to refer. ■

### References

- Messer H H. Clinical judgement and decision making in endodontics. *Aust Endod J* 1999; **25**: 124–132
- Webber J. Risk management in clinical practice. Part 4: Endodontics. *Br Dent J* 2010; **209**: 161–170.
- Caplan D J, Reams G, Weintraub J A. Recommendations for endodontic referral among practitioners in a dental HMO. *J Endod* 1999; **25**: 369–375.
- Lanning S K, Pelok S D, Williams B C *et al*. Variation in periodontal diagnosis and treatment planning among clinical instructors. *J Dent Educ* 2005; **69**: 325–237.
- Suthiprapoporn P, Taguchi A, Nakamoto T *et al*. Diagnostic performance of general dental practitioners after lecture in identifying post-menopausal women with low mineral density by panoramic radiographs. *Dentomaxillofac Radiol* 2006; **35**: 249–252.
- Bader J D, Shugars D A. Agreement among dentists' recommendations for restorative treatment. *J Dent Res* 1993; **72**: 891–896.
- American Association of Endodontists. AAE Endodontic Case Difficulty Assessment Form and Guidelines. 2005. Available at: <https://endomishra.co.uk/wp-content/uploads/2021/04/Difficulty-assessment-form.pdf> (accessed August 2022).
- Falcon H C, Richardson P, Shaw M J, Bulman J S, Smith B G. Developing an index of restorative dental treatment need. *Br Dent J* 2001; **190**: 479–486.
- Ree M H, Timmerman M F, Wesselink P R. Evaluation of the usefulness of two endodontic case assessment forms by general dentists. *Int Endod J* 2003; **36**: 545–555.
- Shah P K, Chong B S. A web-based endodontic case difficulty assessment tool. *Clin Oral Investig* 2018; **22**: 2381–2388.
- Dawood A, Patel S. The Dental Practicality Index – assessing the restorability of teeth. *Br Dent J* 2017; **222**: 755–758.
- American Association of Endodontists. Evaluating Endodontic Treatment Risk Factors 1997. Available at: <https://f3f142zs0k2w1kg84k5p9i1o-wpengine.netdna-ssl.com/specialty/wp-content/uploads/sites/2/2017/05/ss97ecfe.pdf> (accessed 6 June 2022).
- Curry M C. *The utilization of case difficulty assessment when determining endodontic referral*. Chapel Hill: University of North Carolina, 2010. Masters Thesis.
- Muthukrishnan A, Owens J, Bryant S, Drummer P M. Evaluation of a system for grading the complexity of root canal treatment. *Br Dent J* 2007; **202**: E26.
- Tifooni A, Al-Nuaimi N, Dawood A, Mannocci F, Patel S. Validation of the effectiveness of the Dental Practicality Index in predicting the outcome of root canal retreatments. *Int Endod J* 2019; **52**: 1403–1409.
- Al-Nuaimi N, Ciapryna S, Chia M, Patel S, Mannocci F. A prospective study on the effect of coronal tooth structure loss on the 4-year clinical survival of root canal retreated teeth and retrospective validation of the Dental Practicality Index. *Int Endod J* 2020; **53**: 1040–1049.
- Cottham-Cartledge, C. What is the dental practicality index? *BDJ Student* 2022; doi: 10.1038/s41406-021-0266-7.
- De Moor R, Hülsmann M, Kirkevang L, Tanalp J, Whitworth J. Undergraduate curriculum guidelines for endodontology. *Int Endod J* 2013; **46**: 1105–1114.
- Dummer P M H. The quality of root canal treatment provided by general dental practitioners working within the General Dental Services of England and Wales: part 2. *J Dent Pract Board Eng Wales* 1998; **19**: 8–10.

## BDJ Jobs

### Attention: Dental care professionals

Make your job search easier - refine job offers by postcode, salary, job title or company type, and set up personalised alerts so you don't miss out on any DCP roles.

Upload your CV and let recruiters match you to their roles

Visit [bdjjobs.com](https://bdjjobs.com)

SPRINGER NATURE



**BDA**  
British Dental Association