

Considerations for restorative dentistry secondary care referrals – part 1: defining strategic importance

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Key points

An assessment of strategic importance should be carried out before treatment planning or onward referral to a secondary/tertiary care unit.

Outlines the key considerations for determining strategic importance at a systemic and local level.

Takes into account strategic importance before treatment may be essential in allowing the allocation of resources in both primary and secondary care.

Abstract

Strategic importance is an essential concept for dental service providers. It allows clinicians to differentiate treatment needs on both a patient level and a health care commissioning level, not simply based upon complexity alone. On a patient level, it influences both the clinician's and patient's decision as to whether a tooth/teeth should be restored, as well as determining the possible need for specialist input. On a commissioning level, it facilitates the prioritisation of limited resources.

Strategic importance can be considered at a patient level, taking into factors such as age, tolerance to treatment and the patient's choice. It can also be considered at a mouth level, accounting for factors such as its impact on function and aesthetics function. All these factors together can influence the decision as to whether complex treatment is warranted on a given tooth, especially in a healthcare model where the allocation of limited resources is necessary.

Introduction

COVID-19 has produced numerous changes in the daily practice of dentistry. Fallow time requirements, aerosol generating procedure restrictions and personal protective equipment limitations, have all reduced clinical time and chair capacity in the immediate and foreseeable future. As a result, capacity within both primary and secondary care has reduced drastically and the demand on the services has greatly surpassed the speed at which

care can be provided. Strategies to optimise the provision of dental care in the current climate are needed, part of which encompasses appropriate referral between clinicians and tiers of care.

This series of papers aims to discuss the importance of a thorough clinical assessment to assess the strategic importance, restorability and complexity of a case. This will facilitate clinicians to navigate the key questions of whether any treatment should be undertaken and whether it will be predictable. This also supports those clinicians who are considering referring a patient for specialist opinion/treatment as to whether it is appropriate and what the likely outcome may be. There are many challenges general dental practitioners face when making the decision to refer, often from patients requesting advanced treatment, therefore a pragmatic approach is often required from both referring practitioners and the referral centres. When considering how to manage a tooth and whether a referral may be appropriate, we propose a three-stage test:

- Is the tooth strategically important?
- Is the tooth restorable?
- Is the treatment required sufficiently complex?

The first paper in this series will describe the first stage in this process: assessment of strategic importance.

Strategic importance

Strategic importance is an essential concept for dental service providers. It allows clinicians to differentiate treatment needs on both a patient level and a healthcare commissioning level, not simply based upon complexity alone. On a patient level, it influences both the clinician's and patient's decision as to whether a tooth/teeth should be restored, as well as determining the possible need for specialist input. On a commissioning level, it facilitates the prioritisation of limited resources. The concept derives from evidence that third and second (and even first) molars may offer no

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functional or aesthetic benefit at a population level and thus do not justify advanced care. Indeed, the World Health Organisation defines the minimum number of teeth required for function to be 20 occluding units, without the need for a prosthesis.¹ The logical outcome of this is that an argument of strategic importance must be made to justify complex intervention of teeth that may otherwise be deemed unnecessary for oral health and function.

There have been descriptions in the literature as to what might constitute a strategically important tooth. The concept is subjective and there will invariably be interpretations of dental health and the relative importance of teeth. Nonetheless, this paper aims to discuss what may help define strategic importance in the context of assessing a single tooth, considering both the tooth-specific and patient-specific factors that may impact upon it.

Key considerations in determining strategic importance

Patient-level considerations

To determine patient-related factors, it requires investigation on the part of the dental care professional to determine patients' lifestyle choices and physiological boundaries. Their important patient-related factors include oral hygiene level, commitment to treatment, smoking status, systemic health and social factors, for example, profession.

Primary disease stability

Complex treatment should be avoided in patients with poor primary disease control. Moreover, a tooth or teeth become less strategic if it is clear that the patient cannot maintain them, such as through poor oral hygiene or their attitude to treatment. If there is any doubt over the importance of maintaining a tooth/teeth when patient compliance is poor, it is not unreasonable to discuss and provisionalise treatment until such a time that there is ongoing evidence of ownership of oral health.

Age

Fixed prostheses have limited lifespans, with ten-year survival rates for cantilever bridges being estimated at 80.3%² and 93.1%³ for an implant-supported crown. As such, treatment plans should, where feasible and

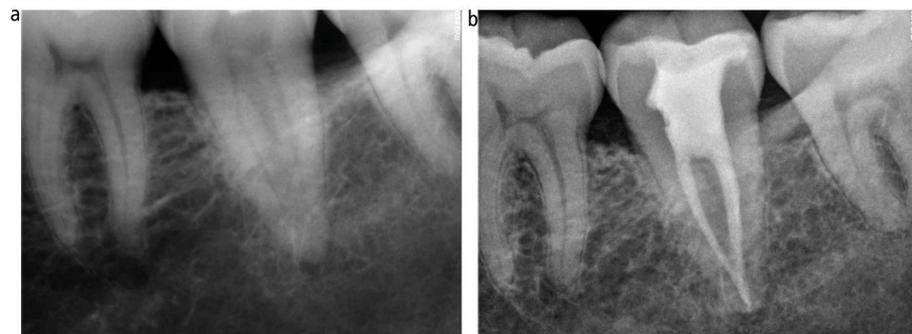


Fig. 1 a, b) This patient has both 36 and 38 intact in an otherwise healthy dentition: preservation of the 37 was not necessary for function but the patient wished to keep it. As such, the treatment was provided on a private basis

sensible, aim to delay the transition to more radical options. Though age *per se* should not be regarded as a marker of when or when not to restore a tooth, there should be a greater impetus in younger patients to maintain teeth.

Tolerance of prosthesis

A tooth may become more strategically important if its presence supports the transitioning of a patient onto a removable prosthesis. It can be more so if the patient has a profound gag reflex and when extraction of a tooth would result in the challenges of denture construction for this patient group.

Patient choice

What is of material importance to the patient should be considered when planning treatment.⁴ Ultimately, once presented with the options, the patient must choose their preferred strategy. If it is their preference to save a tooth that does not meet predictability/strategic importance criteria, they should be informed this would lie outside of NHS care and may be undertaken as a private service only (Fig. 1).

Mouth-level considerations

Functional considerations: the shortened dental arch concept

The shortened dental arch (SDA) concept aims to define the number of functional contacts required for mastication. The original work by Kaiser and Witter suggests that ten occluding contact points are sufficient for function.⁵ Although some may suggest that this is an ageing concept, with several more modern studies questioning its relevance several decades on, it is still

widely accepted. The SDA concept is also one based on health economics, something that must be considered in any system with finite monetary resources, such as the NHS. It has been in place within NHS practice for several decades, with limited reasoning for alteration.

The more modern iteration of the SDA concept may describe a form of rehabilitation in the absence of molar units, in particular when deciding when to provide a fixed or removable prosthesis.⁶ Evidence suggests that patients are able to masticate varying types of food with a SDA, suggesting it is the number of occlusal contacts rather than the number of teeth that impacts upon masticatory efficiency.^{7,8}

This is a key factor in determining the strategic importance of a tooth, as it provides clinicians with a goal of aiming to restore patients to a minimum of ten occluding pairs. Conventionally, this usually means restoring to the second premolars; however, this is not an absolute rule. The specific patients' occlusion must be considered. In a patient with an anterior open bite (as seen in Figure 2), their occlusion may be purely reliant on posterior teeth, thus in this case, a second molar may be deemed strategically important. Furthermore, in a dentition with preserved molars, loss of the premolars may not impact upon aesthetics or function. Indeed, not all patients will demand a replacement for aesthetic purposes, should their masticatory needs be met.⁹

Aesthetic considerations

Healthcare systems have a key role in maintaining teeth in the aesthetic zone for the functional and psychological benefit

of the patient. There is evidence to suggest better employability and quality of life for patients who retain a higher proportion of their dentition.^{10,11} As such, greater emphasis should be placed on root canal treatment and restoration of anterior teeth, over extraction. The width of a smile line is variable from patient to patient, as will be the subjective aesthetic importance of teeth. A patient's smile line should be assessed and if it is deemed the loss of a tooth would compromise the patient's smile, greater effort may be required to save that tooth.

Medical considerations (contraindications to extraction)

- History of head and neck radiotherapy: irradiated bone, either via traditional radiotherapy, intensity modulated radiotherapy (IMRT) or proton beam therapy, becomes hypocellular, hypovascular and hypoxic and consequently, vulnerable to poor healing following trauma.^{12,13} Prevention of osteoradionecrosis is paramount and all teeth should be regarded

as strategically important. Practitioners should inquire about the site of the radiation exposure, the total dose (and if possible, fractionation) and the nature of the radiotherapy (whether conventional, dose sparing IMRT or proton therapy).¹⁴ As a rule of thumb, if the radiation was not

delivered to the head or neck, the risk of osteoradionecrosis is negligible

- Medication-related osteonecrosis of the jaw (MRONJ) risk medications: patients who have had doses of antiresorptive and anti-angiogenic medications are at risk of MRONJ. The risk increases with longer



Fig. 2 This patient has an anterior open bite: the strategic importance of their molars is more critical

Table 1 Patient- and mouth-level considerations for the assessment of strategic importance

Consideration	Assessment
Aesthetic considerations	Anterior teeth have undeniable importance. There is some evidence to suggest lower 33/43 and upper 14/24 may be deemed more strategically important, as seen in Figure 3
Functional considerations	If a patient has <10 occlusal contact points there may be a greater need to preserve teeth for functional benefit (Fig. 4)
Contraindications to extraction	History of radiotherapy and/or bisphosphonate use indicate restoration over extraction. These are not absolute contraindications however and more information should be sought on: <ul style="list-style-type: none"> • The routine of bisphosphonate administration (IV > risk than oral) • The duration of bisphosphonate administration (use for >3 years increases risk level) • Any concomitant risk factors (adjunct steroid use) (Fig. 5) • The site of radiation exposure (Fig. 6) • The dose of radiation exposure (in total and fractionation) (Fig. 7) • Any dose sparing factors such as the use of IMRT or proton beam therapy
Patient-related factors (eg motivation, gag reflex)	<ul style="list-style-type: none"> • Poor motivation and poor self-care do not support the case for more complex care (Fig. 8) • Gag reflexes may prevent successful prosthetic replacement therefore supports restoration conversely • Prominent gag reflexes may also prevent restorative care • If patients have not tolerated conventional prosthodontics, this will add increasing burden to restoration of remaining teeth

Table 2 Tooth-specific considerations for the assessment of strategic importance

Consideration	Assessment
Existing denture/bridge abutment	Indicates restoration over extraction, where the loss of bridge would be less than ten occluding pairs (Fig. 9)
Potential bridge/denture abutment	Indicates restoration over extraction (Fig. 9)
Suitability for multidisciplinary care (orthodontics, implantology)	If complex multidisciplinary care is not possible there may be a greater need to preserve teeth, as a restorative treatment only case (Fig. 10)
Transitionally important tooth	If a patient is transitioning to complete dentures and there is doubt over their ability to tolerate a prosthesis key tooth may be deemed strategically important (Fig. 11)



Fig. 3 a) This patient's full smile does not reveal lower premolars, diminishing their strategic importance on an aesthetic level. b) This patient has a very low lip line when smiling, increasing the aesthetic importance of their lower teeth

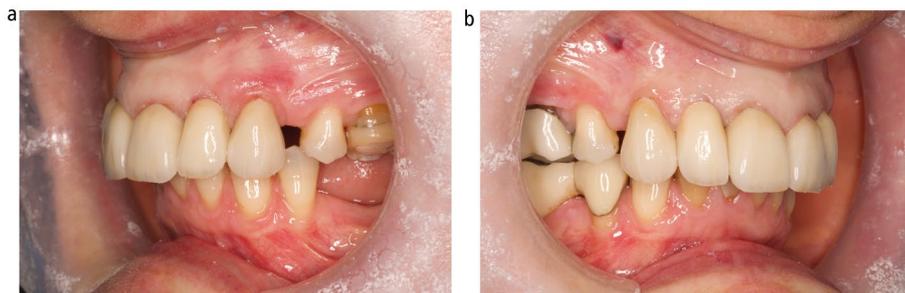


Fig. 4 a, b) This patient is missing molars on the left with no functional dentition increasing the importance of the heavily restored molars on the right

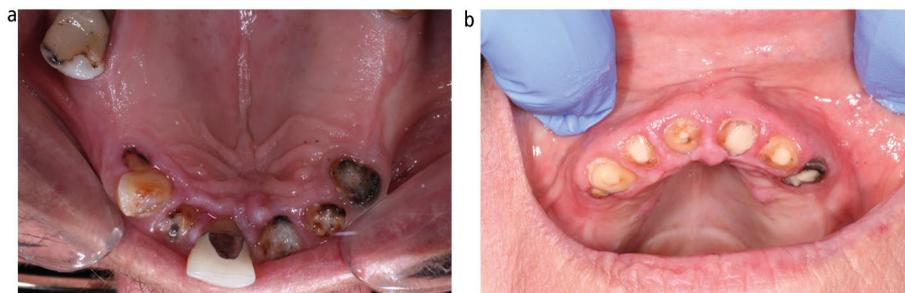


Fig. 5 a, b) This patient was on IV bisphosphonates for five years with adjunct steroids. As such, there was an ambition to avoid extractions with endodontic treatment of the roots and provision of overdentures

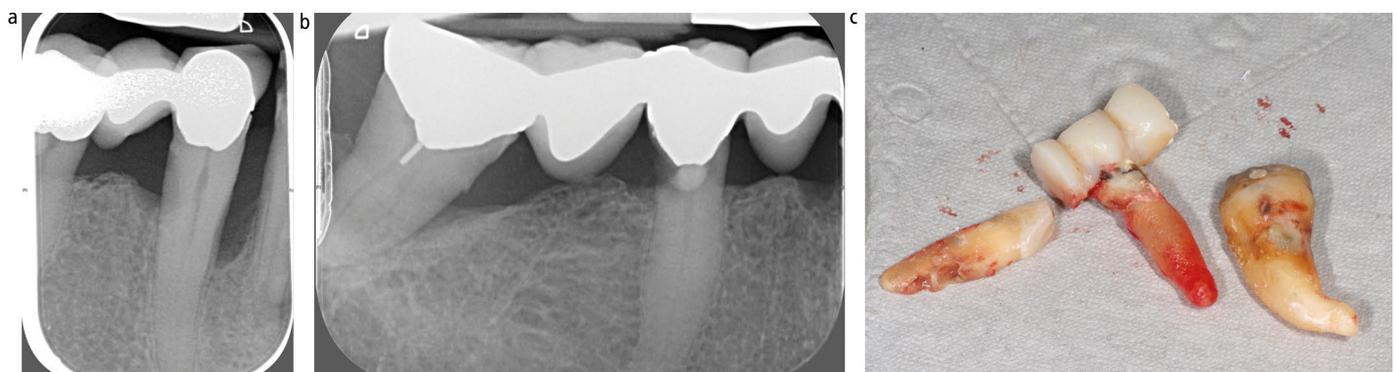


Fig. 6 a, b, c) This patient had a history of radiotherapy for breast cancer and was referred for replacement of the extensive, failing bridge work. As the radiotherapy was distant from the mandible this presented no risk of osteoradionecrosis and a more pragmatic approach adopted

term use of the medication, as well as with use of intravenous (IV) forms of these medications, with one study suggesting a 34.8% risk for IV bisphosphonate patients as opposed to 2.5% for oral bisphosphonate patients.¹⁵ Current Scottish Dental Clinical Effectiveness Programme guidelines define the risk levels and necessary precautions for extraction of teeth in these patients.¹⁶ Bisphosphonates accumulate within the skeletal matrix, therefore the risk of MRONJ is lifelong, even following the discontinuation of the medication.¹⁷ Prevention of MRONJ is paramount and all teeth should be regarded as strategically important

- Bleeding disorders: patients with high risk of bleeding following extractions, such as alcohol-induced liver cirrhosis, anticoagulant therapy, haemophilia, von Willebrand disease and thrombocytopenia require precautions before the commencement of dental extractions. This rarely results in cases where extractions are absolutely contraindicated but liaison with a patient's haematologist is essential and a haematological cover plan can be devised. If there are delays to this process, the dentist must clearly aim to preserve teeth irrespective of the prognosis until a suitably safe extraction plan can be delivered
- Genetic conditions (for example, amelogenesis imperfecta, dentinogenesis imperfecta, Down syndrome, ectodermal dysplasia, cleft lip and palate): certain conditions can affect the quality of both dentine and enamel, making treatment planning and thus determining strategic importance difficult. Some of these conditions can also result in an increased prevalence of hypodontia, with those teeth remaining having increased strategic value. Referral for initial treatment planning with a specialist may be indicated.

All the considerations mentioned above play a significant role in determining the importance of striving to retain teeth that may have a compromised prognosis. Tables 1 and 2 summarise some of these key considerations for determining strategic importance, with Figures 3, 4, 5, 6, 7, 8, 9, 10 and 11 providing examples of how strategic importance can be considered. Figure 12 considers how factors can be used to balance the arguments for and against extraction.



Fig. 7 This patient received 70 Greys (Gy) over 35 fractions as adjunct management of an squamous cell carcinoma of the anterior mandible. As such, though the remaining teeth were compromised, all efforts have been made to retain these with fluoride therapy



Fig. 8 This patient clearly has a need for extensive rehabilitation and many of these teeth could be viewed as objectively strategically important but they have no regular dentist, avoid brushing and consume a high-sugar diet. As such, the balance tips towards extraction or at least prolonging the disease stabilisation phase

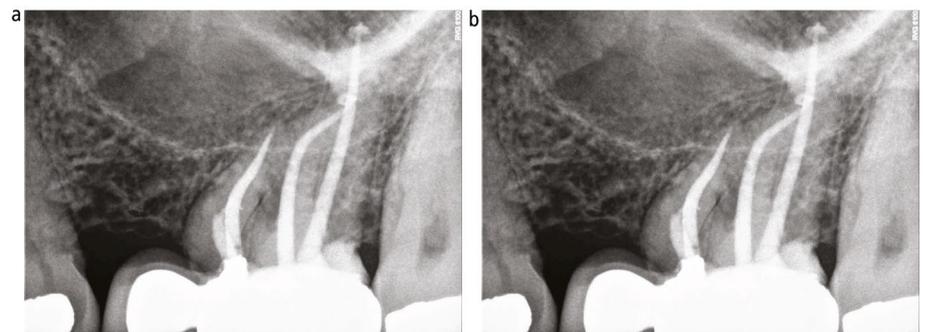


Fig. 9 a, b) The loss of the 26 would result in a two-tooth space. As such, the strategic value of the 26 was increased and retreatment was undertaken, despite the challenging nature of the case

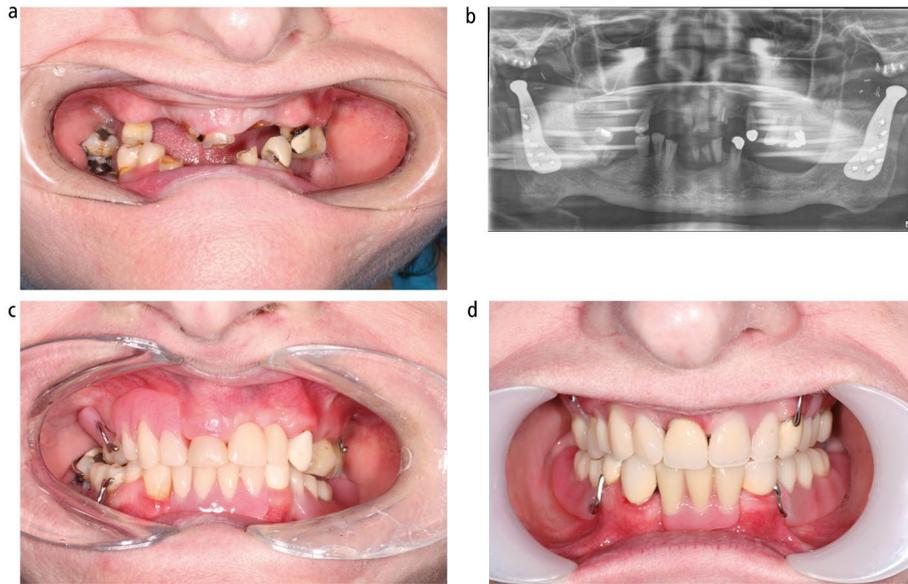
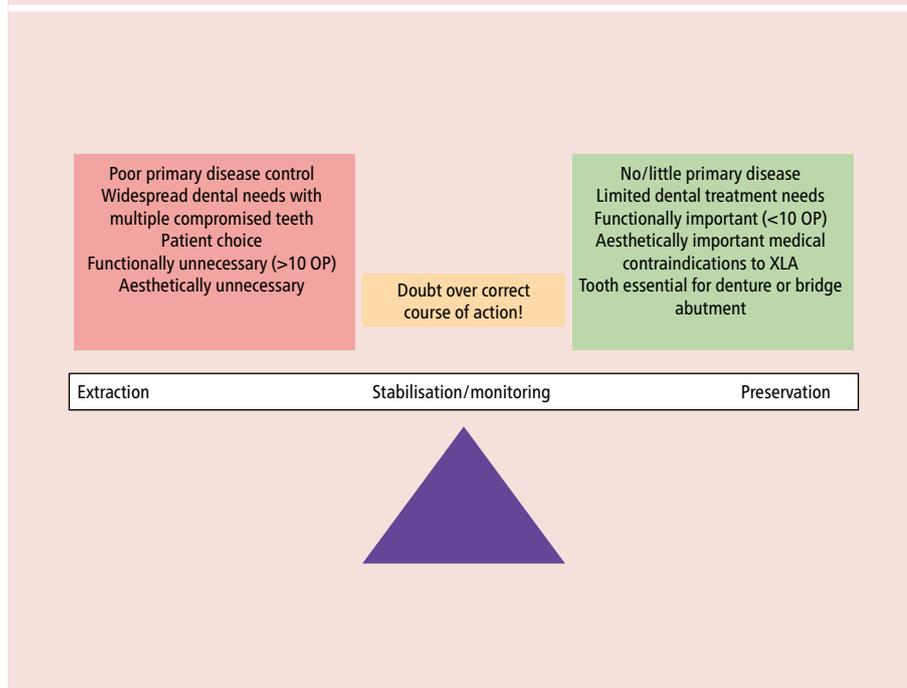


Fig. 10 a, b, c, d) This patient had a severe trismus from arthritic joint change and had been neglected professionally. Following joint replacement, rehabilitation was deemed preferable. There was significant doubt as to how this patient would cope with an extraction-based treatment plan. Following a phase of provisionalisation, the patient was restored with milled crowns and cobalt-chrome dentures



Fig. 11 a, b, c) This patient's dentition was neglected but the transition to complete dentures was deemed too radical for them. As such, several teeth were maintained to transition them via partial dentures

Fig. 12 Balancing the arguments for and against extraction



Tooth-level considerations

Considerations favouring extraction

There will often be scenarios where extraction facilitates the maintenance of more favourable teeth. Most notably, this is discussed when considering the management of mesially impacted lower wisdom teeth, which, if left, may contribute to caries and periodontal disease formation on the distal aspect of the second molar. In these situations, extraction of the wisdom tooth would be preferable. Conversely, once such diseases have developed it may be preferable to remove the diseased second molar and allow the wisdom tooth to erupt.

Dentists will naturally gravitate to less irreversible treatment and often teeth are maintained when their presence may hinder rehabilitation. This is often found when one or two teeth are left. Both patient and dentists may fail to recognise that these may hinder denture construction rather facilitate denture acceptance (Fig. 13).

Considerations favouring restoration

A tooth that has value for future (or pre-existing) use as an abutment has value for both the patient and their treating dentist (Fig. 14). This is especially true when preventing a patient from becoming edentulous on the lower arch; even the presence of a single guide plane can improve retention of a denture (Fig. 15).¹⁸ Similarly, teeth that are already being used as abutments clearly have increased importance in maintaining form and function and can play a key role in retention (Fig. 16).¹⁹

When assessing strategic importance, the flowchart in Figure 17 can aid clinicians in assessing the value of the tooth in question on both a tooth-specific and patient-specific level.

Relevance to NHS dentistry

The NHS currently operates a model based on both primary and secondary care. There is a limitation in capacity in both primary/secondary care which prevents access to patients who are presently not registered with a NHS dentist. This has been further strained by the impacts of COVID-19. As such, there is a need to prioritise the allocation of resources/funding when treating patients in both primary and secondary care. The key considerations here are strategic importance, restorability and complexity. In the case of the NHS, it is necessary to move away from the dental ideal of 28 teeth maintained towards financial reality. Limiting treatment with reduced odds of success and not undertaking complex, costly and time-consuming treatment may allow the system to see and treat patient who otherwise do not have access to NHS care.

Conclusions

Determining strategic importance can be a very subjective process and clinicians should be aware that there will be different stakeholders with often conflicting perspectives. As such, patients' beliefs about the need to maintain a tooth may differ from that of the clinician and, in state and insurance-based healthcare systems, the perspective of the commissioners and insurers. Specifically considering state-supported healthcare systems, systemic and socioeconomic factors must be considered within the decision-making process. Considering limitations in resources, it is not

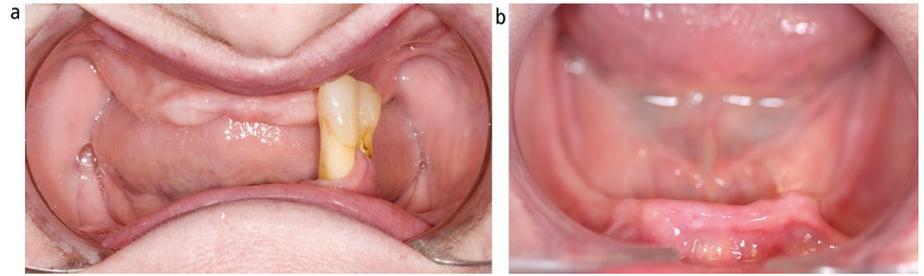


Fig. 13 a, b) The retained 33/34 are now hampering the ability to place the teeth in an optimal position and disrupting peripheral seal. As such, consent was sought to remove these teeth before constructing new complete dentures

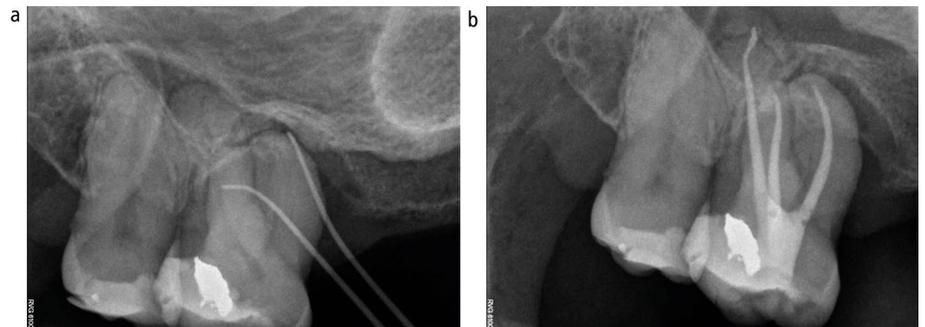


Fig. 14 a, b) The 16 is an abutment for cobalt chrome denture. The endo-perio lesion adds significant doubt to the success of any treatment but the strategic importance was undeniable and as such, potentially unpredictable treatment was undertaken

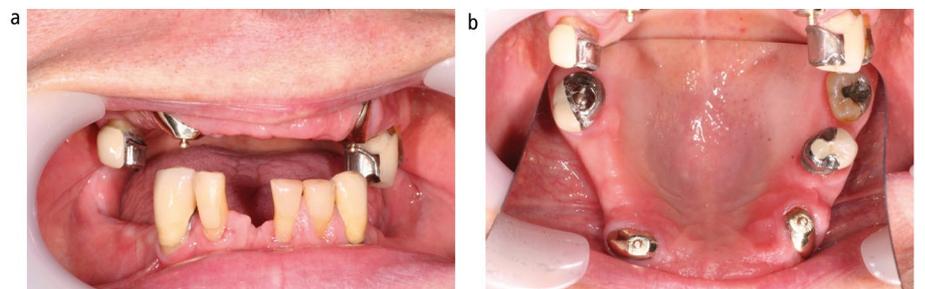


Fig. 15 a, b) The maintenance of key teeth can confer significant advantage when constructing dentures. In this case, milled guide planes were incorporated into crowns on the premolars and the canines were root filled and restored with Rhein attachments

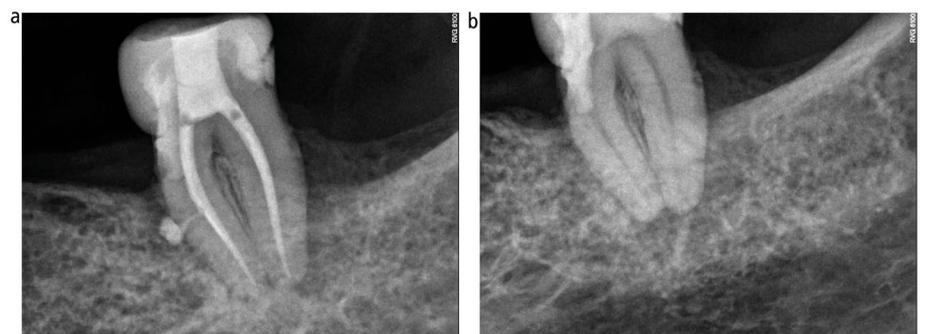


Fig. 16 a, b) The lone standing 37 was of clear functional importance as both a contacting pair and as a denture abutment. Root canal treatment of this tooth was clearly beneficial

always possible to manage all teeth within any sector of the dental health system. The NHS should have a key role in defining strategic importance and supporting clinicians to navigate this conversation.

Ethics declaration

The authors declare no conflicts of interest.

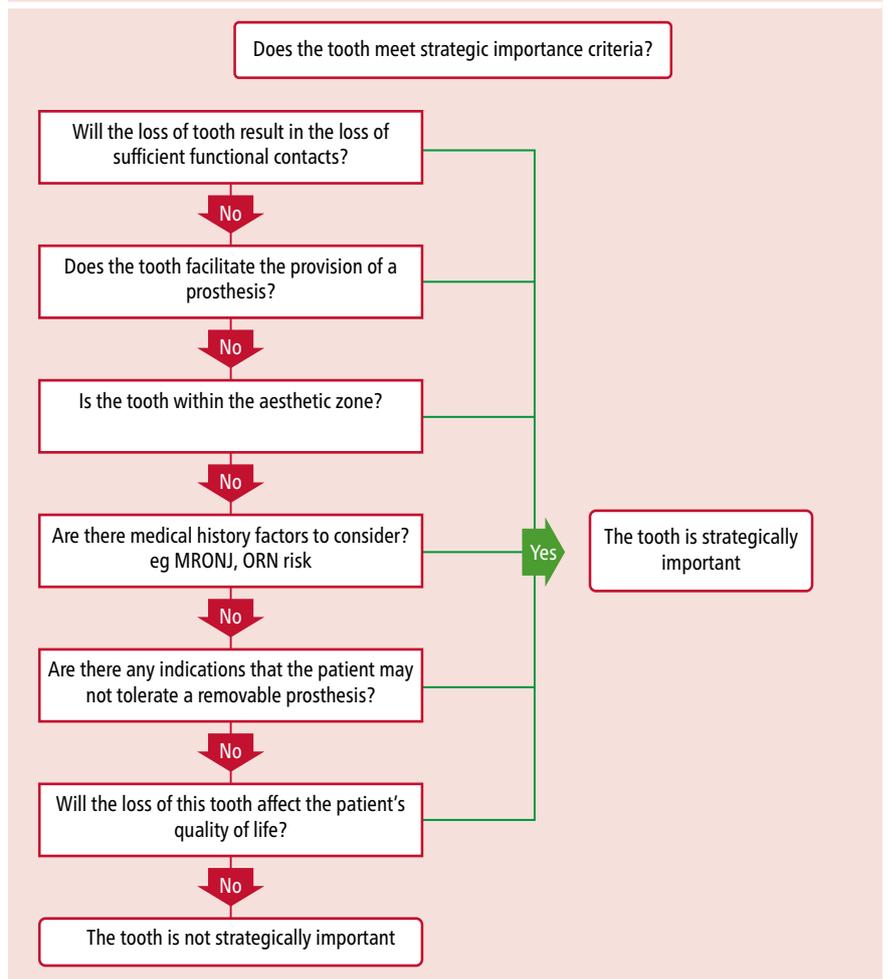
Author contributions

Don S. Jayawardena, Reem Ahmed, Jacob Watts, Joanne Cunliffe and James Darcey all contributed to the literature search and the writing and drafting of the manuscript, as well as subsequent revisions.

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Fig. 17 A flowchart citing pertinent questions to consider when assessing for strategic importance. This list is certainly not exhaustive, nor is it an absolute rule. It should guide the reader in their clinical decision-making



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