

WHITE PAPER

# Collaborative Care Continuum

## The 3 Cs pathway for partially dentate patients

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# Executive summary

## Partial tooth loss: an increasing burden

There are a number of reasons why teeth can be missing, including disease (predominantly caries and periodontal disease), trauma, and congenital absence. A “partially dentate patient” is therefore defined as “a person with an incomplete natural dentition, where one or more teeth are congenitally absent or have been extracted due to disease, trauma or surgery”. This definition applies to different age groups. Over the years, global ageing, associated with increasing levels of natural tooth retention, has led to a marked increase in the number of partially dentate (older) individuals<sup>1</sup>. Consequently, caring for partially dentate patients represents a growing part of oral health care in both developed and developing countries. Identifying and fostering practices that favour efficient, cost-effective, and fit-for-purpose treatment and care is therefore a timely undertaking. This white paper provides insights into the core factors that must be considered to deliver such care.

## Towards personalized care

Tooth loss is often measured objectively by the number of missing teeth and occluding contacts. More broadly, however, tooth loss can impact on subjectively reported function and psychosocial well-being. Loss of significant parts of a natural dentition can affect masticatory function, thus leading to dietary restrictions and associated health consequences. It can lead to impaired oral health-related quality of life (OHRQoL), which in extreme cases can result in feelings of shame and embarrassment and poor social participation.

In general terms, oral healthcare must seek to manage existing pathologies, prevent future or recurrent pathologies, restore function, remove discomfort or pain, and restore aesthetic and psychosocial satisfaction<sup>2</sup>. The white paper therefore advocates for a shift in the pattern of healthcare provision from a biomedical, disease-driven treatment model to a patient-centred, holistic, and prevention-focused approach. It

supports a personalized approach by the dentist to risk assessment, care planning and treatment of partially dentate patients that considers different risk profiles, needs, and expectations depending on personal circumstances.

This white paper highlights the need for dentists to consider various factors that may influence treatment planning. These include not only clinical indications but also health status, functional status (independent, frail, and dependent individuals), aesthetic demands, treatment, and long-term maintenance costs. The dentist must also consider a person’s ability to maintain oral hygiene in order to shape a tailor-made long-term treatment and care plan rather than meeting immediate needs and demands<sup>3</sup>.

Different treatment options include accepting the missing tooth and maintaining a functional dentition; restoring to a shortened dental arch (SDA); restoring to a complete dentition using fixed or removable prostheses; or a controlled progression to edentulism. Technologies that may be used to reach the desired outcome include conventional fixed partial dentures (bridge); resin-bonded fixed partial dentures (resin-bonded bridge); removable partial dentures (RPD); dental implant(s) and associated restoration(s); orthodontic treatment; and combined options: implant-supported RPD, tooth-supported overdenture, etc. This white paper provides insights into the risks and benefits of these different options and technologies, with a focus on the view that technology must serve the patient, not the other way around, and that a patient’s care should be tailored to their current and longer-term needs rather than just an immediate demand.

## Towards a continuum of care

The patient-centered approach advocated in this white paper also implies that caring for a partially dentate patient goes beyond solely replacing one or more missing teeth or filling a space. Caring for a partially dentate patient entails a longitudinal process where a continuum of care is

delivered along three core pillars: a pre-treatment/assessment phase that includes a thorough risk assessment, a clinical assessment and an in-depth discussion surrounding patient concerns and expectations; a second phase in which treatment options are delineated, and actual treatment is provided; and a post-treatment/long-term care phase, which is shaped in a way that will ensure optimal maintenance of the treatment delivered. This white paper considers that each of these three pillars is of equal importance in

order to deliver the best possible care to partially dentate patients.

In summary, as there is no pre-set, ready-made recipe to care for partially dentate patients, this white paper lays out some principles that are deemed to be of general relevance. By discussing the main risks and benefits of a range of treatment options and technologies, it also aims at providing dentists with the ingredients they need to shape the recipe that will be best adapted to each patient.

# Section 1 Introduction

Missing teeth are common among adults, and the number of missing teeth typically increases with age<sup>4</sup>. Global ageing, associated with increasing levels of natural tooth retention, has led to a marked increase in the number of partially dentate individuals among the elderly. As a result, caring for partially dentate patients represents a growing burden of care in both developed and developing countries. Identifying and fostering practices that favour efficient, cost-effective, and fit-for-purpose treatment and care is therefore a timely undertaking. This white paper provides insights into the core principles that should be considered to deliver such care.

## 1.1 Definition of partially dentate patients

A “partially dentate patient” is defined as “a person with an incomplete natural dentition, where one or more teeth are congenitally absent or have been extracted due to disease or trauma or surgery”. This definition applies to different age groups:

- 1. Children:** a group in which the absence of teeth is predominantly due to either hypodontia or trauma. The prevalence of teeth missing because of disease (mainly caries) is decreasing among children in many countries. The loss of posterior teeth in children because of caries rarely results in any form of prosthetic intervention, whereas missing anterior teeth because of trauma or congenital absence may lead to a need for prosthetic replacement. Any choice to replace missing teeth in children should follow the personalized approach described for adults in this paper and only be undertaken once a careful assessment of dental development and the potential for crowding / orthodontic care has been undertaken.
- 2. Younger adults:** a group in which the absence of teeth can be due to hypodontia, trauma or disease, and when caused by disease, is more widespread in people from poorer socio-

economic backgrounds with little or no access to care and an often-neglected personal oral hygiene<sup>5</sup>.

- 3. Older adults:** a growing group of people, many of whom have had access to regular dental care throughout their life course, and in which tooth loss is predominantly due to lifelong exposure to risk factors for oral disease, and the repair and replacement cycle of dental restorations. Some people in this group may have better oral health than the younger population, having greater awareness and personal commitment and resources to maintain their oral health. Some, however, have sporadic oral hygiene habits and seek problem-based care. This cohort is less-well motivated and will have lost teeth gradually over time, with tooth extraction being a preferred treatment option for dental problems. This difference is modified in older populations by changing risks associated with ageing and disease, and with altered personal circumstances, particularly as frailty increases and individuals become more dependent on care from others. There is a marked difference in oral health status with varying socio-economic backgrounds both in terms of active disease, tooth loss, and edentulism. These symptoms are all worse in people from poorer socio-economic backgrounds.

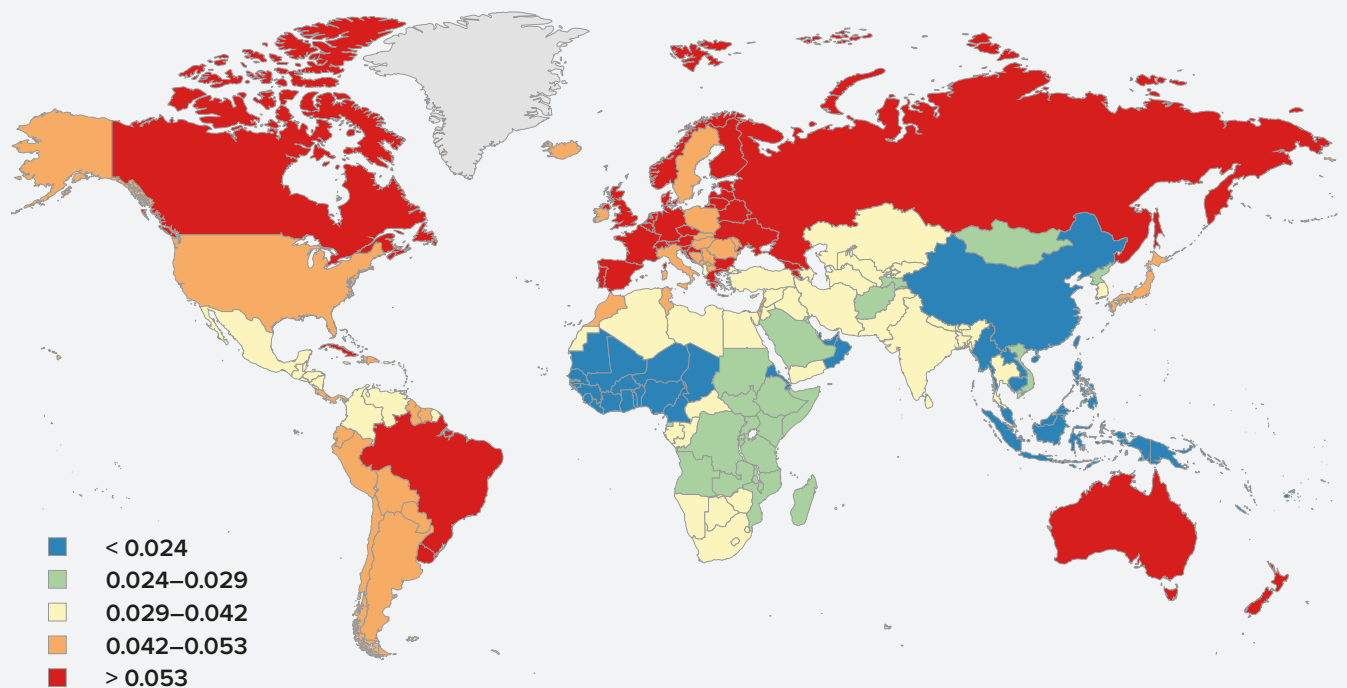
Even though needs and treatment options tend to be similar across age groups, there are significant differences regarding the long-term consequences of the treatment delivered. *Section 4 Treatment* provides a detailed overview of the various characteristics of the different treatment options and technologies available.

## 1.2 Prevalence and incidence of tooth loss

### 1.2.1 Edentulism

The Global Burden of Disease Study has investigated the prevalence of edentulism

**Figure 1** Age-standardized prevalence (proportion) of severe tooth loss in 2010 worldwide



(severe tooth loss), which ranked 36 out of the 291 conditions included in the study<sup>6</sup>. This review showed a significant decrease in edentulism between 1990 and 2010, as both the global age-standardized prevalence and incidence rate of total tooth loss has decreased by 45 percent over the last two decades. In 2010, global prevalence of edentulism reached 2.4 percent among adults, and the incidence rate amounted to 205 cases per 100,000 person-years. The study also notes that these decreases are even more significant when excluding individuals less than 20 years old, showing that complete tooth loss has dropped despite the fact that most populations around the world live longer<sup>7</sup>.

### 1.2.2 A trend from total to partial tooth loss

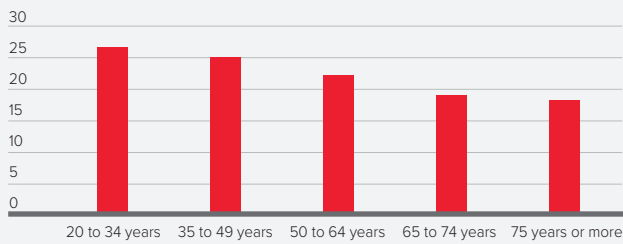
Global data on the prevalence of partial tooth loss are scarce. Available longitudinal studies show a decline in tooth loss and edentulism over recent decades. However, stark differences between

countries, regions, and age groups remain<sup>1</sup>. The average dental status of age cohorts improves and numbers of missing teeth decrease over time. However, a combination of increasing numbers of old and very old adults and an increasing proportion of this age group retaining natural teeth with varying risk of disease mean that increasing numbers of people will need care in the future.

In the United States, data from the National Health and Nutrition Examination Survey (NHANES) 1999-2004 shows that adults aged 20-34 years have an average of 24.9 remaining teeth, those aged 50-64 years an average of 22.3 remaining teeth, and those aged 75 or more have an average of 18.36 remaining teeth. African American adults, current smokers, and those with lower incomes and less education have fewer remaining teeth<sup>8</sup>.

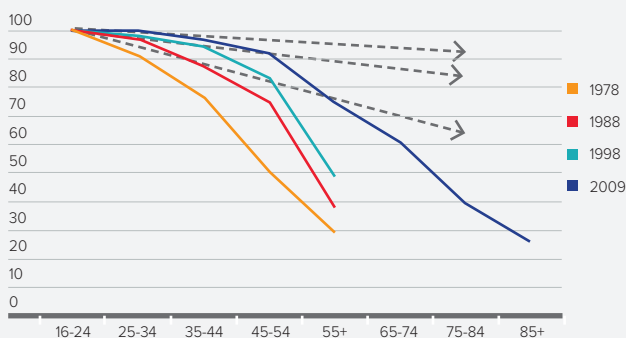
In the UK, the Adult Dental Health Surveys (ADHS) gives comparable data on oral health in England from 1968 to 2009. The trends between these cross-

**Figure 2 US, Years 2004**



sectional surveys give some insight into the rate of transition into edentulism, which appears to occur at around 1-2 percent per decade. They also show a gradual increase in the proportion of people with 21 or more natural teeth over time<sup>9</sup>. The dashed arrows in *Figure 3* indicate trajectories of tooth retention through the ages. The lowest arrow represents the “worst case” scenario and shows how policy can potentially alter disease trajectory and increase tooth retention.

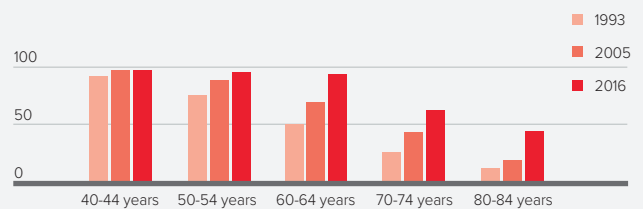
**Figure 3 The proportion of people with 21 or more natural teeth (y axis) by age, 1978-2009**



For 1978-98 only data up to age 55+ are presented but for 2009 data are included in ten year bands up to 85+. The dashed arrows indicate the approximate, but very different trajectories for those who were 35-44 (top), 45-54 middle and 55+ (lower) in 2009 with their expected prevalence of 21+ natural teeth by age 75-84 indicated by the arrow point. This assumes a linear trajectory but note that for those aged 55-64 in 2009 there is the suggestion that the trajectory may have deteriorated in the previous decade and the rate at which people drop below the 21+ teeth threshold has increased.

In Japan, data from the national survey of dental diseases, which is conducted at regular intervals, focuses on the number of remaining teeth, by age group, in line with the Japanese 80/20 strategy. These data show a marked increase in the number of elderly people with 20 or more remaining teeth at the age of 80 over the past 2 decades<sup>10</sup>. These data also show that, despite a significant decrease in tooth loss, the phenomenon remains very widespread in individuals in their seventies and above. Escalating numbers of individuals in these age groups increase the need for care.

**Figure 4 Percentage of people with 20 or more teeth by age group in Japan**



Source: “Survey of Dental Diseases”, Health Policy Bureau, MHLW



## 1.3 The causes of tooth loss

As outlined in the definition, tooth loss is usually due to four main causes:

- congenital absence;
- disease, predominantly caries and periodontal disease;
- trauma;
- surgery.

When caring for a partially dentate patient, identifying the cause for the absence of one or several teeth is essential, as it might be an indicator of future disease risk that will affect subsequent treatment and care options. For instance, the congenital absence of a tooth likely means that the patient will be treated in his or her early years. This is why it is important to consider the lifespan of the treatment proposed: it is estimated that 50 percent of 12-year-olds born in 2007 in the UK will live to 104 years or more<sup>11</sup>. As a result, assuming a treatment has a lifespan of 15 years, a patient treated at the age of 15 might have to repeat that treatment five or six times over his or her lifetime. Conversely, should tooth loss be due to disease, such as severe periodontal disease associated with poor oral hygiene, treating the active disease and stabilizing the patient will be essential before undertaking any definitive treatment.

Finally, if tooth loss is the result of trauma, specific attention may need to be paid to any ongoing risk of trauma occurring again. For example, the fact that an individual continues to play a contact sport may influence treatment choices and would certainly require the provision of a protective mouthguard.

## 1.4 The effects of tooth loss

### Nutrition and diet

The loss of natural teeth, which is gradual and cumulative over the life course, is associated with diminished nutritional intake, especially in older adults. In studies of nutrition in adult populations, poor-quality diets have been reported in adults missing natural teeth and wearing partial and

complete dentures<sup>12,13</sup>. The reasons for this are thought to be difficulty in chewing hard foods, such as raw vegetables and fruit, and a diminished sense of taste. Conversely, there is some limited evidence that improvement of oral health and restoration of occlusal (bite) function through prosthetic rehabilitation generally has very positive effects on these parameters, particularly when the prosthetic care is linked to a dietary intervention and where efforts are made to maximize the stability of a prosthesis. In the U.K. National Diet and Nutrition Survey of people aged 65 years and older, Sheiham et al.<sup>14</sup> reported on the oral health of the participants in the survey. A consistent finding in their report was that dentate individuals had a higher daily intake of protein, fibre, calcium, iron, and vitamin C than their edentulous counterparts. This has implications for general health in adults, as poor diet may lead to nutrient deficiencies and illnesses such as osteoporosis, atherosclerosis, and bowel disease<sup>15,16</sup>.

### Health related Quality of Life (QoL)

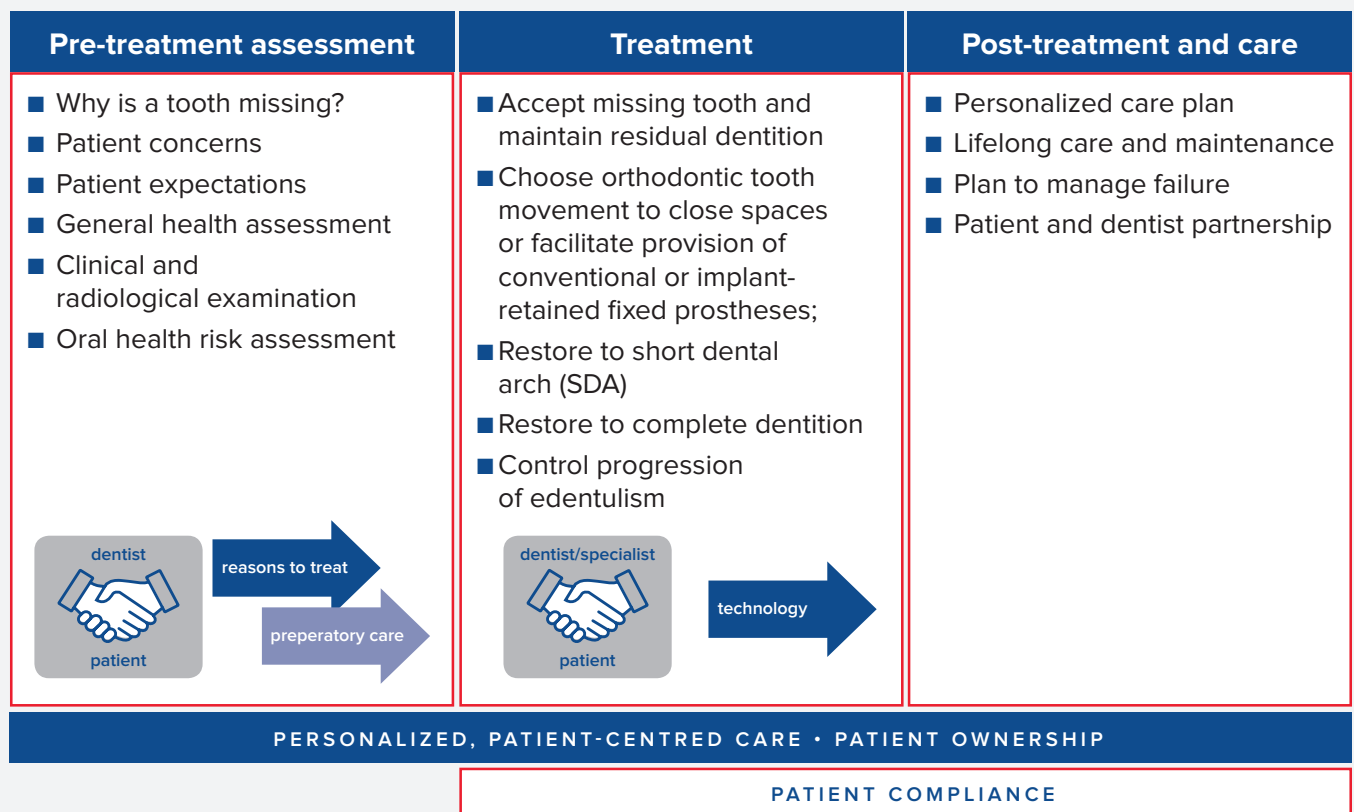
As populations age and lose teeth, their quality of life (QoL) may change, particularly with respect to the way their oral condition impacts day-to-day activities. This may happen as a direct result of altered function due to tooth loss, but may also be a result of changes in perceptions and values that occur with increasing age. A number of other factors may modify this process such as the social and cultural norms to which populations are exposed. For most people, QoL is affected in some way by oral health. The relationship between age, tooth loss, and OHRQoL has been explored using nationally representative population datasets. In these studies, it has been reported that age and tooth loss are closely associated with, but have independent effects on, OHRQoL. Tooth loss (which is linked to increasing age) is associated with more negative impacts, whilst increasing age independently results in fewer negative impacts. In all the populations and sub-populations studied, a complete or almost complete natural dentition was associated with the best OHRQoL. The location of missing teeth also influences the level of impact on health-related QoL, and this appears to be independent of the country or instrument used to measure health-related QoL<sup>17,18</sup>.

## Section 2 Continuum of care

In caring for a partially dentate patient is not solely about treatment, replacing one or more missing teeth, or filling a space. Caring for a partially dentate patient should be viewed as a longitudinal process

that includes three core pillars: pre-treatment assessment; treatment; and post-treatment and long-term care, as illustrated in *Figure 5*.

**Figure 5** Collaborative care continuum



The white paper provides insights into the core elements that must be considered within each of these pillars to ensure fit-for-purpose, patient-centered oral care.

# Section 3 Pre-treatment assessment

## 3.1 Reasons for treatment

“Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex”<sup>19</sup>. This new definition of oral health published by FDI World Dental Federation in 2016 acknowledges the multifaceted nature and attributes of oral health and recognizes that, beyond disease status, oral health also bears physiological (functional) and psycho-social dimensions. When caring for a partially dentate patient, it is therefore essential to understand the various reasons and motivations that led the patient to seek treatment. Those can range across the three core elements of oral health as defined by FDI, illustrated in *Table 1*.

**TABLE 1** Reasons and motivations for treatment

Disease and condition status	Physiological function*	Psycho-social function
Mitigate the consequences of caries or periodontal disease	Improve chewing efficiency	Improve self-esteem
Stabilize oral health status	Improve speech	Improve aesthetics
Mitigate the consequences of trauma or ablative surgery for malignancy		Increase social participation

\*A dentist may provide additional treatment to improve distribution of biting forces or to maintain occlusal stability

## 3.2 Patient assessment

### 3.2.1 Patient perspective

Shifting from a biomedical, disease-driven, and paternalistic approach to oral health to a patient-centred approach requires that patient perspectives be taken into account<sup>20,21</sup>. Evidence shows that patients’ motivation and compliance with treatment

are strongly influenced by their own perception and expectation of their situation and by their degree of engagement<sup>21</sup>. In addition, evidence shows the emergence of better educated and more assertive patients, who claim the right to participate in the decision-making process<sup>22</sup>.

Research has shown that there are likely to be discrepancies between the professionally assessed need and the subjective treatment need as perceived by the patient<sup>23-25</sup>. In order to ensure optimal patient participation and compliance in subsequent treatment steps, a clear understanding of the patient’s motivations and concerns is fundamental. A preliminary dialogue will therefore focus on the reasons that drove the patient to seek dental care. Is the patient mainly driven by functional concerns (difficulties chewing/speaking), or by aesthetic considerations (feelings of shame, restricted social participation), or by both?

A clear understanding of patients’ motivations, expectations, fears and concerns is therefore instrumental when developing a treatment and care plan. To that end, effective communication is essential. Good patient-dentist communication has been shown to be not only associated with improved patient outcomes and satisfaction, but also with better adherence to treatment<sup>26</sup>. In addition, complaints and litigation regularly occur not because there has been a technical or clinical error, but because of miscommunication<sup>26</sup>.

### 3.2.2 General health assessment

A general health assessment is needed to identify possible existing conditions or medications that may affect treatment and treatment outcomes. Specific attention should be paid to diabetes; smoking; drugs that influence bone metabolism used for osteoporosis and other conditions; a history of radiotherapy to the jaws; polypharmacy; salivary gland function; and physical, social and mental dependency.

In addition, patients' social circumstances also need to be assessed: in particular, possible frailty or dependency need to be identified, as they may affect the likelihood of disease and the challenges in providing clinical care<sup>27</sup> and the individual's ability to undertake personal oral health care. The FDI roadmap for healthy ageing and brochure on achieving a healthy ageing society provide more concrete guidance on the subject<sup>28</sup>.

### About miscommunication

- The dentist said the patient needs to call the specialist.
- "The dentist," said the patient, "needs to call the specialist."
- The dentist said, "the patient needs to call the specialist."

### 3.2.3 Oral health assessment

Secondly, a thorough clinical oral health assessment is needed. It should include:

- **Characteristics of area(s) where teeth are missing:**
  - Width, interocclusal space
  - Single/multiple space
- **Occlusal assessment**
  - Occlusal habits
  - Occlusal stability
  - Parafunction
- **Periodontal assessment<sup>29</sup>**
  - Presence and distribution of plaque and calculus,
  - Assessment of periodontal and peri-implant soft tissues,
  - Measurement of probing depth, gingival recession (or enlargement), and bleeding on probing.
  - Exploration of furcation lesions and mucogingival aspects.
- In case of the presence of implants, careful assessment of the periodontal condition of the patient around both natural teeth and implants.
- In addition, the patient's oral hygiene status should be assessed and documented.
- **Caries detection and assessment<sup>30,31</sup>**
  - **Detecting lesion extent**, which aims at assessing the severity of the lesion(s).
  - **Assessing lesion activity**, which aims at determining whether a lesion is currently active and continuing to suffer net loss of mineral, with demineralization being out of balance with remineralization, or if it has become inactive, i.e. arrested or remineralized.
  - **Monitoring lesion behaviour**: this last aspect will be important in upcoming patient encounters to ensure that the lesions are stabilized before proceeding to any definitive treatment options.
- **Endodontic status<sup>32</sup>**
  - Tooth vitality
  - Presence of periapical or peri-radicular lesions
  - Evidence of cracks
- **Residual tooth structure**
  - Tooth wear: evidence of parafunction, erosive tooth wear, abrasion
  - Restorability assessment
- **Soft tissue morphology and biotype**
  - Thin vs thick tissues
  - Narrow vs thick band of keratinized tissues
- **Current removable prostheses, if present**
  - Particularly important for Removable Partial Dentures (RPD) where design of the prosthesis may affect disease risk, e.g. excessive coverage of dental and gingival tissues
  - Presence or absence of RPD
  - Stability and retention of RPD and possibility to improve these with a different design
  - Quality of adaptation to supporting mucosal tissues

- **Residual bone volume in the aesthetic zone, sufficient to place dental implants**
- **Level of smile line/visibility of anterior teeth**

### 3.2.4 Disease risk assessment

Disease risk assessment aims at targeting the appropriate level of intervention—preventive care and/or treatment—for patients based on their risk status. For patients who are at low risk for future disease, no additional intervention may be needed.

For patients who are at moderate or high risk, additional preventive measures may be indicated, such as delivering patient education directed at improving their oral health behaviours, e.g. oral hygiene, dietary counselling, smoking cessation, and increasing protective factors, e.g. fluoride exposure, salivary stimulation<sup>30</sup>. As the treatment options available to partially dentate patients may increase the risk for caries and/or periodontal disease, performing a thorough disease risk assessment is particularly important.

- **Periodontal disease:** microbe-host interaction is the main element in the pathogenesis of periodontal diseases. However, other risk factors also come into play. Some are nonmodifiable, such as genetic profiles, gender, age, and some systemic conditions (such as type 1 diabetes, leukaemia, and osteoporosis). Others may be modifiable, such as lifestyle factors, e.g. smoking,

alcohol and diet, and metabolic factors such as obesity, type 2 diabetes, and stress. In addition, local factors such as levels of plaque and/or calculus, furcations, enamel pearls, root grooves and concavities, open contacts, malpositioned teeth, wearing dentures, and overhanging and/or poorly contoured restorations may increase the risk for periodontal diseases<sup>29</sup>.

- **Caries:** Dysbiosis in the oral microbiome lies at the heart of dental caries. This dysbiosis is largely driven by the availability of sugars in the diet or reduction in host defenses through salivary dysfunction. Studies have shown that the best indicator of a patient developing caries in the future is previous caries experience<sup>33-35</sup>. Any clinical signs of active demineralization (active caries lesions) can be considered as a risk for caries progression. Other aetiological risk factors for caries must also be considered, such as diets high in fermentable carbohydrates (sugars), the extent of biofilm (plaque) coverage, and reduced salivary flow<sup>30</sup>. Caries risk changes in people who have exposed coronal and root surfaces rather than just coronal surfaces. The pH for demineralization of dentine is around 0.5 of a pH unit higher than that for enamel, so exposed dentine will tend to demineralize earlier in relation to a change in oral pH and be subject to demineralization for longer, as pH gradually increases with time.

## Section 4 Treatment

Several options may be considered in the event of one or more missing teeth. Depending on each patient's personal circumstances, one or more options may be relevant. These are the available options:

- a) Accept the missing tooth and maintain residual dentition;
- b) Choose orthodontic tooth movement to close spaces or to facilitate provision of conventional or implant-retained fixed prostheses;
- c) Restore to shortened dental arch (SDA);
- d) Restore to complete dentition;
- e) Control progression to edentulism.

**TABLE 2 Overview of treatment options**

Indications	Patient perspective	Main risks	Main benefits
<b>Accept the missing tooth and maintain residual dentition</b>			
No or minimal functional limitation. Patient not motivated to replace missing teeth.	The probability that a patient will accept a missing tooth will partly depend on where it is located. For example, a Japanese study showed that only 3% sought treatment when only the second molars were missing. Slightly more than half requested treatment when first and second molars were missing <sup>4</sup> .	May compromise future rehabilitation if further teeth are lost, leading to functional limitation.	Simplifies maintenance, reduced biological price of prosthetic treatment.
<b>Orthodontic tooth movement</b>			
Desired aesthetic and functional outcome can be achieved by tooth movement only. Alignment of teeth to facilitate fixed prosthodontic rehabilitation.	Extended course of orthodontic care prior to prosthetic rehabilitation can take 18 months to 2 years. Fixed appliances may be aesthetically or functionally unacceptable to the patient.	Caries on teeth with bonded brackets. Aggravation of periodontal disease. Root resorption. Failure to move the teeth.	May achieve outcome without damaging natural teeth. May be able to use less destructive methods for reconstruction.
<b>Restoration to shortened dental arch (SDA)</b>			
Some functional limitation, aesthetic impact of missing anterior teeth.	Randomized clinical trials (RCT) indicate that restoration to SDA is equally acceptable to replacement of missing teeth with removable partial dentures (RPD) <sup>36,37</sup> .	May compromise future rehabilitation if further teeth are lost, leading to functional limitation.	Improves oral function to an <i>acceptable</i> level Simplifies maintenance, reduced biological price of prosthetic treatment.
<b>Restoration to complete dentition</b>			
Significant functional limitation, aesthetic impact of missing anterior teeth.	Potentially improves oral function and patient satisfaction for patients reporting negative impacts following partial tooth loss <sup>38</sup> .	Biological price of tooth preparation for prostheses. Increased maintenance requirement for patient.	Improves oral function to an <i>optimal</i> level.
<b>Controlled progression to edentulism</b>			
Unstable, advanced disease, not responding to treatment, or poor compliance by patient, poor prognosis for remaining natural dentition.	Potentially increases likelihood of adaptation to total tooth loss.	Patient fails to adapt to total tooth loss.	Reduction of pathogens in the oral cavity with a potentially positive health impact Improves oral comfort. Potential to improve chewing function.

The most relevant option will depend on, in particular:

- the patient's oral/periodontal health status;
- the patient's oral disease risk;
- the patient's motivation and participation;
- the patient's willingness to undertake complex treatments over a longer period of time;
- the patient's norms and values/ cultural acceptance;
- the initial costs and long-term maintenance costs.

## 4.1 Available technologies, risk/benefit analysis

There is a biological price to pay when providing a removable or fixed tooth-retained prosthesis, including removal of tooth tissue and introduction of

a foreign body around which biofilms can aggregate. Preparing a tooth for a full coronal restoration involves removal of between 50 and 60% of the coronal tooth tissue depending on the material to be used for the crown. This obviously compromises the tooth for the future and causes trauma to the dental pulp. Restoration of a space should be designed to minimize harm and maximize the benefit to the client in terms of aesthetics, function, and quality of life. The following section provides a synthetic overview of the main risks and benefits of the following technologies:

1. Conventional fixed partial denture (bridge)
2. Resin-bonded fixed partial denture (resin-bonded bridge)
3. Removable partial denture (RPD)
4. Dental implant(s) and restoration
5. Orthodontic treatment
6. Combined options: implant-supported RPD, tooth-supported overdenture, etc.

**TABLE 3 Overview of main properties of treatment technologies**

Indications	Patient perspective	Main benefits	Main risks	Average lifespan
<b>Conventional fixed partial denture (bridge)</b>				
Can use fixed-fixed, fixed-movable or cantilever designs. Can extend into space but limited number of cantilevered units practical without increasing risk of failure. Cantilevers good for replacing single units if supporting teeth are sound.	Improved QoL <sup>4</sup> .	Fixed in place. Can have good aesthetics when bone resorption in pontic area is limited.	Destruction of tooth tissue with extent of destruction exacerbated with different materials options (all-ceramic is more destructive than metal-ceramic. All-metal is the least destructive). Loss of vitality as a consequence of preparation/repeated trauma through life, particularly for a previously restored tooth. Restored teeth at greater disease risk than non-restored embrasure spaces. More difficult to clean, especially beneath pontics. Risk of rotational failure with linked abutments and unfavourable leverage forces from pontics.	98% 5-year survival rate with metal ceramic restorations; 93% 5-year survival rate for all ceramic restorations <sup>39</sup> . Natural teeth change colour with age; they tend to become more opaque and yellow/brown in colour. Patients can perceive an aesthetic mismatch between ceramic restorations and natural teeth with time due to a change in appearance of their natural teeth. Should this occur, consider attempting to whiten the natural teeth to make them closer to their original colour, rather than remaking the crowns.
<b>Resin-bonded fixed partial denture (bridge)</b>				
Can only be used predictably on relatively short spans. Evidence suggests greater success with 2-unit cantilever compared with 3-unit fixed-fixed designs <sup>40</sup> ; anterior bridges have a better survival rate than posteriors <sup>41</sup> .	Improved QoL <sup>4</sup> .	Minimal or no tooth preparation, less destructive than conventional preparations.	Decementation, particularly posterior bridges. Chipping of veneer porcelain from frameworks. Greying of anterior abutment teeth with metal retainer wings.	91.4% 5-year survival rate; 82.9% 10-year survival rate <sup>42</sup> . Natural teeth change colour with age; they tend to become more opaque and yellow/brown in colour. Patients can perceive an aesthetic mismatch between ceramic restorations and natural teeth with time due to a change in appearance of their natural teeth. Should this occur, consider attempting to whiten the natural teeth to make them closer to their original colour, rather than remaking the crowns.
<b>Removable partial denture (RPD)</b>				
Good at replacing multiple missing teeth. Good at restoring defects in alveolar bone/gingivae if lost. Can be used to readily replace teeth in a “free end saddle” situation. If designed well, can be modified if further teeth are lost. Good for terminal dentition phase and planning.	Often not perceived as a “denture”, better accepted as a “partial” or a “removable bridge”. High degree of non-compliance with use, particularly when replacing posterior teeth <sup>22,43</sup> . Improvement of problems related to smiling and eating <sup>44</sup> .	Can be a low-cost treatment option. Simple to manufacture and use. Can be made (especially when made from acrylic) in a low-tech environment.	Removable and may not be stable depending on quantity of support/retention available. Increased disease risk for both caries and periodontal disease. Both can be managed with good oral health and prevention, but both are at risk, especially if someone has already lost teeth because of either disease. These patients will remain at high risk for disease as a consequence. Not well-liked/tolerated, particularly with distal extension prostheses. Poor compliance.	<i>(Caveat – removable prostheses more likely to be provided to patients with higher risk of tooth loss)</i> Abutment teeth for removable partial dentures are most vulnerable to disease and increased risk of further tooth loss. Survival influenced by standard of oral hygiene and frequency of maintenance programme, level of periodontal support and endodontic status of abutment teeth, 5-year survival rate of abutment teeth ranges from 70-83% <sup>45,46</sup> . Survival rate for RPDs are likely to be affected by selection bias in that people at the greatest risk for further tooth loss are more likely to be offered an RPD.



Indications	Patient perspective	Main benefits	Main risks	Average lifespan
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**Dental implant(s) and restoration**

<p>Can be used anywhere there is bone or when bone augmentation is possible.</p> <p>Can be used to support/retain a very wide range of prostheses.</p>	<p>Improved QoL<sup>4</sup>. Reluctance/fear of surgery may limit uptake, in particular among older individuals<sup>47</sup>.</p> <p>Lay people tend to have high expectations regarding the capacity of implants to restore appearance, function, and QoL to normal. They overestimate function and longevity and underestimate the expertise needed to carry out the clinical procedures<sup>48</sup>.</p>	<p>Predictable in most people</p> <p>High level of patient satisfaction</p> <p>Can get good aesthetics if planned and executed properly</p>	<p>Peri-implant disease (especially in the presence of periodontal disease elsewhere in the mouth).</p> <p>Better survival rates in mandible than maxilla.</p> <p>May need to create/augment bone with increasing complexity of procedures.</p> <p>Reduced survival rate in smokers.</p> <p>Use in other risk groups<sup>49</sup>:</p> <ul style="list-style-type: none"> <li>- Medication-related osteonecrosis of the jaw (MRONJ)</li> <li>- People with diabetes, particularly if the disease is poorly controlled.</li> </ul> <p>Damage to structures in bone (nerves).</p> <p>Fracture of veneer material on superstructure when porcelain is used over metal.</p> <p>Screw loosening of screw-retained prostheses or loss of retention of cemented restorations.</p> <p>Implant fracture, screw fracture, etc.</p> <p>As a broad generalization, screw-retained prostheses are easier to maintain and more adaptable than cement-retained prostheses.</p>	<p><i>(Caveat – May depend on the treatment protocols. Delayed loading has a slightly better long-term survival than immediate loading protocols; survival in non-grafted bone slightly better than grafted bone. Will also be influenced by implant surface (machined/roughened) and materials used to construct prosthesis)</i></p> <p>Survival of implants 96% after 5 years, 93% after 10 years; Survival of restorations 95% after 5 years and 80% after 10 years of function<sup>50</sup></p> <p>Natural teeth change colour with age; they tend to become more opaque and yellow/brown in colour. Patients can perceive an aesthetic mismatch between ceramic restorations and natural teeth over time due to a change in appearance of their natural teeth. Should this occur, consider attempting to whiten the natural teeth to make them closer to their original colour, rather than remaking the crowns.</p>
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**Orthodontics**

<p>Closure of spaces and alignment of teeth that may facilitate other care pathways.</p>	<p>Extended care pathway, particularly in older adults.</p>	<p>May achieve clinical outcomes without operative intervention.</p> <p>May improve options for further care.</p>	<p>Caries around appliance.</p> <p>Risk of root resorption.</p> <p>Contra-indicated in the presence of active periodontal disease.</p>	<p>If orthodontics only, may require lifelong retention/fixed retainers.</p>
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**Combined options: implant-supported RPD; tooth-supported overdenture, etc.**

<p>Long spans, reduced bone volume, lower costs when compared to fixed prostheses.</p> <p>Varies according to individual situations.</p>	<p>Improved QoL<sup>51</sup>.</p> <p>Need to explain to patients the rationale and advantages of using a combined approach.</p>	<p>Adequate retention for a removable prosthesis; retaining natural teeth to support an overdenture preserves proprioception.</p>	<p>Tooth-supported overdentures have a high disease risk and need a high standard of oral hygiene to preserve abutments.</p>	<p>Evidence for survival in tooth supported overdentures is very limited<sup>52</sup>.</p>
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There is no one-size-fits-all model: the best treatment option as well as the most adequate technology to use will vary according to the personal situation of each patient. Clinical indications will

drive the options that may be contemplated: technologies that increase caries risk may not be best in patients with a high caries risk due to other conditions<sup>53</sup>, and dental implants may not

be a sensible option in patients with a high risk of periodontitis<sup>54</sup>. Long-term planning is also important: what will the patient's mouth look like in 15 years? What might the patient's needs be by then? Knowing that all restorations/prostheses have a limited lifespan, how can the impact of failure in the future be accommodated within the care plan? For example, patients who received implants 20 years ago are now faced with the need to manage them or may be showing signs of peri-implantitis. This is why it is important to consider the long-term consequences of the treatment undertaken. At the time of restoration, a detailed assessment of the patient's risk factors should influence the treatment plan. For example, if the patient cannot maintain an adequate standard of plaque control, then a fixed restoration will be difficult to maintain and is likely to fail. The condition of the residual tooth structure influences the quality of teeth as retainers for both fixed and removable partial dentures, with particular concerns around teeth that are endodontically treated and have an unfavourable crown-root ratio as a result of periodontal attachment loss<sup>45</sup>. In the case of implant-retained restorations, the clinician should think about the "what if" scenario if an implant supporting the restoration is lost. Will this require a full remake of the restoration, or is it possible to design the restoration with a degree of retrievability? This should influence the choice of the position of the implants, and how many. It should also influence the choice of whether the restoration is screw- or cement-retained, bearing in mind that screw-retained restorations are easier to retrieve.

In addition, patient preferences will come into play. Does the patient have pre-defined preferences with regard to specific treatment options (fixed or removable dentures, implants, or other options)? A qualitative study of trends in patient preferences showed that some patients were willing to accept a longer treatment and to endure financial hardship to achieve their preferred outcome<sup>22</sup>. In contrast, studies focusing on edentulous patients have shown that around 30% may refuse dental implants even when they are provided free-of-charge, not only due to fear and anxiety about the associated surgical intervention, but also because of doubts regarding the appropriateness of the procedure in an elderly person<sup>47,55</sup>.

As a health professional, the dentist is called upon to strike the right balance between purely clinical elements and patient-expressed needs, concerns and expectations to shape a treatment plan that will be the most effective for the patient. Specific concerns, fears, and preferences will all be considered when delineating definitive treatment options together with the patient.

#### 4.1.1 Towards an enlightened choice

Research has shown that, irrespective of treatment options and technologies chosen, careful preparation and planning are key to successful outcomes. Rehabilitative treatment is a process that starts before the actual treatment is performed and that subsequently involves long-term care and maintenance in a whole-patient approach. Choosing a preferred treatment and technology must be the result of a holistic assessment and of constant dialogue between the dentist and the patient. Final decisions will be the result of a balance between clinical elements, patient preferences, and financial considerations. There must also be a mutual understanding between patient and clinician about the technical and biological maintenance requirements when replacing missing teeth with a prosthesis.

Preliminary discussions allow for an in-depth understanding of the patient's expectations, fears, concerns, and possible preferences. While many adults have missing teeth, not all will feel the need to replace them<sup>22</sup>. In the absence of a subjective treatment need, long-term compliance with treatment may be suboptimal, particularly when the technology used is unpopular. Financial and insurance considerations may also influence decisions. The cost-effectiveness of each treatment option, including long-term maintenance, is an important issue<sup>56</sup>. So is the patient's ability to afford each treatment option. This includes both the affordability of the treatment itself as well as long-term maintenance costs. In the UK for example, restoration with an RPD was found to be 1.84 times more expensive than an SDA treatment approach over 12 months<sup>56</sup>. Patients' willingness to pay for a given treatment is another important element. As an example, recent qualitative research conducted

in a group of elderly patients (median age 72 years) in Ireland observed that patients expressed a willingness to pay that exceeded stated treatment costs for simpler, functionally orientated care according to the principles of the shortened dental arch, but a willingness to pay below-stated treatment costs for removable partial dentures, as well as for dental implants<sup>57</sup>.

The retrievability of the restoration is another important element to consider. Specific examples of this include the use of compromised teeth as abutments for a removable partial denture and long-span implant-supported prostheses. The risk of tooth loss is significantly higher for abutment teeth-supporting and retaining RPDs<sup>45</sup>. The most predictive risk factors for abutment tooth loss are crown/root ratio and whether the abutment has been endodontically treated<sup>46</sup>. When using such compromised teeth as abutments, it is important to ensure that short term loss of such a tooth does not completely compromise the function and comfort of the prosthesis. The clinician needs to consider using an alternative tooth as an abutment or ensure that their denture design allows easy modification of the denture to restore function and comfort if the tooth is lost. In the case of long-span, fixed-implant-retained restorations: if an implant is lost, consider planning on converting to a removable prosthesis. This may influence the location of implants when planning restorations. It is also important to consider retrievability in relation to retention options for the prosthesis placed on implants. It is very valuable to be able to easily remove an implant crown or re-tighten a screw without damaging the restoration<sup>58</sup>. This is not easy to achieve with cement-retained restorations on implants.

Depending on the treatment strategy and on the technology chosen in collaboration with the patient, and depending on the complexity of the case, referral for specialist advice may have to

be considered at this stage. An adequate flow of information and smooth communication between the referring dentist and the specialist is essential to ensure that the needs of the patients are adequately covered. Great care must also be taken to make sure that the patient understands the reasons for the referral and adheres to this suggestion.

Before proceeding to treatment, patient ownership, participation, and collaboration must be secured. The patient needs to understand the risks and benefits of the treatment he or she is about to undertake. The patient must accept that the chosen treatment might include several encounters, possibly over weeks or months. Patients must also understand that all restorations and prostheses have a limited lifespan. There have been many reported cases of patients who believe that the treatment they are being prescribed will be “permanent”, and who feel disillusioned when it fails. They also need to understand that maintaining their oral health post-treatment necessitates their participation in terms of oral hygiene, attending follow-up visits, etc. Only then will they be able to give their informed consent.

## 4.2 Preparatory care/stabilization

Once the dentist secures informed consent from the patient, preparatory steps are fundamental in order to optimize definitive treatment outcomes. A thorough oral health assessment performed in the pre-treatment stage will have allowed the dentist to observe the presence of historical or active disease, as well as its extent (affecting a specific tooth or the entire mouth). Depending on these observations, stabilizing active disease may be necessary before proceeding to definitive treatment. In the case of care shared between a generalist/primary care dentist and a specialist clinician, stabilization of disease will most likely be managed by the generalist, as will ongoing maintenance.

### Checklist of to-do's before undertaking definitive care

- Assess patient's overall health condition
- Assess patient ownership
- Ensure stability of primary dental disease
- Assess compliance or cooperation to review risk
- Review definitive care plan (rehabilitation and long-term maintenance)
- Secure informed consent from the patient

## 4.3 Definitive care

Once all conditions for a successful definitive care are met, the treatment options that have been agreed upon can be implemented.

Not all dentists may be comfortable performing every type of restorative treatment option or have the technical equipment that allows them to offer all of these treatments. Knowing when to refer to a specialist is therefore an important part of holistic management to achieve high quality oral healthcare. The decision around whether the treating dentist or a specialist performs all or part of the definitive treatment needs to be made in consultation with the referring dentist, the specialist, and the patient, as this will affect the definitive treatment and care plan. The final decision should be based on the education, training, and experience of the referring dentist and the specialist as well as on the specific needs of the patient<sup>59</sup>.

Similarly, collaborations with other professions may be sought at this stage. Examples include intra-professional collaboration with dental hygienists for oral hygiene instructions and inter-professional collaboration with nutritionists for dietary advice if needed. The dentist is responsible for leading and coordinating the definitive care and the long-term care and maintenance of the patient.

## Section 5 Post-treatment and long-term care

Objectives of definitive care often focuses on the treatment itself to restore aesthetics and function. Research in Ireland<sup>60</sup> has shown, however, that only 40% of dentists schedule systematic review visits, and only 10% refer patients for periodontal treatment or perform oral hygiene instruction<sup>43</sup>. However, as illustrated in previous sections, caring for a partially dentate patient requires a long-term commitment that goes beyond the actual treatment. This implies the need to schedule systematic review appointments, with the period between reviews being determined by the disease risk of the patient<sup>61</sup>. Another key element in successful treatment is patient education. In short, long-term care and maintenance need to become integral parts of any treatment delivered to partially dentate patients<sup>62</sup>. For example, Tada et al.<sup>62</sup> demonstrated significant differences in rates of tooth loss in patients provided with removable partial dentures when a maintenance protocol was implemented every 3–6 months. Tooth loss was much higher when there was no maintenance or an infrequent maintenance protocol.

### Personalized care plan

A long-term personalized care plan needs to be set up in partnership with the patient. This will rely on:

1. **Good plaque control:** The frequency of recall depends on the patient's ability to perform good plaque control.
2. **Disease risk, particularly caries and periodontal disease risk:** The frequency of recall will depend on the level of risk that has been identified.

3. **Need for mechanical maintenance/repairs:** over time, some restorations will need mechanical repair, such as chipped porcelain needing to be polished. Remake may be required if extensive amount is lost, removable dentures will need to be relined or rebased as they lose adaptation to the underlying denture bearing area, and occlusal surfaces may need to be added to as they become worn over time. Ultimately, all restorations have a lifespan and may need to be replaced.

### Patient education

A thorough dialogue with the patient will ensure that he or she has enough information to properly maintain his or her restorations and take ownership of the long-term care and maintenance that is needed. Discussions will focus on:

- **Oral hygiene instructions:** depending on the type of treatment performed, specific oral hygiene routines may apply.
- **Risk awareness:** the treatment performed will be associated with specific risks. A well-informed patient will be better equipped to monitor risks and call on his or her dentist in case of need.
- **Treatment lifespan:** even if this has already been discussed when defining a treatment plan, the treatment lifespan is an important point to repeat to avoid that the patient feel cheated when a restoration needs to be repaired or replaced.
- **A plan to manage failure:** the possibility that a restoration fails is an important point to discuss.

**TABLE 4 Specific recommendations to patients for performed treatments**

Specific risk awareness	Specific oral hygiene instructions	Managing failure – what’s next?
<b>No restoration: Accept the missing tooth and maintain residual dentition</b>		
<p>Tipping of teeth adjacent to space, over-eruption of opposing tooth: these issues need to be monitored and may lead to compromised oral function.</p>	<p>Reinforce oral hygiene and dietary advice. Daily toothbrushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk; use of interdental cleaning aids such as dental floss or brushes. For details of risk assessment and management of patients at higher caries risk, refer to the FDI Caries Prevention and Management Chairsides Guide. Annual recall for low risk, 3–6 month recall for moderate to high risk.</p>	<p>May need to restore space if there is significant tooth movement or further tooth loss.</p>
<b>Orthodontics</b>		
<p>Plaque accumulation around the orthodontic appliance leading to caries and increased periodontal diseases risk. Root resorption during orthodontic treatment reducing the ability of teeth to support their fixed prosthesis. Teeth fail to move.</p>	<p>Reinforce oral hygiene and dietary advice. Daily toothbrushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk; use of interdental cleaning aids such as dental floss or brushes. For details of risk assessment and management of patients at higher caries risk refer to the FDI Caries Prevention and Management Chairsides Guide. Monthly follow-up for appliance adjustment.</p>	<p>Revise plan of care if it fails.</p>
<b>Restoration: Conventional fixed partial denture (bridge)</b>		
<p>Plaque accumulation around abutments leading to gingival inflammation and/or caries at margin. Higher risk of caries due to maintenance difficulties. Mechanical failure of abutment tooth if it has been endodontically treated. Fracture of the veneering material.</p>	<p>Reinforce oral hygiene and dietary advice. Daily toothbrushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk; use of interdental cleaning aids such as dental floss or brushes. For details of risk assessment and management of patients at higher caries risk, refer to the FDI Caries Prevention and Management Chairsides Guide. Annual recall for low risk, 3–6 month recall for moderate to high risk.</p>	<p>Improve oral hygiene. Removal of marginal caries and seal with adhesive restorative material. Replace bridge if abutment tooth is lost, design driven by length of span and patient preference. Attempt repair of fractured porcelain or worn resin veneering material with adhesive material or adjust sharp edges, may need replacement if repair fails.</p>
<b>Restoration: Resin-bonded fixed partial denture (bridge)</b>		
<p>Plaque accumulation around abutments leading to gingival inflammation and/or caries at margin. Partial decementation that can lead to caries on the underlying abutment. Decementation leading to loss of bridge.</p>	<p>Reinforce oral hygiene and dietary advice. Daily toothbrushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk; use of interdental cleaning aids such as dental floss or brushes. For details of risk assessment and management of patients at higher caries risk, refer to the FDI Caries Prevention and Management Chairsides Guide. Annual recall for low risk, 3–6 month recall for moderate to high risk.</p>	<p>Improve oral hygiene. Removal of marginal caries and seal with adhesive restorative material for early caries. For partial decementation, remove the overlying wing and treat underlying caries if detected, leave remaining structure as a cantilevered bridge. For decementation, attempt replacement, need to ensure removal of adhesive from both the bridge wings and the tooth surface. For repeated decementation, consider alternative replacement options such as implant retained crown/bridge or conventional bridge.</p>

Specific risk awareness	Specific oral hygiene instructions	Managing failure – what's next?
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Restoration: Removable partial denture (RPD)		
<p>Increased caries risk on abutment teeth.</p> <p>Further tooth loss, potentially compromising the function and comfort of the prosthesis.</p> <p>Loss of denture teeth from the prosthesis.</p> <p>Mechanical failure.</p>	<p>Daily toothbrushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk, but consider 5,000 ppm fluoride toothpaste and professional application of fluoride gels or varnish or the use of silver diamine fluoride or chlorhexidine varnish every three months if the patient has a history of recurrent root caries.</p> <p>Thorough cleaning of the denture outside of the mouth with a soft toothbrush and encourage the patient to soak denture overnight in a suitable denture cleanser (avoid hypochlorite cleansers in metal-based dentures).</p> <p>Recall every 3–6 months due to higher risk of tooth loss in these patients.</p>	<p>Reinforce oral hygiene.</p> <p>Replace missing tooth or denture may need to be modified to maintain retention; if not possible, then remake denture.</p> <p>Modification of the prosthesis or replacement with a new prosthesis may be necessary if more natural teeth are lost in the future.</p>

Restoration: Dental implant(s) and restoration		
<p>Development of peri-implantitis around the implants, higher risk in patients with existing periodontal disease.</p> <p>Mechanical failure of the implant or connecting mechanisms.</p> <p>Prosthetic failure.</p>	<p>Reinforce oral hygiene and dietary advice, which reflects the individual's caries risk status for his or her remaining natural teeth.</p> <p>Daily brushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk.</p> <p>Use of interdental cleaning aids such as dental floss or brushes.</p> <p>For details of risk assessment and management of patients at higher caries risk, refer to FDI Caries Prevention and Management Chairside Guide.</p> <p>Annual recall for low risk, 3–6 month recall for moderate to high risk.</p> <p>Review oral hygiene on specified interval of recall.</p>	<p>Treatment of peri-implantitis as it occurs.</p> <p>Repair and/or replacement of restorations as they fail.</p> <p>Modification of the type of prosthesis: for example, converting a fixed prosthesis to an implant-supported overdenture may make the delivery of personal oral care easier.</p> <p>Removal of implants may be necessary in serious cases and other options may have to be considered.</p>

Restoration: Combined options: implant-supported RPD, tooth-supported overdenture, etc.		
<p>Increased caries risk on abutment teeth.</p> <p>Further tooth loss, potentially compromising the function and comfort of the prosthesis.</p> <p>Development of peri-implantitis around the implants, increased risk in patients with existing periodontal disease.</p> <p>Mechanical failure of the implant or connecting mechanisms.</p> <p>Loss of denture teeth from the prosthesis.</p> <p>Prosthetic failure.</p>	<p>Daily toothbrushing with a toothpaste containing at least 1,100 ppm fluoride for a patient with low caries risk, but consider 5,000 ppm fluoride toothpaste and professional application of fluoride gels or varnish or the use of silver diamine fluoride or chlorhexidine varnish every three months if the patient has a history of recurrent root caries or has a tooth-supported overdenture.</p> <p>Thorough cleaning of the denture outside of the mouth with a soft toothbrush and encourage the patient to soak denture overnight in a suitable denture cleanser (avoid hypochlorite cleansers in metal-based dentures).</p>	<p>Reinforce oral hygiene.</p> <p>Replace missing tooth or denture may need to be modified to maintain retention; if not possible, then remake denture.</p> <p>Modification of the prosthesis or replacement with new prosthesis may be necessary if more natural teeth are lost in the future.</p> <p>Treatment of Peri-implantitis as it occurs.</p> <p>Repair and/or replacement of restorations as they fail.</p> <p>Modification of the type of prosthesis: for example, converting a fixed prosthesis to an implant-supported overdenture may make the delivery of personal oral care easier.</p> <p>Removal of implants may be necessary in serious cases and other options may have to be considered.</p>

No restoration: Controlled progression to edentulism		
<p>Failure to adapt to complete replacement denture.</p>	<p>Ensure an adequate understanding of the need to maintain hygiene of the prosthesis and oral soft tissues. Ideally, this should include leaving the prosthesis out overnight, but this may not be practical in reality.</p> <p>Ensure the patient understands the need for routine recall for oral health screening even when edentulous.</p>	<p>Consider implant-supported prostheses (fixed or removable), particularly in younger, middle-aged adults, to reduce the impact of post-extraction alveolar bone loss.</p>

# Concluding remarks

This white paper supports a personalized approach to the treatment and care of partially dentate patients. It advocates for a person-centered approach that considers different risk profiles, needs, and expectations depending on personal circumstances. It presents a continuum of care concept that includes a pre-treatment assessment phase followed by treatment and, finally, by a post-

treatment and long-term care phase. In addition, it summarizes contemporary evidence on different treatment options and technologies. It is hoped that this white paper will contribute to a shift in the pattern of oral healthcare provision towards increased patient-centeredness that will ultimately improve patients' health outcomes, quality of life, and satisfaction with treatment.

## Call to action

### Continuum of care

Caring for a partially dentate patient is a longitudinal process that extends over a longer period of time and includes three main pillars: a pre-treatment assessment phase, a treatment phase, and a post-treatment and long-term care phase. Dentists are therefore called upon to consider each of these three pillars as equally important and to organize their treatment and care plan along this continuum.

### Personalized care

The treatment and care of a partially dentate patient does not fit into a one-size-fits-all model: the best treatment option as well as the most adequate supporting technology depend on the personal situation of each patient. As health professionals, dentists are called upon to strike the right balance between purely clinical elements and patient expressed needs, concerns, and expectations to shape a tailor-made treatment and care plan.

### Patient-dentist communication

Moving from a biomedical, rather paternalistic approach to oral healthcare to a patient-centered model necessitates smooth patient-dentist communication. Dentists are therefore called upon to reflect on the way in which they communicate

with patients as individuals, actively listening to their perspective, giving them opportunities to ask and answer questions as they arise, and ensuring that any communication that takes place is fully understood<sup>26</sup>.

### Patient education

Regular and effective oral hygiene routines are an essential component to maintain good overall oral health and to preserve the restorative work undertaken. It is therefore fundamental that patients receive accurate, fit-for-purpose advice on daily hygiene and, if needed, prosthesis maintenance, which will allow them to play an active part in maintaining their oral health. Dentists are therefore called upon to educate their patients accordingly.

### Financing mechanisms

Entering into a real dialogue with a patient; assessing needs, expectations, fears, and concerns; ensuring patient participation and collaboration; as well as delivering preventive advice are all essential, yet sometimes time-consuming, tasks that form an integral part of the care and treatment of a partially dentate patient. Too often, these tasks are poorly remunerated. National Dental Associations are called upon to advocate for remuneration mechanisms that offer incentives for patient-dentist communication and preventive actions in the best interest of the patient.



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