Complicating Factors in Complete Dentures: Assessing Case Complexity

"In brief" Points

- Dental practitioners must be able to assess complexity in complete dentures and plan care for individual patients.
- Medical, oral and social factors all contribute to case complexity in complete dentures.
- Knowledge of these factors, combined with the ability to identify these through patient assessment, may aid practitioners in making well-informed clinical decisions to support edentulous patients.

Abstract

This article aims to describe common complicating factors that impact on the success of complete denture treatment and present an overview of the challenges these pose in practice. The authors present a range of medical, oral and social factors to consider when providing treatment to edentulous patients; allowing the practitioner to identify cases which may require referral. The information is applicable to all dental practitioners and is a useful aid to highlight complicating factors in individual patients and to make well-informed clinical decisions.

Introduction

The most recent Adult Dental Health Survey reported that over 2.5 million adults are edentulous in England, Wales and Northern Ireland [1]. Whilst the prevalence of edentulism has reduced, this still leaves a large number of people requiring complete dentures to improve aesthetics, speech and function. With the number of patients in the over 75-year age group expected to almost double in the next 20 years, this treatment need will remain [2].

Considering this, dental professionals must possess suitable skills to meet these demands. However, it appears that dental students are becoming less exposed to complete denture treatment, with a wide variation in teaching and clinical targets reported [3, 4]. This in turn, appears to impact on the confidence of recent graduates in providing complete dentures [5-7]. Within the Standards for the Dental Team, the General Dental Council (GDC) ask dental professionals to *"maintain, develop and work within your professional knowledge and skills"* [8]. Dental professionals must be reflective and self-critical of their abilities to provide effective treatment depending on individual patient presentations. This involves making a judgement about whether they possess the appropriate knowledge and skills to treat the patient-specific needs identified during an assessment. Having knowledge of a detailed assessment procedure, highlighting common complicating factors and assessing case complexity in edentulous patients will undoubtedly assist professionals to work within their skill set and refer when appropriate.

This article aims to describe common complicating factors that impact complete denture provision, from both operator and patient perspectives. The awareness of these factors may aid practitioners in making well-informed decisions regarding case complexity in complete dentures.

The First Appointment: Assessment of the Edentulous Patient

The first appointment for edentulous patients should aim to define and address the needs of the patient, as well as identifying any complicating factors that may impact on the success of complete dentures. During this appointment, the clinician must collect as much information as possible in order to make a judgement of case complexity. This will aid appropriate decision making regarding the need to treat or refer to a colleague with additional skills. Once treatment has started, it becomes very difficult for the clinician to reverse this momentum and cease care mid-treatment if they realise the case is beyond their level of expertise.

Considering the time constraints placed upon general dental practitioners, a simple pre-treatment questionnaire can be developed and given to the patient prior to the initial visit, to facilitate this data collection. This small additional step can be invaluable in the early identification of common complicating factors. An example of a pre-treatment questionnaire can be seen in Table 1.

Once the patient attends for the first visit, attention should focus on obtaining as much information as possible through detailed history taking, extra-oral and intra-oral examination (including the assessment of any existing prostheses) and special investigations. This allows the clinician to establish diagnoses and provide a viable treatment plan which addresses any inadequacies noted in the current dentures and a prognosis of the likelihood of success (and failure) of any planned prostheses. The findings can then be discussed directly with the patient and a mutual decision on whether to embark upon complete denture treatment can be made with informed consent achieved.

History taking

A detailed patient history should encompass the following:

- Medical History

- Patient presenting complaint(s)
- Patient expectations of treatment
- Dental History
- Social History
- Information regarding oral hygiene regimes
- Information regarding routine dietary habits

The practitioner should spend the majority of the initial consultation gathering a history of the patient's presenting complaint. There should be a specific focus on obtaining a "denture history" that explores previous experiences (positive and negative) with complete dentures. If the patient is currently wearing dentures, efforts should be made to understand exactly what the patient dislikes about their current set as well as documenting any recurring issues in all historic sets of dentures. This will facilitate the identification of areas that the patient is particularly concerned about, with an aim to determining whether improvement can be achieved with any potential new prostheses. This information also provides essential insight into the expectations of the patient.

Clinical examination

Clinical examination should begin with an extra-oral examination to assess the anatomical structures of the head and neck for areas of pain, tenderness or swelling. This should include examining the lymph nodes of the head and neck region for lymphadenopathy and palpation of the temporomandibular joint and muscles of mastication. Finally, variances in skeletal relationship and facial profile as well as noticeable facial asymmetry should be determined.

Following this, an intraoral examination should be undertaken, initially without the dentures in place. The intra-oral soft tissues must be examined for the presence of pathology. The lubrication of the oral mucosa can also be noted at this stage. Assessing the alveolar ridges is an essential part of the

intra-oral examination for edentulous patients. This assessment typically considers the form and amount of resorption of the alveolar ridges, as well as the condition of the alveolar mucosa, the sulcus depth and the location and position of the insertion of muscle attachments.

Examination of Existing Dentures

Studies have shown that the quality of prostheses have a significant impact on patient satisfaction [9]. Therefore, a thorough investigation of the quality of the existing dentures is an essential part of an edentulous patient assessment. This should allow the clinician to make a judgement whether a realistic improvement is likely and whether this will match the patient's hopes and aspirations for the new prostheses. Key features to assess in relation to existing dentures include:

- *Coverage of Complete Denture Bearing Area:* with a particular focus on posterior extensions in the maxilla and mandible.
- *Under-/Overextensions:* a common cause for loss of retention with existing prostheses.
- *Occlusal Vertical Dimension (OVD):* a significant loss of OVD can be noted in patients that have used worn dentures for an extended period of time. Careful consideration has to be made on the adaptive capability of a patient to cope with a large change in OVD if the 'ideal' 3-4mm of FWS is to be created for the new dentures.
- *Aesthetic Features:* including the shade and mould of existing teeth, the degree of lip and facial support they provide, the width of the arch and the buccal corridors, occlusal planes and midline discrepancies.

Special investigations

For the edentulous patient, special investigations, including radiographs, are usually not required. However, if the practitioner is suspicious of retained roots, these may be confirmed via periapical radiographs or an orthopantomogram if deemed necessary. Other investigations including salivary flow tests, oral rinses to detect for Candida infections and biopsies of areas of abnormal mucosa may

be necessary in certain situations. It is likely that these investigations will require referral to secondary care.

Success in Complete Dentures

The ability to achieve a successful outcome in complete dentures may differ to other aspects of clinical dentistry. Historically, success in complete dentures was presumed to be completely dependent on the techniques and skills employed by the operator. However, recent studies have demonstrated no significant differences between clinical fabrication techniques, although the quality of evidence is very low [10, 11]. Increasing attention has been directed towards patient-dependent factors and studies have shown that the clinician/patient relationship [12] and patient personality [13-15] play a vital role in the treatment outcome. The authors would argue that success in complete dentures is dynamic and highly dependent on the patient, however there is still a need to consider operator-dependent factors due to the low level of existing evidence.

Common Complicating Factors in Complete Dentures

Systemic Factors

Neuromuscular Disorders

Neuromuscular disorders, such as Parkinson's Disease, often have a huge impact on a patient's oral health and tolerance of prostheses [16, 17]. Patients presenting with neuromuscular disorders commonly take medication that reduce salivary function. Patient tolerance or acceptance of removable prostheses is commonly reduced in patients with neuromuscular disorders due to the impeded control of oral musculature and the common occurrence of xerostomia.

These disorders can also increase the complexity of the clinical stages of complete denture fabrication. Due to involuntary muscle tremors, it can be extremely difficult to accurately record maxillomandibular relationships in centric relation (CR). Additionally, it can be very challenging to measure the Resting Face Height (RFH) or Occlusal Face Height (OFH), which complicates the provision of an appropriate Freeway Space (FWS).

Deterioration in Cognitive Function

Patient cooperation, oral health maintenance and the ability to obtain informed consent are impacted in patients with an established deterioration in cognitive function [18]. These challenges impact on the formation of positive patient-dentist relations and may impede complete denture success. Equally, patients must be able to understand and respond to instructions in order to obtain optimal results in impression taking and jaw registration. If all of these aspects of patient management are impacted by reduced cognitive functioning, these in turn are likely to affect the technical quality and patient acceptance of complete dentures.

Oral Factors

Dry Mouth

Dry mouth may present as a symptom (termed xerostomia) or it may be detected by the clinician during intra-oral examination. Common causes of dry mouth include medications and polypharmacy, systemic conditions including Sjögren's syndrome and Diabetes mellitus, head and neck radiotherapy and various lifestyle choices [19]. Dry mouth has been demonstrated to have a significant impact on patient satisfaction of complete dentures, with most common complaints related to prosthesis instability and soft tissue soreness and discomfort [20].

Atrophic Alveolar Ridges

Atrophic alveolar ridges present significant challenges in the provision of complete dentures. Evidence from the literature suggests this is a particular issue in the mandible, with atrophy being more common and presenting as a more significant negative factor in patient satisfaction with mandibular dentures [13, 21, 22].

The most commonly used classification of edentulous ridges is the *"Classification of the Edentulous Jaws"* by Cawood and Howell [23], which was a progression of previous work by Atwood [24]. This classification can be seen in Table 2 and a clinical photograph of an atrophic mandibular ridge can be seen in Figure 1. Additionally, Leyssen *et al.* have recently published a new classification for edentulous ridges, which takes into account potential complications that arise during denture construction [25].

The reduction in the denture bearing area has implications on the retention and stability of prostheses and this must be explained to patients prior to treatment, to manage expectations. Significant resorption also presents increased technical challenges including the ability to achieve accurate functional impressions and jaw registrations.

Fibrous Tissue

Large areas of fibrous tissue increase treatment complexity [26]. It is most commonly seen on the anterior aspect of the maxillary ridge and may present retention and stability issues in the final prosthesis. This is often due to the movement of the underlying tissues rather than the prosthesis itself. The management of significantly fibrous ridges typically involves more advanced impression techniques that may not be within the skill set of all practitioners.

Tori, Bony Prominences and Unfavourable Undercuts

The presence of tori, irregular bony prominences and large undercut regions may impact on the ability of the clinician to utilise the complete denture bearing area when designing the prostheses. Relatively common presentations include palatal and mandibular tori, bony exostoses, prominent genial tubercles in atrophic ridges and irregular bony ridges in recently edentulous patients. Clinicians often have to make a choice to either reduce the extensions of the denture or block out the undercuts, both are likely to impact on the success of the final prostheses.

Gag Reflex

Whilst not as common as some of the problems previously discussed, significant gag reflexes often create problems in complete denture construction. This should be checked prior to complete denture provision and a simple test involves palpating the denture bearing area with a finger or a round-ended dental instrument. If the patient cannot tolerate this test, additional clinical, behavioural or psychological techniques may be required to manage this reflex prior to complete denture provision.

Strong Perioral Musculature and Tongue Spread

If optimal denture stability in function is to occur, it is important to ensure that the polished surfaces and teeth are positioned in the neutral zone. Restriction of the neutral zone with either strong perioral musculature or lateral tongue spread often requires some "patient training" and more advanced techniques to be able to achieve suitable polished surfaces and tooth positions [27].

Limited Mouth Opening

Limited mouth opening can present problems at all stages of complete denture provision. If placing a stock edentulous tray into the patient's mouth presents a challenge, the ability to accurately record impressions and jaw registration will inevitably be compromised and may require more advanced techniques [28].

Presence of Sub-mucosal Retained Roots

The presence of sub-mucosal retained roots may complicate the success of a complete denture. Careful palpation of the ridges and a visual check should be made for communications, punctum and unusual raised areas on the proposed denture bearing areas. If roots are suspected, a radiograph should be requested to either confirm or rule out their presence. If confirmed, clear communication with the patient regarding the appropriate management is vital. If the patient wishes to defer initial intervention, the risk of short-term problems, such as post insertion pain [29], retrospective surgical intervention and relining of the definitive prosthesis must be discussed.

Variances in Skeletal Relationships

Variances from a Class I skeletal relationship can present challenges in jaw registration and selecting tooth positions. It is often difficult to strike a balance between denture stability and optimal aesthetics. Practitioners should take particular care in placing the lower denture teeth over the underlying ridge, to maximise lower denture stability in function, which often means diverting from "optimal" overjet and overbite.

Significant Facial Asymmetry

The jaw registration stage will determine much of the final aesthetic result of the dentures. It is recommended in most cases that the incisal and occlusal planes of the upper denture are made parallel to the interpupillary and alar-tragal lines respectively. However, the clinician may need to deviate from this in a patient with significant facial asymmetry, in order to achieve an aesthetic result [30]. Most patients will present with a degree of minor facial asymmetry, but the clinician must assess whether this falls within normal boundaries. Patients who may present with significant facial asymmetry include those who have experienced facial palsy, different craniofacial syndromes or a history of severe trauma.

Social and Behavioural Factors

Bruxism and Parafunctional activity

Positive findings of tenderness to palpation of the muscles of mastication are suggestive of a grinding or clenching habit. If suspected, the patient should be informed they are likely to require more frequent repair and replacement of dentures due to the excessive forces being applied. These patients should be strongly encouraged to leave the dentures out at night and be warned of the increased risk of tenderness to the underlying mucosa [31].

High Patient Expectations of Complete Dentures

The assessment of patient expectations of complete dentures is multifaceted, particularly important lines of enquiry are:

- *Complete Denture History:* this is a useful indicator of patient expectations and past satisfaction with complete dentures. It is more likely that a patient may have unrealistically high expectations if they have received a number of sets of complete dentures in a relatively short period of time.
- *Perceived Issues with Existing Dentures:* perceived looseness or aesthetic issues that are not in agreement with the practitioner's findings of the existing set are unlikely to be remedied when making a new set and may be suggestive of unrealistic expectations.
- *General Perceptions of Dentures:* patients who do not want dentures or have a strong desire for other treatment modalities are less likely to be satisfied, regardless of the quality of the prostheses [32].
- *Denture Experience:* patients with experience in wearing dentures may have moderated their expectations over time but importantly may have developed appropriate

neuromuscular control to tolerate dentures. Patients wearing dentures for the first time should be made aware of the potential need to undergo a period of "self-training".

- *Denture Secrecy:* some patients place huge importance on concealing their "status as a denture wearer" and therefore any changes to design or appearance may heighten their fear of being "exposed". If high aesthetic demands are present in combination with denture secrecy it may be suggestive of a neurotic personality trait, which is associated with decreased satisfaction with complete dentures [13, 14].
- *Denture Fixative:* a dislike or refusal to use denture fixative may also present problems. It is vital that the clinician approaches this subject at the first visit and demonstrates how fixative can be used to maximise denture retention and comfort. If a patient presents with some of the complicating factors previously discussed in relation to anatomy, and yet complains of looseness, fixative may need to become part of their denture wearing routine.

By the end of the first appointment, the clinician should be well placed to identify the presence of any complicating factors impacting denture provision. As seen in Table 3, it is important to recognise the stages of complete denture construction that are likely to be impacted the most. Once these have been identified, the practitioner may choose to schedule a longer appointment time for specific clinical stages that have been identified as more challenging than in a routine case.

In anything other than a straightforward case, the authors recommend that a decision is not made instantly, but time is taken to evaluate the complicating factors discussed in this article. A final, carefully considered decision can then be made whether to treat or refer to a colleague with appropriate skills. The patient can then be contacted to inform them of the decision and an explanation can be provided as to why their case provides a high degree of difficulty, and why referral may provide a better chance of success. Clearly identifying the specific obstacles to

treatment will then enable the clinician to structure a detailed referral letter to present to a secondary care institution or a practitioner with special interest.

Conclusion

There are multiple systemic, oral and social factors that can affect clinical techniques and patient perceptions of complete dentures. Identifying these factors through a structured patient assessment may aid practitioners in making well-informed clinical decisions to provide the best care for their patients.

Declaration of Interests

The authors declare no conflicts of interest.

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Table 1 - An Example of a Pre-Treatment Questionnaire for Edentulous Patients.

Question	**Answer**
Why do you feel you need a new set of dentures?	
In the last 20 years how many sets of full dentures have you had?	
How old were you when you first started wearing full dentures?	
Do you think your dentures are very loose? Please state if this is the upper, lower or both dentures	
Are you happy with the appearance of your dentures? If not, why?	
Do you currently use Denture Fixative? If not, why?	
Does your partner/best friend know you wear full dentures?	
Do you sleep in your dentures?	
Do you often have a dry mouth?	

Table 1 - Cawood and Howell Classification of the Edentulous Jaws (23).

Class I	Dentate
Class II	Immediately post extraction
Class III	Well-rounded ridge form, adequate in height and width
Class IV	Knife-edge ridge form, adequate in height and inadequate in width
Class V	Flat ridge form, inadequate in height and width
Class VI	Depressed ridge form, with some basalar loss evident

Table 3 –Summary table: stages of complete denture construction affected by the complicating factors discussed

Complicating Factor:	**Stages of Complete Denture Construction Most Affected:**
Neuromuscular disorders	Jaw registration, review
Deterioration in cognitive function	All stages
Dry mouth	Review, secondary impressions with zinc oxide eugenol materials
Atrophic ridges	All stages
Fibrous tissue	Secondary impressions, review
Tori, bony prominences and unfavourable undercuts	Primary and secondary impressions, try in, fit, review
Gag reflex	Primary and secondary impressions most challenging, although impacts all stages
Strong perioral musculature	Secondary impressions, jaw registration, try in, fit, review
Limited mouth opening	All stages
Submucosal retained roots	Review
Variances Skeletal relationship	Jaw registration, try in
Significant facial asymmetry	Jaw registration, try in
Bruxism and parafunctional activity	Fit, review