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Stephen Davies

A Guide to Good Occlusal Practice

Second Edition

BDA
British Dental Association

Springer

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Preface

There is a very long list of contributors to this work. Without their expertise this multi-disciplinary work on the provision of Good Occlusal Practice would not have been possible. I am very fortunate to have had the expertise, support and energy of such a loyal and kind group of professional friends. Special thanks go to Indika Weerapperuma who, in addition to having contributed to two chapters, has been my sounding board for ideas and has proofread the book. Each chapter has evolved from an initial discussion with the specialist(s), from which a first draft was created. Throughout the development, Occlusion has been kept as the central theme. After a lifetime of teaching the Occlusion, it is my experience that both undergraduate and postgraduate students approach the subject with the mistaken belief that it is somewhere between difficult and incomprehensible. It has been a privilege to experience a colleague's joyous realisation that the subject is not as difficult as they thought. It is my sincere hope that the reader's reaction will be the same.

At Springer/Nature: I would firstly like to thank James Sleigh for the invitation to rewrite the 2002 BDJ book *A Clinical Guide to Occlusion*; my special thanks go to Alison Wolf who has consistently supported and guided me through the publication stage of this work.

I would like to thank Mrs Mandy Lynam, who as my dental nurse would not let me dismiss a patient with a poorly occluding restoration even if I had wanted. Gordon Lucas, my technician partner, has been the talented and reliable provider of all my indirect restorations for more than 40 years. Finally, I would like to acknowledge the clinical companionship and academic encouragement that the Manchester Dental School and Hospital provides; I am blessed to be part of that community.

Finally, and above all others, I want to thank my wife for her patience and understanding. When I qualified and we married in 1971, we both thought that Dentistry would just be my job.

2022, Manchester, UK — Stephen Davies

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Readers' Voices

Tara Bharadia 5th Yr Dental Student Dr. Davies has always said that occlusion is easy, and this book is the proof! In the run up to finals, a once mystical and daunting topic now seems tame and manageable. All the terms are properly explained right at the start and there are chapters to refer to when you have specific questions further on in your career. You will come away being confident with the theory as well as comfortable with the practical elements of examination and treatment considerations. I would recommend this book to anyone who is confused by Occlusion!

Don Jayawardena Dental Core Trainee This book has easy to understand explanations regarding terminology and in taking occlusal records. Most important to me as a DCT it gives clear guidance on when to reorganise or to conform—a question I am often asked! The author suggests planning the occlusion using the EDEC principle, and he highlights useful techniques for taking pre-treatment records; these are useful in my current restorative DCT post.

Chris Needham Experienced GDP, Pre PG qualification Despite being an experienced GDP, Occlusion was a subject that I thought I might never fully comprehend. This book really does simplify Occlusion, explaining the common pitfalls and how to avoid them. I have picked up many techniques that I now use daily. This is essential reading for all General Dental Practitioners, because it will give them confidence to carry out Good Occlusal Practice in all of their treatments. I feel much more confident to pursue PG education in Advanced Restorative Dentistry.

Amy Burns Post Graduate Student A refreshing common-sense approach to dealing with clinical scenarios from simple cases up to more advanced dentistry. I have previously found the subject of occlusion daunting; however the step-by-step approach in this book has broken it down into easy to grasp concepts. I feel confident applying this to my clinical work, and it has given me a robust understanding which has been invaluable for studying for my MSc.

April Scholey GDP with PG qualification A brilliant summary of how occlusion affects our everyday dentistry. Postgraduate education has taught me that occlusion is that missing link that ties together all aspects of dentistry. It can be the cause of restoration failure and needs to be considered at the planning stage, not as an

afterthought. This book is an excellent, evidence-based summary that encompasses a long career of research and clinical practice from an inspiring practitioner—all condensed in one place!

James Darcy Consultant in Restorative Dentistry This book seeks to demystify Occlusion. It is logical in progression from basic to advanced aspects of Good Occlusal Practice in Restorative Dentistry. It outlines the key information and reinforces the most important messages, not least the EDEC principle. This update also discusses newer thinking on more flexible approaches to rehabilitation which introduces pragmatism into case planning and delivery of treatment. I would recommend all practitioners read and keep a copy of it on their shelves for reference.

Nick Grey Professor of Dental Education, University of Manchester and National Teaching Fellow This book is a 'must read'. It covers the management of clinical issues that confront the profession and does so in a reader-friendly way.

What Is Occlusion?

1

Objective

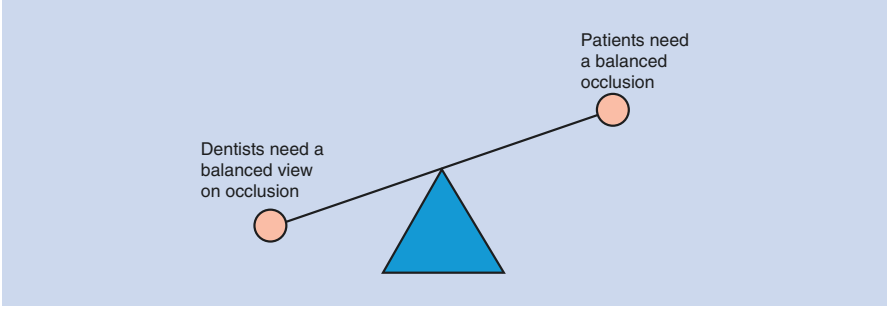
The aim of this book is to explore the role of Occlusion in Dental Practice.

There is an enormous range of opinion within the dental profession regarding the significance of Occlusion [1]. It is very important that the profession in general and practising dentists in particular have a balanced view of Occlusion.

To be controversial from the start, having a broad consensus within the profession on the importance of Occlusion is more important than every patient having a balanced occlusion.

The fact that the study of occlusion is characterised by extremes of opinion makes it confusing and difficult for individual dentists to subscribe to a philosophy which is in line with contemporary good practice supported by evidence from practice-based research. I hope that this book will make it easier for individual dentists to find a philosophy that helps them in their everyday practising life; and that some of the ideas expressed in this book will find favour with the profession. Above all, I hope that the reader will detect a 'common-sense approach', whilst still finding it supported by evidence.

There is some evidence that 'Occlusion' could be covered in undergraduate curriculums with a more 'coordinated teaching strategy'. I will be pleased if this book can make a contribution to that aim [2].



S. Davies, *A Guide to Good Occlusal Practice*, BDJ Clinician's Guides,
https://doi.org/10.1007/978-3-030-79225-1_1

In this chapter, we will discuss:
1. What is '*Occlusion*'.
2. Why Occlusion is important.
3. The significance of *Ideal Occlusion.*

Range of Opinion

At one end of the spectrum there are dentists who believe that they can go through their working lives with scant regard for their patients' occlusion. They seem to believe that they can conduct their practice ignoring the occlusal consequences of the treatments that they perform daily. Whereas all dentists know of the importance of the good marginal adaptation of their restoration to the health of the adjoining dental and periodontal tissues, some dentists do not appreciate the potential consequences of poor occlusal contact to the opposing teeth and their supporting structures. This is bizarre given the fact that very few dental treatments do not involve the occlusal surfaces of teeth.

Conversely there is a body of opinion that considers Occlusion to be of such systemic import to the well-being of our patients, that 'Occlusion' takes on an almost mystic importance and attracts a cult-like devotion (Table 1.1). This can lead some dentists to advocate occlusion as being the key to resolving or preventing a range of disorders far removed from the Masticatory System, for example prolapsed lumbar discs. Often such enthusiastic fervour is associated with a didactic prescription of 'occlusal rules', to which there must be slavish adherence in the treatment of every patient! It may be harsh to describe the devoted adherence to a particular Occlusal Philosophy as a 'cult', but sometimes characteristics like gurus and followers and an intolerance of any other belief can justify this perception.

There are several dangers in these extremes:

Both may lead to inappropriate levels of care for our patients.

- The 'Occlusion doesn't matter' group may undertreat patients or provide treatments that can lead to iatrogenic damage.
- Whereas the 'Correct Occlusion is the key to a whole body musculo-skeletal harmony' group may overtreat patients by providing irreversible treatments without a solid evidence base.

Table 1.1 It has been claimed without evidence that occlusion causes

Temporomandibular disorders	Poor posture
Excessive ear wax	Speech defects
Prolapse of lumbar disc	Negative influence on the craniosacral mechanism
Reduced strength in deltoid and rectus femoris muscles	Lack of beauty

The Confusion and Controversy that is generated by this wide range of opinion on the importance of Occlusion causes an anxiety in the minds of undergraduate and postgraduate students. It makes many of them feel that Occlusion must be very difficult.

It is not surprising that these two extreme views co-exist so easily within a thinking profession because the one appears to provide the justification for the other. The 'occlusion doesn't matter' group probably justify their reluctance to become 'involved in occlusion' on what they perceive to be the exaggerated and unsubstantiated claims of the group who believe occlusion to be the central pillar of holistic care. This congregation of opinion in turn may be so frustrated by the apparent disregard of the study of occlusion that they are led to 'gild the lily' by overstating the importance of occlusion and then in the absence of what they perceive to be an inability 'to see the obvious' they go on to lay down rules, which they encourage all dentists to follow for every patient.

'**Occlusion**'
There is no escape
Dentists cannot:

- Repair
- Move
- Remove

} teeth

without being involved in occlusion

It is the objective of this book to explore the role of occlusion in dental practice in a manner based on reason, common sense and evidence. There is good and bad practice in occlusion as in other aspects of clinical dentistry. I hope, therefore, to establish the concept of *Good Occlusal Practice*, in all of the dental disciplines.

Guidelines of Good Occlusal Practice

These Must Be Guidelines Not Rules

All patients are different, reacting to similar stimuli in different ways. This is an accepted truth in medicine, so I do not see why it should not apply to Occlusion in dentistry. As a consequence, I believe that a patient's individual needs can and should be left to the individual clinician.

It is my hope that the Guidelines of Good Occlusal Practice in this book will appeal to my colleagues. And that, upon reflection, the reader will agree that some are obvious, and hardly needed stating.

The fog of confusion and controversy must be cleared, because no practising dentist can care well for their patients without having regard for Good Occlusal Practice.

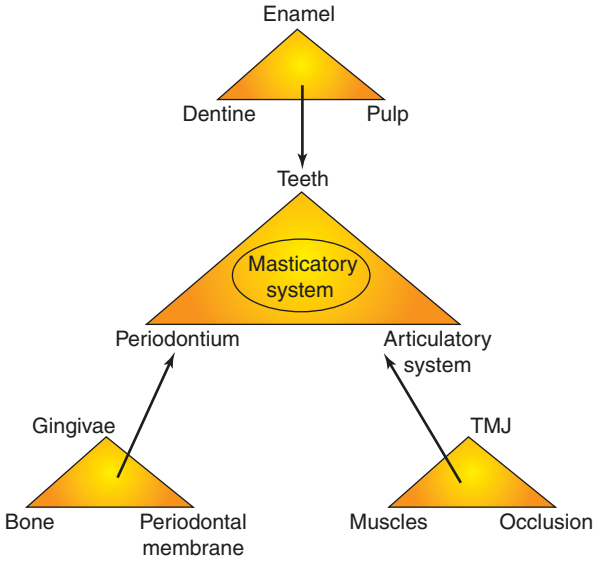


Fig. 1.1 The Masticatory System

The Importance of Occlusion in Dental Practice

Occlusion can be very simply defined: it means the contacts between teeth.

Before describing the significance of the different ways in which occlusal contacts are made Occlusion needs to be put into context.

The Masticatory (or stomatognathic) System (Fig. 1.1) is generally considered to be made up of three parts:

- Tooth Tissues.
- Periodontal Tissues.
- Articulatory System.

Many dentists feel that they qualified from their dental school with a very good knowledge of the first two parts of the Masticatory System, namely the Teeth and the Periodontal Structures, but they can feel vulnerable in their knowledge of the third part: the Articulatory System. It appears that some dentists feel that their time at university did not prepare them adequately in this area. Possibly Occlusion may be undertaught in the undergraduate curriculum.

> 'Occlusion' = Contacts between teeth

In my view, we should not be too hard on our Schools as the undergraduate dental education must, by necessity, concentrate initially on the first two parts of the Articulatory System. Dental Schools must produce newly qualified dentists who are

able to treat patients. Only once the dental undergraduate has an understanding of the diseases that affect the dental and periodontal tissues (parts 1 and 2 of the Masticatory System) can the schools start to allow the student to treat patients. There is consequently justification for the study of the Articulatory System being considered to be chronologically the third area of study. But because of the inescapable fact that almost all dental treatment has an occlusal consequence, it is wrong to consider the study of the Articulatory System to be less important than the first two parts of the Masticatory System.

The Articulatory System is the biomechanical environment in which dentists provide most of their treatments.

Given the increasing quantity of knowledge to be amassed in the modern undergraduate course, it may be that those responsible for setting the dental undergraduate curriculum will not be able to cover the Articulatory System as they would wish. Now that there is a universal acceptance of the need for continuing education, it may be more realistic to consider a comprehensive study of the Articulatory System as the first mandatory element of a postgraduate dental education. Although it may be, by necessity, the last to be learnt it is not less important than the other parts of the Masticatory System.

Is the Articulatory System a True System?

A system is defined as: *'A set or assemblage of things connected, associated, or interdependent, so as to form a complex unity'* [3]. The Articulatory System meets these criteria, so the answer to this question is: Yes.

In this system one can imagine the temporomandibular joints as the hinges, the masticatory muscles as the motors and the dental occlusion as the contacts (Fig. 1.2b).

When viewed in these mechanical terms (Fig. 1.2b), it is clear that the elements of the Articulatory System are inescapably connected. Furthermore, it can be argued that they are obviously interdependent because a change in any part will clearly affect the other two parts (Fig. 1.3a). But it should be remembered that this effect will not necessarily be an adverse one. In fact, one must suppose that the system as a whole can, in the vast majority of cases, compensate for change. This phenomenon can be described as Adaptive Capability and is a feature of living systems. In contrast, a machine has been described as a '*System that is not the result of a fertilized egg*', i.e. it is not capable of adaptation [4]. This is an important reassurance to clinicians, as it means that an intervention to or alteration of one element of a system, such as the dental occlusion, will not always have an adverse effect on another part of the system, for example, the masticatory muscles. Any dentist who believes that a change in the occlusion will always have an adverse effect on the muscles or the TMJs is treating the patient *mechanically*, which given the definition of a machine is a damning commentary of their clinical nous. This concept of adaptive capability is important when considering Ideal Occlusion, as will be discussed later.

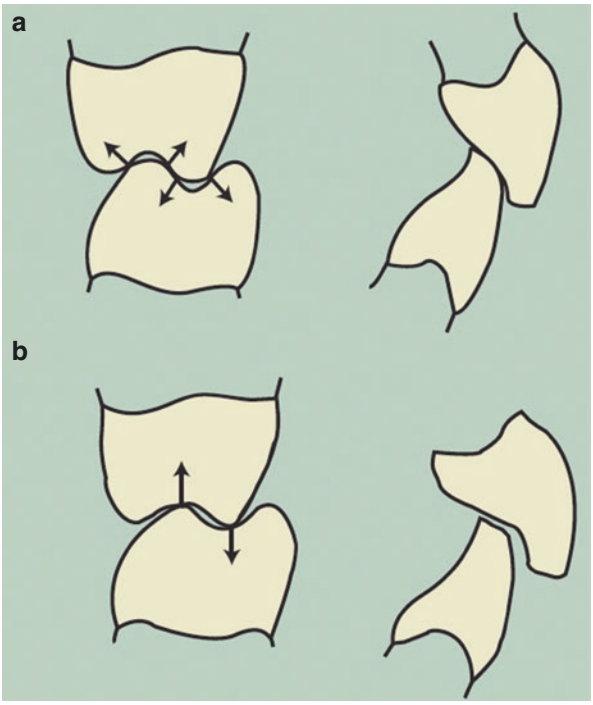


Fig. 1.5 (**a**) No freedom in centric occlusion. (**b**) Freedom in centric occlusion

In Fig. 1.5a, there is no Freedom in Centric Occlusion. Another way of thinking about this phenomenon is to consider that the occlusal contacts have 'locked in' the mandible to the maxilla. In contrast Fig. 1.5b demonstrates a situation where the mandible can move anteriorly, for a short distance, in the same sagittal and horizontal planes.

Other aspects of the Static Occlusion that can be described are

- the extent of the posterior support,
- the Angle's classification of the incisor relationship together with measurement of the overbite and overjet,
- the existence of any crossbites.

The answer to the question 'Does Centric Occlusion occur in Centric Relation?' is a useful one, because it describes the relationship of the mandible to the maxilla when the teeth fit together. In some ways the answer to the question 'what is the Jaw Relationship when the teeth fit together' would be more useful. But given that there is no way of reliably imaging the position of the head of the condyle in the glenoid fossa [6], this is a question to which there is no answer.

The word **'Centric'** is an adjective.
It should only be used to qualify a noun.
Centric *what?*

Although there is no significant translation within the Working Side TMJ, there can be a movement of the condyle. This is sometimes called 'Bennett Movement'. A better term is *'immediate side shift'*, because the movement is:

- Immediate [*It occurs at the very beginning of the Lateral Excursion.*]
- Non-progressive [*It finishes almost as soon as it has started.*]
- Lateral [obviously if the mandible is moving *medially* on the NWS.]

This movement

- is variable from patient to patient.
- is the consequence of the WS condyle being joined to the NWS condyle.
- is difficult to observe, measure and reproduce on an articulator.
- can be significant to the comfort of a posterior restoration.

Figure 2.1 provides an illustration on mandibular movement during a right lateral excursion.

Bill is controlling the Working Side, and Ben is in charge of the Non-Working Side.

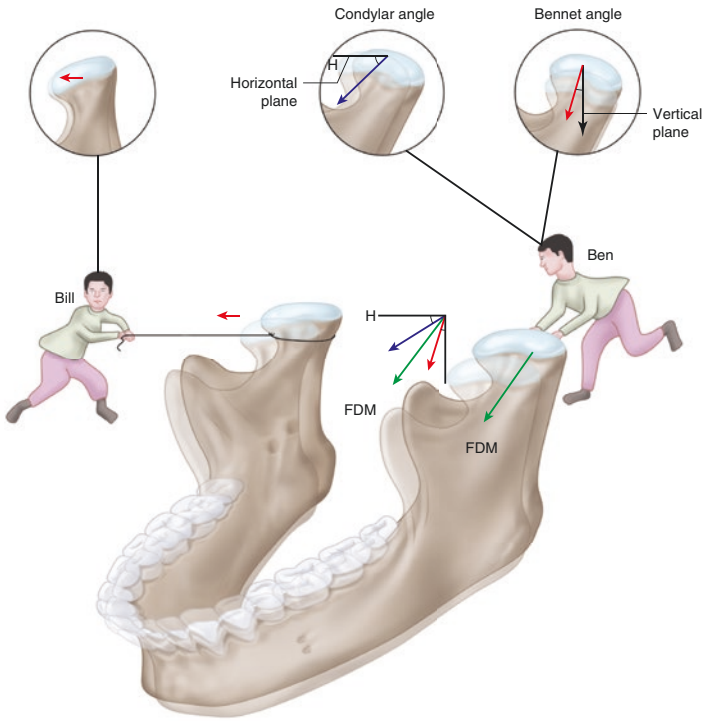
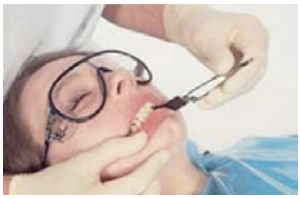


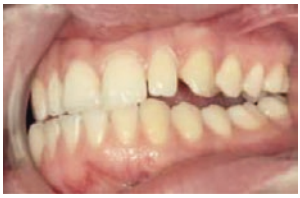
Fig. 2.1 Illustration of the direction of mandibular movement

Fig. 2.7 How to examine anterior guidance

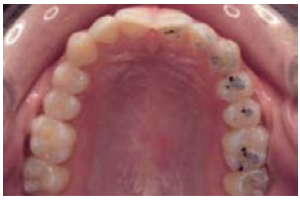
- Finding whether there are **Non working side** interferences, by trying 'a pull out'



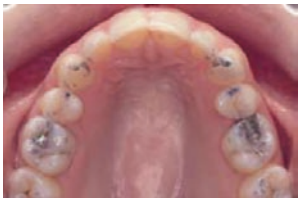
- During this right lateral excursion, there is a NWS interference between UL6 (26) and LL7 (37)



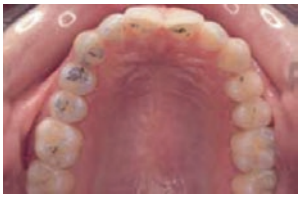
- Examining for the existence of working side interferences by marking the contact between the teeth during a slide to the working side (as illustrated)
- Next mark the centric occlusion stops in a different colour (not illustrated)



- Example of canine guidance



- Example of a group function



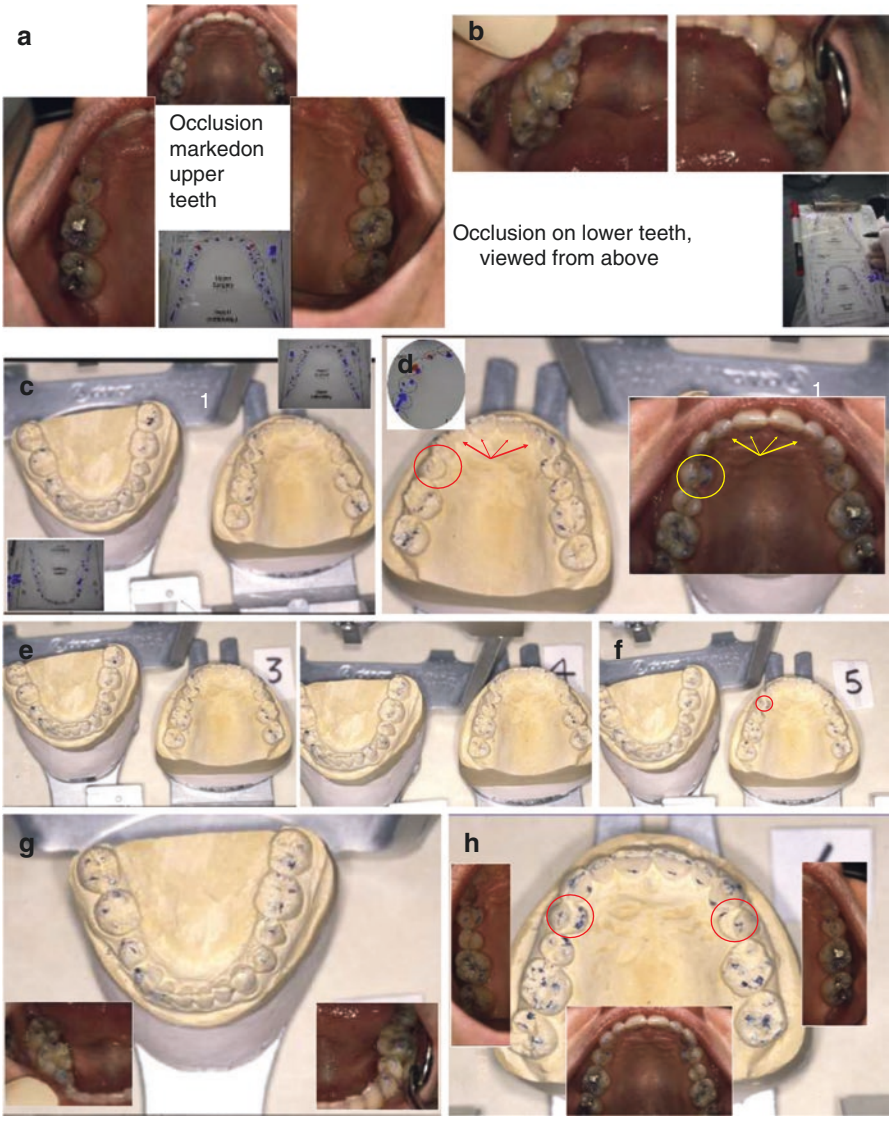


Fig. 3.24 Case illustrating model grooming (**a**–**h**) (**c**) Occlusion of Mounted Models compared with Occlusal Sketch. (**d**) Occlusion of upper Mounted Model compared with Occlusal Sketch and photograph of upper dentition (**e**) Model Grooming in Progress (**f**) Model Grooming Continues: First sign of improving accuracy [UR4] (**g**) Model Grooming Completed: Lower model now has same occlusion as in the mouth. (**h**) Model Grooming Completed: Upper model has same occlusion as in the mouth

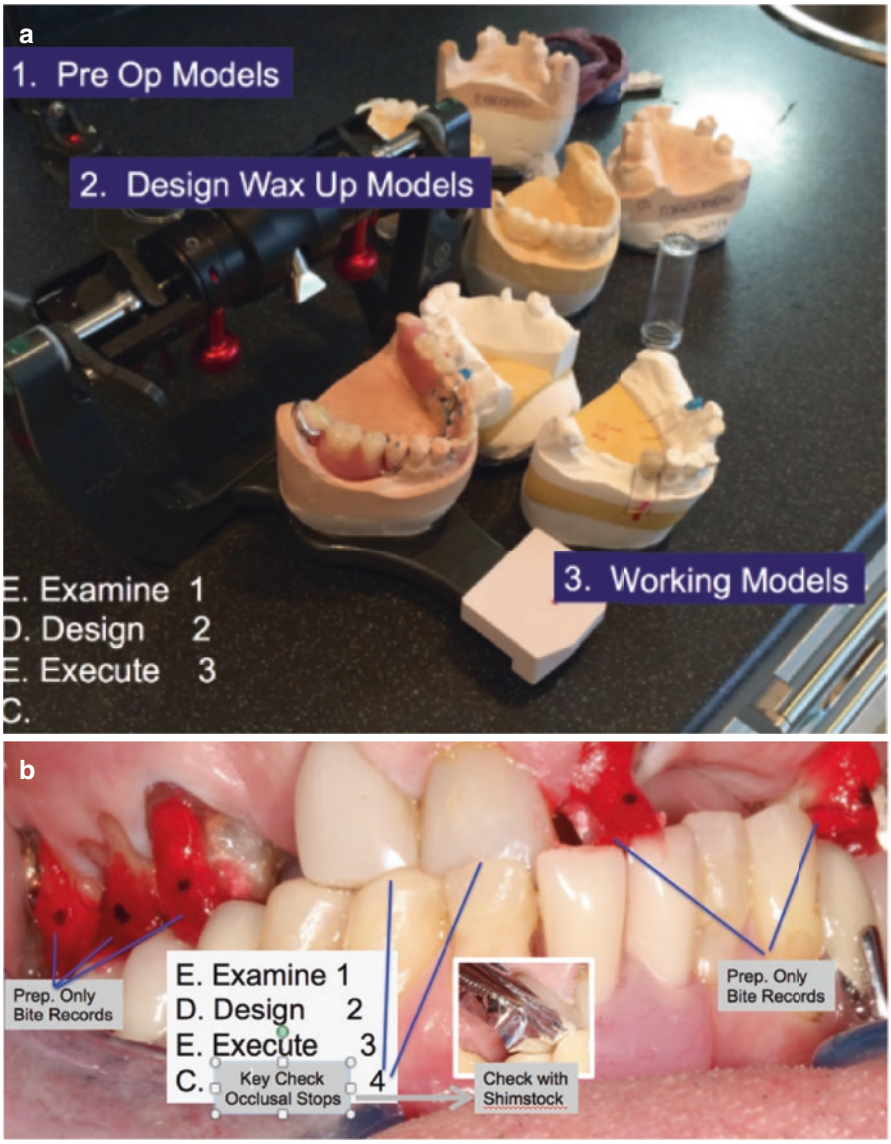


Fig. 4.3 (**a**, **b**) Shows a case involving the restoration of most of the teeth

Figure 4.3a illustrates the stages that were needed to ensure that it was possible to design a Conformative treatment plan.

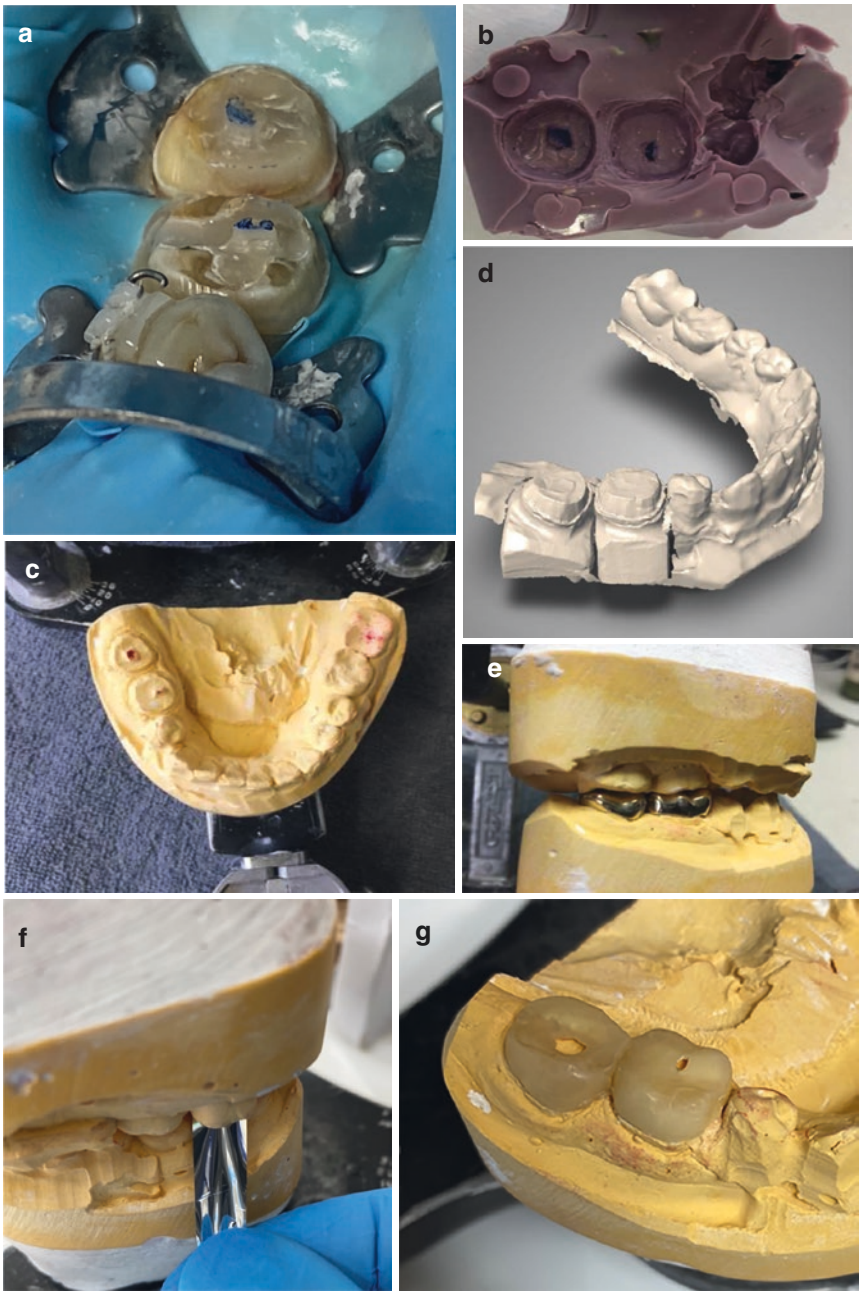


Fig. 4.5 (**a**) Teeth prepared for crown, but with the Centric Stops preserved. (**b**) Small check impression taken before rubber dam is removed. (**c**) Mounted Model of full arch impression. (**d**) Digitised lower model AFTER technician has removed Centric Stops. (**e**) Crowns on mounted models [the buccal aspects of the teeth anterior to the crowns is not accurate, because the patient was in fixed orthodontic brackets]. (**f**) Checking that the occlusion of the other teeth is preserved. (**g**) the temporary crowns placed onto the working model to illustrate where the Centric Stops were

The reason why growth modification and orthognathic surgery are discussed in a book on occlusion is that orthodontic success cannot be judged by occlusal outcome alone.

4.2 Growth Modification

Growth modification comprises an attempt to modify the underlying hard or soft tissues to bring about skeletal and dentoalveolar change. In a growing child, a functional appliance is most common treatment choice for a developing Class II skeletal problem. It has the aim of enhancing mandibular growth and restrain maxillary growth (Fig. 6.8).

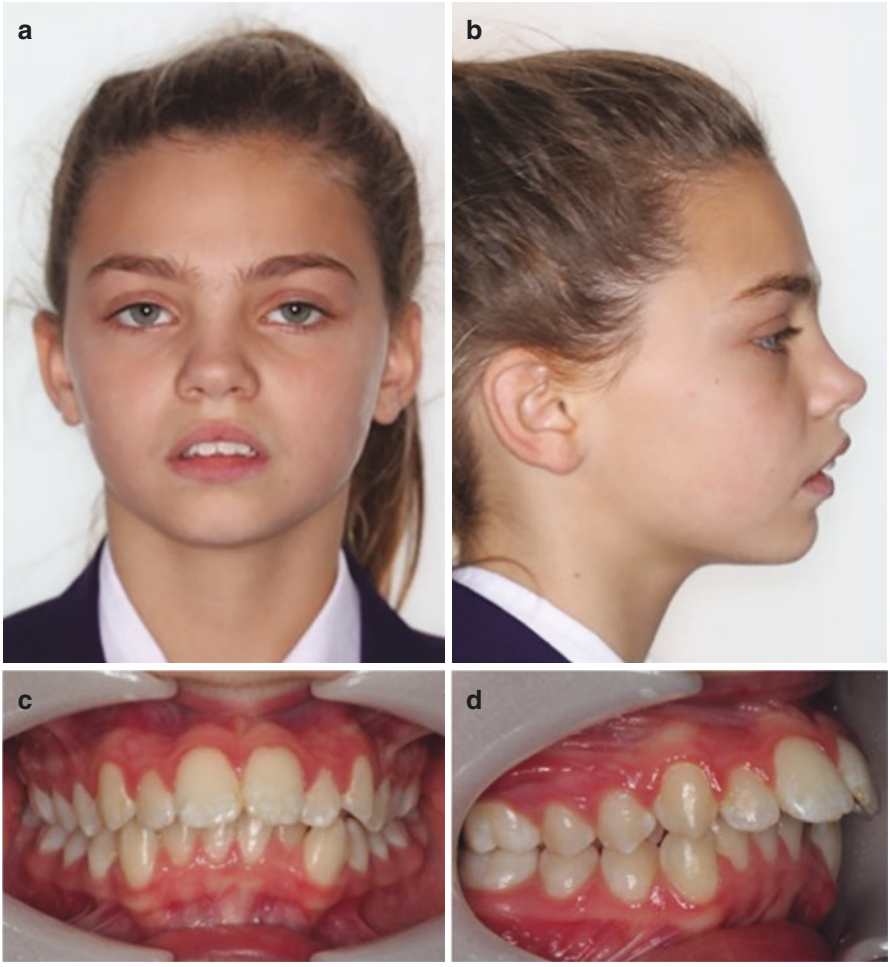


Fig. 6.8 (**a**–**d**) Pre-treatment photographs of a Class 2 patient before functional appliance treatment. (**e**–**h**) Post-treatment photographs showing good dental and facial appearance

Fig. 6.8 (continued)

Q. How Do Functional Appliances Work?

- Do functional appliances modify growth?
- OR Do functional appliances work principally by dento-alveolar change?

Current evidence shows functional appliances cause an initial small but meaningful increase in mandibular growth in young patients. But when these patients are monitored to the completion of orthodontic treatment, no significant skeletal differences is found between the treatments started in childhood and those started in adolescence. The only difference is lower incidence of dento-alveloar trauma in the patient who started treatment in childhood [4].

It can be concluded, therefore, that the long-term gain in mandibular growth is very small with functional appliances [5].

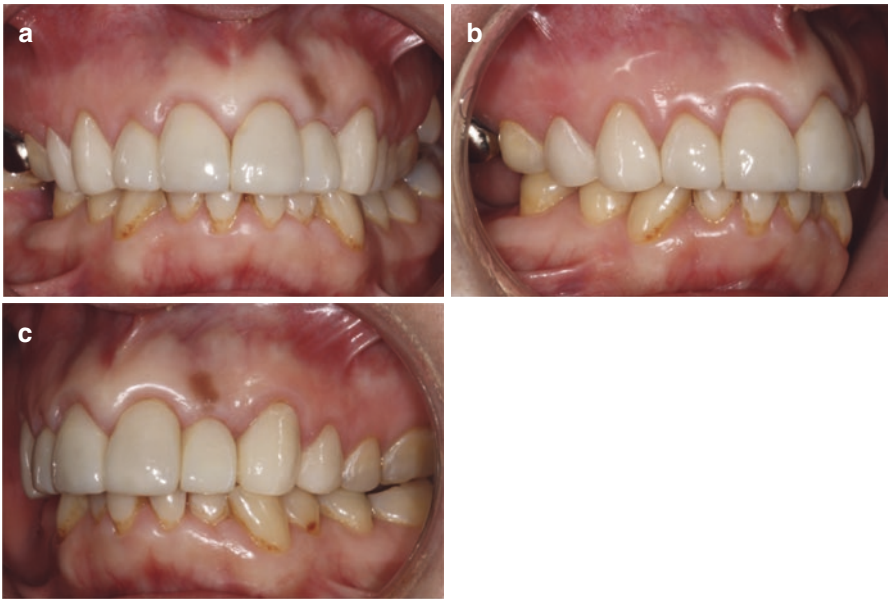


Fig. 10.51 Case 8: Completed case

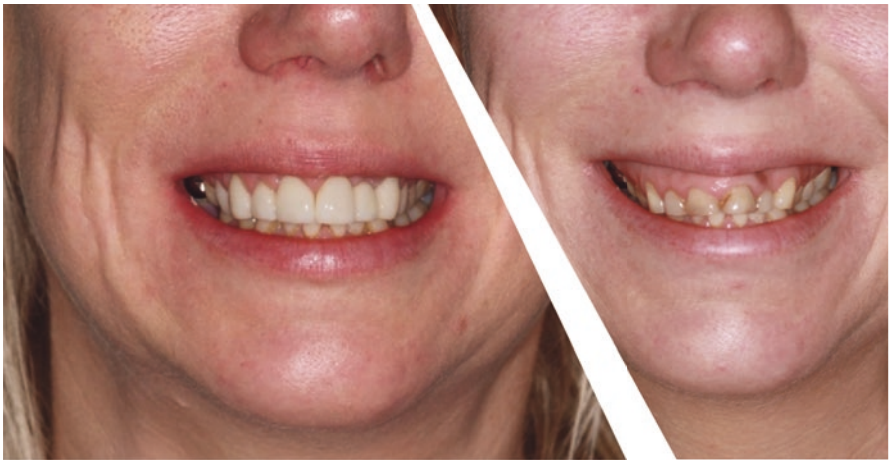


Fig. 10.52 Post- and pre-op showing. Improved aesthetics, with reduction in visible attached gingivae, at the same OVD