Conformative, Re-organized or Unorganized?

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Abstract: **'Occlusion' is presented within the concept of the articulatory system, and guidance is given on how to avoid unplanned occlusal changes. When and how to examine the occlusion is explained, and this is expanded to cover the needs of restoring a patient to the 're-organized approach'. In addition, the merits of the different types of occlusal records are discussed.**

In order to avoid a lengthy explanation of the terminology in the text, a glossary is appended; any term that is defined in the glossary is marked by an *.

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Clinical Relevance: **Most restorative procedures involve the occlusal surfaces of teeth. Because dentists wish to avoid unplanned changes in the occlusion, it is important that the occlusion is considered before, during and after treatment. This paper aims to help dentists develop their own philosophy of avoiding the 'unorganized approach' by providing techniques which follow a logical sequence.**

Most restorative dentistry has the potential to cause a change in the patient's occlusion*. Dentists should avoid unplanned occlusal change, because it may lead to an iatrogenic problem or a restorative failure. Accordingly, most dentists develop a strategy for planning their treatments within principles of 'good occlusal practice'.

Despite the many excellent textbooks on occlusion,[1-5] practitioners may feel that the subject is daunting and even confusing. Although an understanding of 'occlusion' within the context of the articulatory system[6] and of the factors that influence mandibular movements[7] would be useful, it is not essential to the reader of this paper. Reference to the basic principles of occlusion[8,9] will only be made when they are of practical help.

The aim of this paper is to explore some of the decisions that practising dentists should make when they provide restorations. It is a mistake to think that an understanding of occlusion complicates common clinical procedures. This paper is an opportunity to describe some of the protocols and techniques that have made life easier for the author, who is a general practitioner. For the dentist who is concerned about 'getting the bite right', the process of thinking about the occlusion *before treatment* makes clinical practice easier. More importantly, it will also improve the outcome for the patient.

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EXAMINATION

When to Examine?

The occlusal surfaces of the teeth are often involved in restorative treatment. This therefore has the potential to change the patient's occlusion.

Often, the examination of the occlusion is left until *after* the treatment is finished; when we 'check the bite'. This 'final check' will only show two extremes: a restoration that is 'too high' or one that has no occlusal contact at all. If no examination of the pre-treatment occlusion was made, the post treatment check alone could not confirm that the new restoration added to, but did not change, the patient's overall occlusion. If we do not know exactly what the pre-treatment occlusion was, to say that we have 'checked that it is the same' may therefore be meaningless.

How to Examine the Occlusion

At its simplest, the examination of the occlusion is performed in three steps:

- First, the teeth need to be dry and one of the easiest ways of doing this is to ask the patient to close onto folded tissue paper held by Miller forceps* (Figure 1).

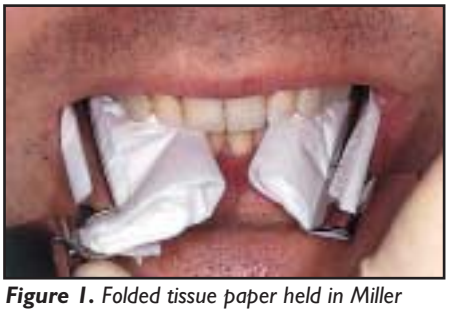

***Figure 1.** Folded tissue paper held in Miller forceps to dry teeth prior to marking the occlusion.*

***Figure 2**. Red articulating paper held in Miller forceps to mark the dynamic occlusion.*

***Figure 3.** Blue articulating paper held in Miller forceps to mark the static occlusion.*

- It is best next to mark-up the patient's dynamic occlusion*, by asking the patient to slide his/her teeth from side-to-side whilst holding articulating paper (Bausch Articulating Paper – Red, Blue: 009 010 – Bausch Articulating Papers Inc, Nashau, NH06062, USA) between them (Figure 2). Ideally, the articulating paper©* will be no more than 40 microns in thickness. Thicker paper will give false marks.
- The final stage requires changing the colour of the paper and asking the patient to tap his/her teeth together into a normal bite (Figure 3). This will mark the static occlusion*. This 'dry-dynamic-static' order will produce a clear representation of the occlusion. It is much more reliable than the 'static-dynamic' examination order, which tends to rub off the static occlusion marks during the excursive movements.

Examination of the contacts that the teeth make in the patient's habitual bite* (synonym: centric occlusion*, intercuspation position*) is quick and reliable,[10] and it is all that is needed for the majority of restorative procedures. There are two reasons why it is an essential examination to carry out before every restorative procedure:

- It enables the operator to make the most important decision of all: can the restorations be provided within the 'conformative approach'?* That is to say: are there sufficient good occlusal contacts on teeth that are *not* going to be restored to ensure that the patient will occlude into the same jaw relationship? If this is the case, and assuming that the patient does not have a temporomandibular disorder, the conformative approach is the obvious decision. There would be no reason to change the occlusion. If there are not sufficient occlusal contacts on the adjacent teeth, then, as soon as the occlusal surfaces are removed or altered on the prepared teeth, it is already too late to use the conformative approach! The patient's pre-treatment bite has been lost, and so the conformative approach is no longer an option. A good example of this might be a posterior bridge preparation without a standing tooth distal to it.
- If the conformative approach is going to be used, this examination is the first stage of that approach.

The initial examination also helps with the design of a restoration. For instance, if a tooth to be filled has a good strong 'centric stop'*, it would be better if that centric stop could be avoided in the cavity preparation. If the occlusion is not marked, the design of the cavity cannot take this into consideration. Similarly, if the dynamic occlusion is marked onto anterior teeth, then the design of restoration can allow the conformative approach to be used in the provision of that restoration. (Figure 4a–c).

This sequence is described by the E.D.E.C. principle:[11]

E – Examine the pre-operative occlusion;
D – Design the restoration;
E – Execute that design;
C – Check the restoration adds to, but does not change, the occlusion between the other teeth (i.e. the conformative approach).

However, if the pre-treatment occlusal examination indicates that a sufficient number of the occlusal contacts are going to be destroyed or changed, it may be impossible to keep the same

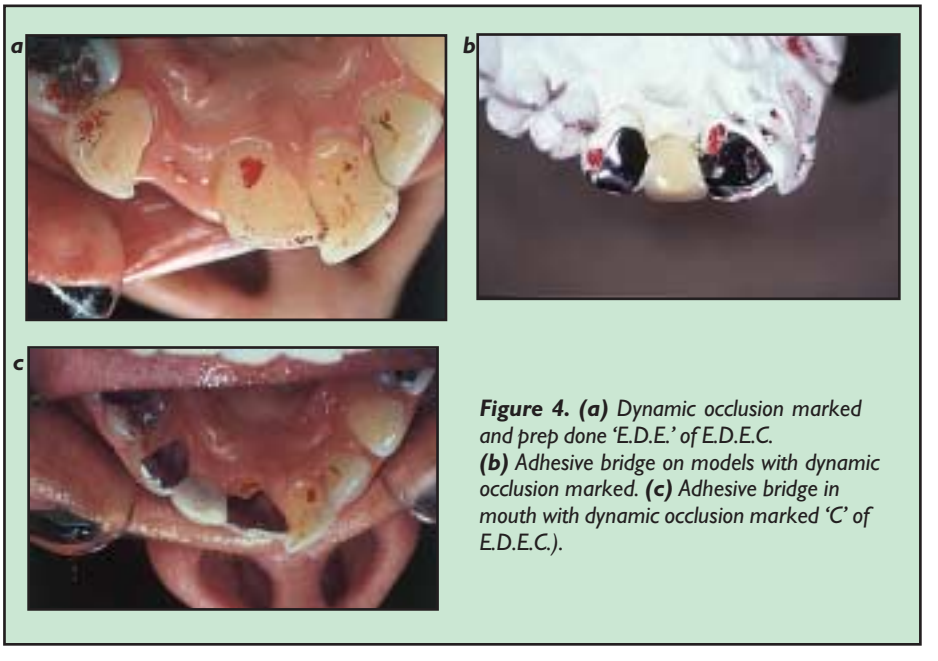

***Figure 4. (a)** Dynamic occlusion marked and prep done 'E.D.E.' of E.D.E.C. **(b)** Adhesive bridge on models with dynamic occlusion marked. **(c)** Adhesive bridge in mouth with dynamic occlusion marked 'C' of E.D.E.C.).*

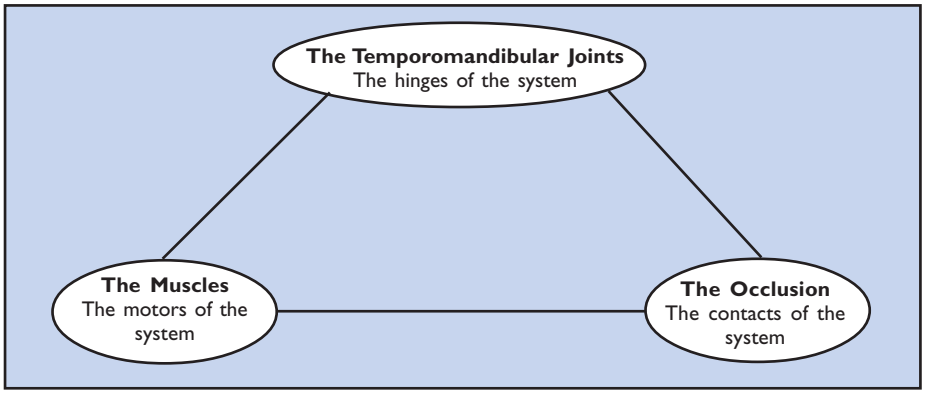

Figure 5. *The articulatory system.*

occlusion; i.e. we cannot *conform*. In this situation, the occlusion is going to be changed. If these changes are made to a specific plan that:

- Records the starting point (pre-treatment occlusion);
- Defines the end point (final restoration);
- Plans all the stages necessary to take the patient successfully from the pre-treatment occlusion to the occlusal prescription of the final treatment (treatment plan);

The treatment can justifiably be described as having been carried out to the 're-organized approach' *. The objective of the 're-organized approach' is to provide an occlusion that is more ideal*. More ideal for the teeth, the periodontal tissues (or osseointegrated bone around an implant), and the tissues of the articulatory system (TMJs and mandibular muscles).

If a patient's occlusion is changed without following these criteria, it is an 'unorganized approach'*.

THE EXAMINATION PROCEDURE PRIOR TO RESTORING A PATIENT TO THE RE-ORGANIZED APPROACH

The examination required to restore a patient to the reorganized approach is more complex than that needed for the conformative approach. The essential difference between the examination of a patient who is going to be restored to the re-organized approach and one to be restored to the conformative approach can be summed up in two words: 'jaw relationship'*.

In a dentate patient, the overriding guidance that determines the relationship between the mandible and the maxilla is the occlusion of the teeth; not the TMJs and associated muscles. If the occlusal surfaces of a sufficient number of teeth are to be destroyed in the restorative procedure, then the patient's original jaw relationship will potentially be changed because, when the occlusal surfaces of sufficient teeth are altered, so is the habitual jaw relationship.

It is possible that the patient's articulatory system will adapt to a new occlusion and jaw relationship. However, as the dental defence organizations will testify, it is the case that this adaptation does not always occur. The safest way of managing a change in a patient's occlusion, and consequentially his/her jaw relationship, is to make the new occlusion more ideal. For, although the pre-treatment occlusion was probably not an ideal occlusion* either, the patient had developed a longstanding tolerance of it. The danger of providing a *new* 'less than ideal' occlusion, in an 'unorganized' course of restorative treatment is that it is 'revolution not evolution'.

As stated, the most likely consequence of a patient being provided with a new, and less than ideal occlusion (the 'unorganized approach') is nil. The patient will adapt to it, maybe after a period of mild discomfort. Teeth can move or wear in response to occlusal load and this valuable compensation can reduce occlusal trauma. It is important to remember that this adaptation is not possible in an implant. If, however, compensation does not occur, then the resultant trauma may have unwanted sequelae. There may be damage to the dental and periodontal tissues, or the articulatory system may be affected. The adaptive capability of the TMJs, muscles, and periodontal membrane, together with the strength of our restorations, are tested by a different and less than ideal occlusion. Damage is probably more likely if the restorations have occlusal surfaces in a hardwearing material such as porcelain, or if the teeth are joined together by bridgework. In the author's experience, a significant number of Temporomandibular Disorder (TMD) patients consider a course of treatment involving extensive restorations to be the precipitating factor to their joint problems.

Therefore, if dentists are going to change occlusions, it is safer to make them more ideal. The solution to not being able to use the 'conformative approach' is to follow the 're-organized approach'. The re-organized approach is a system by which dentists can provide a specific occlusal prescription that is much less likely to cause a disturbance to the joints and muscles. It is used when a significant change to the patient's existing occlusion is proposed.

RESTORING A PATIENT TO THE RE-ORGANIZED APPROACH

Examination

The first step of a restoration to the re-organized approach is an examination of all the elements of the articulatory system (Figure 5).

The first reason for carrying out this examination is to diagnose any pre-existing TMD*. A TMD may be

***Figure 6. (a)** and **(b)** Use of Duralay© to record an inter-arch record or 'bite'.*

exacerbated by the treatment process and so may influence treatment planning. Secondly, this examination has the aim of determining the position of the centric relation* (CR) (retruded contact position RCP), because CR is the starting point for the provision of an ideal occlusion.

Examination of the TMJs[12] and mandibular muscles[13] is quick and simple. The TMJs should be examined for sounds, tenderness to palpation and range of motion. Three muscle groups are examined: the temporalis and masseter muscles are tested for tenderness to palpation, whereas the lateral pterygoid muscles are tested by the resisted movement test.

The examination of the patient's static and dynamic occlusion in and from centric occlusion (CO) (intercuspation position ICP) is carried out in the same manner as described for the conformative approach. This is partly to confirm that the conformative approach cannot be followed. Sometimes during this examination it will become apparent that, by preparing alternate teeth, the conformative approach is possible. But the essential difference for an examination prior to using the re-organized approach is the determination of centric relation, because this is the starting point of the new restoration. In order to examine the occlusion in CR, the patient is not simply asked to close his/her teeth together. This would put the mandible into the jaw relationship determined by his/her habitual bite (centric occlusion). The first step of the occlusal examination for the re-organized approach is to guide the patient into centric relation. The first or premature contact is noted in this jaw relationship[2] (static occlusion), as are the contacts during mandibular excursive movements (dynamic occlusion).

The ability to examine and record a patient's centric relation is a fundamental skill for a dentist whose patient cannot be restored to the conformative approach. It is difficult, if not impossible, to provide an ideal occlusion without this first step.

The essential points of finding centric relation are as follows:

- The patient should be relaxed in a supine position.
- The dentist, whilst holding the patient's mandible, can feel that the lower jaw is loose and describes a fairly perfect arch, i.e. the head of the condyle is in the rotational phase of its movement. This means that the mandible is in terminal hinge axis*.
- Because centric relation is 'the only centric that is *reproducible with or without teeth present*',[14] the best confirmation that centric relation has been found is that the same position is found at different times and by different operators. Centric relation is a consistent position, which is one reason why it is so useful in the re-organized approach.
- In order to confirm that it is the same position, the procedure should be repeated several times and the patient is asked whether the same teeth are touching. The clinician can be sure that it is the same jaw relationship if the patient feels the same premature contact each time. This is much easier than trying to mark the premature contact with articulating paper each time. It is possible because of the proprioceptive receptors in the periodontal membrane. The patient's proprioception is the most sensitive piece of equipment that can be used to confirm the consistency of centric relation; if it is not a consistent position, then it is not CR. It is worth considering that this test does not work if the teeth are anaesthetized or the dentition is partially or completely implant-supported.

Records

There is a difference between an examination and a record. Examining the occlusion is very nearly always necessary, whereas a record of that examination is necessary in order to communicate or to refer back to the results of that examination.

Therefore a record of the patient's occlusion is essential if:

- a technician is involved in the treatment;

***Figure 7.** Use of Hard Beauty Wax (Moyco, USA) to record an inter-arch record or 'bite'.*

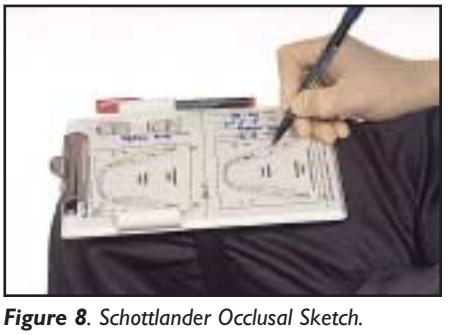

***Figure 8**. Schottlander Occlusal Sketch.*

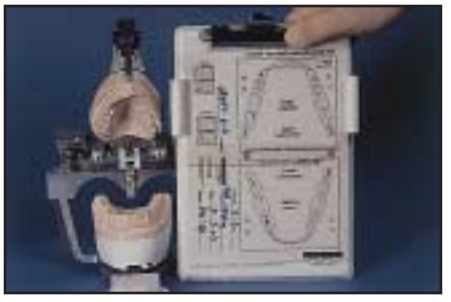

Figure 9. *Schottlander Occlusal Sketch being used to check the accuracy of the occlusion marked on articulated models, in the dental laboratory.*

- a dentist is trying to conform either with the patient's pre-existing occlusion or with the new occlusal prescription.

Occlusal records (Figures 6a, b and 7) usually take the form of some type of bite registration and/or mounted models. The accuracy of these is very technique sensitive and there is evidence that they may not be reliable.[15,16] The author would wish to bring to the reader's attention the technique of Occlusal Sketching© (Stephen Davies/the Victoria University of Manchester 2002 – all rights reserved) which is a simple and accurate means of communicating occlusal information.[17,18]

The occlusal record can be used as the only bite record or as a check of a conventional bite registration. Additionally, it may be used as a means of keeping an archive of the occlusion for medico-legal purposes. The Occlusal Sketch© consists of a diagrammatic representation of idealized dental arches, on which the results of an occlusal examination can be recorded. It can be configured both for the clinician's and the technician's perspective. It is based upon the theory that dentists and dental technicians will place a dot in the same place on an idealized diagram of a tooth to represent the mark left by articulating paper on a tooth or model of a tooth.

The Schottlander Occlusal Sketch© (Schottlander Ltd, Letchworth Garden City, Herts) was initially configured for surgery use, i.e. the upper arch is viewed as a mirror image and the lower by direct vision from above (Figure 8); this facilitates the recording of the dots of the static occlusion (in blue) and lines of the dynamic occlusion (in red). This takes only a few minutes and is a permanent record of the patient's occlusion at that time. It will either be

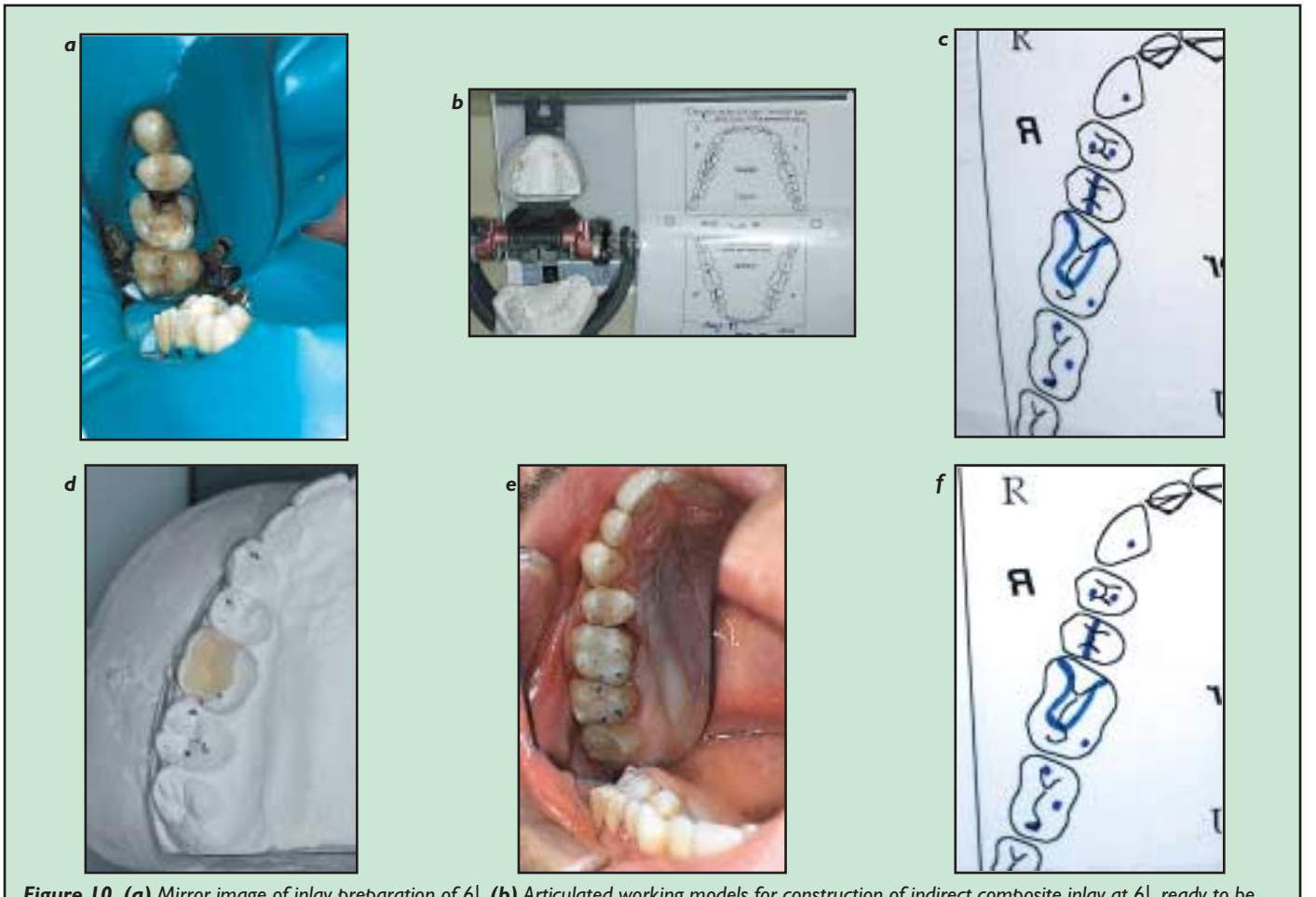

Figure 10. (a) *Mirror image of inlay preparation of 6|. **(b)** Articulated working models for construction of indirect composite inlay at 6|, ready to be verified by occlusal sketch. **(c)** Close up of occlusal sketch, showing the record of the occlusal contacts of the teeth adjacent to 6| **(d)** Finished inlay at 6| on model, showing the adjacent occlusal contacts. **(e)** Mirror image of finished inlay at 6| in mouth, showing the adjacent occlusal contacts. **(f)** Close up of occlusal sketch, showing the record of the occlusal contacts of the teeth adjacent to 6|.*

***Figure 11**. Marking of the patient's occlusal contacts during manipulation to centric relation.*

used as a record, against which reference can be made during a patient's treatment, or as a means of communicating information that will enable the technician to check the accuracy of the mounting of working models prior to the construction of an indirect restoration. In the case of the latter, the sketch is sent with the impressions and any other records to the laboratory. In the laboratory, the sketch is reconfigured for the technician to use next to the mounted models in order to check the accuracy of the occlusion as marked on those models (Figure 9). If there is a difference between the occlusion as marked on the models and the sketch, then a few minor adjustments to the models may produce the same occlusion as the occlusal sketch shows, being that of the patient. This minor alteration to the models is known as 'model grooming'.[11] Figures 10 a–e show the use of an occlusal sketch to confirm that the conformative approach has been successfully followed. The inlay in 6| contributed to, but did not change, the patient's overall occlusion.

RESTORATION TO THE RE-ORGANIZED APPROACH

There is a sequence to this procedure. Not every stage, as described below, is necessary for every case; but it is essential that the objective of each stage be considered. How that objective is achieved is the clinician's decision; it will vary with the complexity of the case and the experience of the operator. Irrespective of how it has been achieved, a stage should not be started until the objective of the previous stage has been realized.

The re-organized approach is a sequential process with a clearly defined starting and end point.

Stage 1: Try to Avoid the Re-organized Approach!

Reason

The re-organized approach is much more difficult and the consequences of failure are more severe than in the conformative approach

Objective

To find a way by which the conformative approach can be used, even in multiple restoration cases.

Technique

Even in large cases, it is quite often possible that, by using very careful records and splitting the restoration into stages, you can conform to the pre-existing occlusion. The use of pattern acrylic (Duralay©, Reliance Dental Mfg Co., Illinois, USA or GC Pattern Resin©, GC UK, Newport Pagnell, UK) bite registrations in the alternative preparation technique[19] are useful in this respect.

Stage 2: To Find Centric Relation

Reason

Centric relation is the starting point of any re-organized restoration, because:

- Centric relation 'is the only "centric" that is reproducible with or without teeth present, and recent research has confirmed the great clinical significance of this position as the key to the solution of occlusal problems. It is the only reference position that assures simultaneous harmonious alignment of both TMJs'.[14]
- Centric occlusion occurring in centric relation is the definition of an *ideal* static occlusion*

Objective

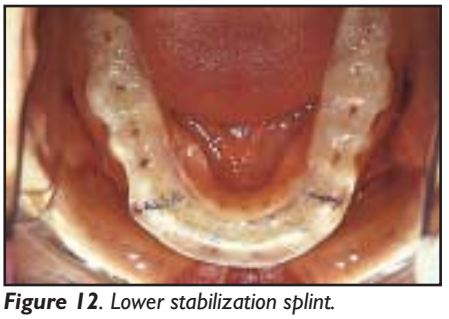

***Figure 12**. Lower stabilization splint.*

***Figure 13**. Anterior Bite Plane or 'Lucia Jig'.*

To find the closing point of terminal hinge axis of the mandible.

Technique

There are three levels of complexity:

- In many cases, a careful manipulation (Figure 11) of the patient's mandible will be sufficient to find centric relation.[20] First, the operator must feel that a neuromuscular release* has been achieved. The mandible should feel relaxed during a smooth arching guided motion. Secondly, the patient must *consistently* feel exactly the same premature contact in CR. This should be tested at different times and, if there is uncertainty, by different operators.
- In a significant number of cases, a period of stabilization splint* therapy (Figure 12) will be needed to be sure that the muscles have relaxed enough for the true position of centric relation to have been established. This extra stage is necessary in those patients for whom a degree of neuromuscular release is possible, but it is shortlived and so it is very difficult to maintain neuromuscular release for long enough for the recording procedure to be completed.

***Figure 14**. An example of a lower bridge that has not been made to an ideal occlusion, which would have been the 're-organized approach'. This occlusion was also not the same as the patient had pre-operatively, which would have been the 'conformative approach'. This patient, who developed a TMD almost immediately after this bridge was fitted was probably restored to the 'unorganized approach'!*

Consequently, although the position of centric relation is reliable enough to make a splint, it is not truly consistent because of the muscle tension. Therefore it would be dangerous to use it as the starting point of the restoration of the patient to a new occlusion. The splint will need to be reviewed over a period of time, during which time it will require adjustment. Finally, a consistent and muscle-free jaw relation will be established.

- In some cases, a stabilization splint cannot even be made because the mandible is so tight that the guiding of the patient to centric relation is made impossible. In these cases, an anterior bite plane or 'Lucia jig' (Figure 13) should be considered as an aid to trying to find CR.[21]

Stage 3: Equilibration of Standing Teeth

Reason

By providing the patient with a centric relation occlusion in his/her existing dentition, a 'reference point' is established for all of the future restorative work. If this stage is not done, it becomes less likely that the definitive restorations will occlude in the ideal jaw relationship of CR.

Objective

The overall objective of our 're-organized treatment plan' is to provide restorations in an occlusion that, although different from the patient's pre-operative one, is the most likely to be tolerated by the patient, i.e. an ideal occlusion*. The objective of this stage is to establish one of the three important principles of 'idealized occlusion': the coincidence of centric occlusion in centric relation or centric relation occlusion (CRO). The other two principles (the establishment of a dynamic occlusion that is free from posterior interferences and cusp to fossa contacts between opposing teeth) are less achievable at this stage and so have to be left until the provisional or definitive restorations.

Technique

There are two phases to this procedure. The first is essential, in all but the simplest of cases, even in the hands of the most experienced of operators.

- Mock equilibration on accurately mounted models. The first reason for this stage is that it is undoubtedly the best way of learning how to equilibrate. Secondly, it shows the end point before commencing treatment. In clinical practice, there can be few things worse than starting to equilibrate a patient's teeth, only to realize, halfway through the procedure, that the objective of providing an occlusion in centric relation is unachievable! A mock equilibration should answer the question whether provisional restorations are going to be necessary in order to provide a patient with a CRO. Thirdly, it will enable your patient to see the clinical objectives more clearly. This facilitates their informed consent and gives them confidence in your approach to treatment planning. Both are essential before encountering the difficulties that are bound to lie ahead in the execution of that plan.
  Finally, a mock equilibration gives a guide to the nature and sequence of adjustments needed. It is a valuable rehearsal.
- The equilibration of the teeth is done by careful and sequential removal of the premature contacts in centric relation until all of the posterior teeth touch simultaneously in that jaw position. It is done over at least two visits and without local anaesthetic. Equilibration is not an easy procedure, as demonstrated by the fact that most dentists would much prefer to prepare some teeth for crown and bridgework than do an equilibration! It is, however, a necessary skill for the dentist who wishes to restore a case to the re-organized approach.

Stage 4: The Diagnostic Wax-Up

Reason

Once the patient is equilibrated to an occlusion in centric relation, the most significant part of the 'reorganization' has been achieved; that is the establishment of an occlusion in the new jaw relationship. Everything done now must 'conform' to that jaw relationship. So really the 're-organized approach' is the conformative approach with a few extra stages! However, during subsequent stages and within the restriction of not moving away from the CRO, the opportunity exists to improve the occlusion further by providing:

- Ideal anterior guidance (no posterior interferences);
- Enhanced tooth morphology;
- Cusp to fossa occlusal contacts (no incline contacts);
- Better aesthetics.

This does not happen by accident, it needs *designing*. A diagnostic wax-up is the *design stage* of the mouth restoration.

Objective

The most important reason for designing the future restorations in wax and on a semi-adjustable articulator is that it allows the two operators (technician and clinician) to determine how the restorations are going to interact with opposing teeth, both in the static and dynamic occlusion. Although some will

see this as an unnecessary stage it will, in most cases, save time. It is certainly preferable to performing multiple and demoralizing adjustments at the fit stage.

Sometimes our 'dental' brain tells us that some crown and bridgework *doesn't look right*. Figure 14 shows such a case. The design stage in this case was missing. When it doesn't look right, it usually doesn't function well from an occlusal point of view either. '*Form follows function*' in dentistry. The unnatural looking occlusal plane, as seen in Figure 14, resulted in a significant non-working interference. And, although some patients may have adapted to it, the patient in this case didn't. In fact, she developed a severe pain on the right side of her face within one month of the fitting of the lower bridge. It would have been much better if the design of the restoration of the right side of her dentition had been 'worked up' in a diagnostic wax-up.

Technique

At its simplest, all dentists and technicians can put some carving wax (Ivory 'Picowax'©, Skillbond Ltd, High Wycombe, Bucks, UK) onto mounted models and carve some teeth that seem to fit against the adjacent and opposing teeth. Although unsophisticated, this is still a valuable 'design' stage.

At its most complex, there are a few 'masters' who can do a diagnostic carving using wax of different colours to build up the detailed morphology of each proposed restoration incrementally.[22]

In addition, there is a largely ignored but very useful technique for establishing the ideal occlusal planes, called the Broadrick flag technique. This is based upon a concept developed by Monson in 1918, and has recently been described again in the literature.[23]

Irrespective of the manner in which a diagnostic wax-up is carried out, there are advantages that will help the patient, technician and dentist to visualize the final result. By designing the occlusal planes at this stage, the final restorations will both look and function better.

Stage 5: Preparation of Teeth and Construction of Provisional Restorations

Reason

The function of the provisional restorations is not only to protect the prepared teeth and maintain gingival health, but also to maintain the occlusion whilst the crowns are being made.

Objective

One of the objectives for the clinician, at this stage, is to prepare the teeth in such a way to allow the technician to construct the crowns to the agreed occlusal design. In particular, the preparations should have appropriate occlusal reduction. It is important that the clinician keeps the final occlusal prescription in mind during the preparing of the teeth, otherwise the technician may not be able to create the desired result.

Technique

A transparent acetate template that has been made on a model of the diagnostic wax-up during the preparation of the teeth is very useful, and almost justifies the diagnostic wax-up stage by itself. It is not only used to form the temporary crowns, but will help to gauge the amount of tooth removal necessary. It can be either a vacuum-formed laboratory made item, or can be formed on the model at the chairside (Ellman Pressform Kit©, Ellman International UK Ltd, Northampton, UK).

Stage 6: Provisional Restorations

Reason

The fitting of provisional restorations affords the clinician the opportunity to refine the functional and aesthetic aspects of the treatment.

The occlusion can be adjusted over a period of time and the patient will have the opportunity to influence the appearance of anterior crowns or bridges. The reality is that, although the use of an articulator is essential in complex cases, no articulator is able to duplicate the patient's mandibular movements exactly. So final refinements to the new occlusion can only be made in the patient's mouth and this is best done on the provisional restorations, not the definite restorations.

Figure 15. *Custom anterior bite table being formed by simulating a left lateral mandibular excursion against a cast of the upper anterior provisional restorations.*

Figure 16. *Close up view of custom anterior bite table.*

Figure 17. *Custom anterior bite table guiding the upper working model through a simulated left lateral mandibular excursion.*

In addition, the patient will have the opportunity during a provisional restoration phase to suggest modifications to the appearance of any anterior crowns.

Technique

Provisional restorations are usually made in heat-cured acrylic or composite, at the dental laboratory. They are made from the same records as would be needed for the definitive crown or bridgework, and

to the same high standard of marginal adaptation. They are cemented with a temporary cement to facilitate easy removal. Over a number of review appointments, the occluding surfaces of the restorations are adjusted by equilibration or addition. The objective is to fulfil the criteria of an ideal occlusion, which are:

- Cusp to fossa tooth contacts (an avoidance of incline contacts);
- Multiple and simultaneous posterior tooth contacts in 'centric relation';
- Guidance for lateral and protrusive mandibular movements of the mandible that is at the front of the arch, and so free from posterior interferences, especially on the non-working side.[24]

The final act of this phase of treatment is to articulate study casts made from impressions of the mouth with the provisional crowns in place. These models will guide the technician during the construction of the definitive restorations.

Stage 7: The Definitive Restorations

Technique

By the time this stage has been reached the exact form of the restorations and the jaw relationship in which those restorations will occlude has been organized. The challenge for both of the operators (clinician and technician) is to execute that prescription (Examine, Design, **Execute**, Check). In effect this last stage of the 're-organized approach' is to '*conform*'; conform to the new design that has been worked up in the previous stages. The techniques employed, including an accurate bite registration, are the same as would be used in the 'conformative approach'.

One particularly useful technique, if the restoration of the upper anterior teeth is involved, is 'custom anterior guidance'. This enables the ideal anterior guidance that has been developed in the provisional restorations or equilibrated dentition to be duplicated in the definitive restorations. The anterior guidance table of a semi-adjustable articulator is loaded with an accurate acrylic, such as pattern resin (Duralay© or GC©). The guidance pin of the articulator is transcribed through this material whilst it is setting. This is done by moving the upper member of the articulator through lateral and protrusive excursions, whilst keeping the lower anterior teeth of the models in contact with the palatal surfaces of the upper cast. In this way, the movement of the pin through the material is determined by the palatal surfaces of the upper anterior teeth. Thus, when the upper working model is fitted into the articulator, the 'custom anterior guidance table' will act as a template for the ideal palatal contour of the upper anterior crowns (Figures 15, 16, and 17).

Stage 8: The Post-operative Stabilization Splint

Reason

In very large cases, especially in patients who have a history of bruxism, it is sound practice to protect the new restorations *immediately* from the effects of parafunction.

Objective

If the patient might need a splint in the future, it is much better to make it now, as the foreseen last stage of the treatment plan, rather than in response to a failure of a restoration.

Technique

It is easy to record the ideal jaw relationship, because CO and CR coincide. A facebow will be helpful.

THE RE-ORGANIZED APPROACH: A SUMMARY

A complex case involving multiple crowns provided to a different jaw relationship, and maybe to an increased vertical height, may seem impossibly daunting.

In reality, it is a series of phased treatments; each has a clearly defined aim, and the successful completion of each phase becomes the foundation for the next stage. Success will be the result as long as these phases are predetermined and the discipline is maintained of not starting a phase until the aims of the previous one have been achieved.

Sometimes, for a particular phase of treatment, specialist help may be needed. This may be available from a consultant in restorative dentistry or an experienced colleague. In my experience, this sort of second opinion is well received by the patient. Because the patient is already aware of the complexity of his/her case, he/she will be reassured by the referral for a second opinion. It will be seen as an example of a careful approach. Equally, because the experienced colleague to whom the referral is made will be acutely aware of the difficulty of this type of case, he/she will not undermine the patient's confidence in your approach by suggesting that a second opinion is anything other than prudent. Increasingly, the public expect and should have the opportunity for this type of clinical governance.

The number of stages of the re-organized approach will vary from case to case, depending on the complexity and operator experience, but the essential steps can be summarized as follows:

- Attend to the needs of individual teeth first (e.g. endodontics, core placement) but without changing the bite;
- Diagnose and maybe treat any temporomandibular disorder;
- Determine 'centric relation' (retruded contact position); the starting point of the re-organized occlusion;
- Design and develop an *ideal occlusion* by some or all of the following:
  A diagnostic wax-up;
  Equilibration of the natural dentition;
  Provision of provisional restorations.

These stages are to 'full mouth restoration' what the 'try in' is to complete denture construction.

- Copy that design in the definitive crowns.

CONCLUSIONS

The restoration of teeth almost always involves the occlusal surfaces of teeth, and so has the potential to change the occlusion and possibly the jaw relationship of the patient.

Pre-treatment examination of the occlusion will answer the question whether the treatment can be carried out to the '*conformative approach*' which is always the treatment of choice. If the complexity of the case precludes this, a planned and carefully staged *re-organized approach* to changing the patient's occlusion and jaw relationship is indicated.

Unplanned changes may cause iatrogenic change, which would be difficult to justify in the light of these long established restorative guidelines. Avoiding a *disorganized* result in complex restorative cases is readily achievable, if the treatment is split up into phases with carefully considered objectives.

REFERENCES

1. Ash MM, Ramfjord S. *Occlusion*. Philadelphia: Saunders, 1995.
2. Wise MD. *Occlusion and the Restorative Dentistry for the General Practitioner*. London: BDJ Books, 1986.
3. Dawson PE. *Evaluation, Diagnosis, and Treatment of Occlusal Problems*. St Louis: CV Mosby, 1974.
4. Howat A, Capp NJ, Barrett NV. *A Colour Atlas of Occlusion and Malocclusion*. London: Wolfe Publishing Ltd., 1991.
5. Pameijer JHN. *Periodontal and Occlusal Factors in Crown and Bridge Procedures*. Amsterdam: Dental Centre of Postgraduate Courses, 1985.
6. Davies SJ, Gray RJM. What is occlusion? *Br Dent J* 2001; **191:** 235–245 or Chapter 1: *A Clinical Guide to Occlusion*. London: BDJ Books, 2002.
7. Davies SJ, Gray RJM. The examination and recording of the occlusion: why and how. *Br Dent J* 2001; **191:** 291–302 or Chapter 2: *A Clinical Guide to Occlusion*. London: BDJ Books, 2002.
8. Smith BGN. Occlusion: 1. General Consideration. *Dent Update* 1991; **18:** 141–145.
9. Smith BGN. Occlusion: 2. Practical Techniques. *Dent Update* 1991; **18:** 187–192.
10. Anderson G, Schulte GC. Reliability of the evaluation of occlusal contacts in intercuspal position *J Prosthet Dent* 1993; **70:** 320–323.
11. Davies SJ, Gray RJM, Smith PW. Good occlusal practice in simple restorative dentistry. *Br Dent J* 2001; **191:** 265–281 or Chapter 3: *A Clinical Guide to Occlusion*. London: BDJ Books, 2002.
12. Davies SJ, Gray RJM. A clinical approach to temporomandibular disorders: Examination of the articulatory system: the temporomandibular joints. *Br Dent J* 1994; **176:** 473–477 or Chapter 2: *A Clinical Guide to Temporomandibular Disorders*. London: BDJ Books, 1995, 1997.
13. Davies SJ, Gray RJM. A clinical approach to temporomandibular disorders: Examination of the articulatory system: the muscles. *Br Dent J* 1994; **177:** 25–28 or Chapter 3: *A Clinical Guide to Temporomandibular Disorders*. London: BDJ Books, 1995, 1997.
14. Ash MM, Ramfjord S. *Occlusion*. 4th edition. Philadelphia: Saunders, 1995; p.76.
15. Murray MC, Smith PW, Watts DC, Wilson NFH. Occlusal registration: science or art? *Int Dent J* 1999; **49:** 41–46.
16. Walls AWG, Wassell RW, Steele JG. A comparison of two methods for locating the intercuspal position (ICP) whilst mounting casts on an articulator. *J Oral Rehab* 1991; **18:** 43–48.
17. Davies SJ, Gray RJM, Al-Ani MZ, Sloan P, Worthington H. Inter- and Intra-operator reliability of the recording of occlusal contacts using the 'occlusal sketch' acetate technique. *Br Dent J* 2002; **193:** 397–400.
18. Davies SJ., Al-Ani MZ, Richmond R, Worthington H. Is the 'Occlusal Sketch' technique a reliable means for the dental technician to check that the occlusion of working models is the same occlusion as the patient has? *Eur J Prosthodont Rest Dent* 2002; **11**: 87 (Abstract – Paper presented at the 50th British Society for the Study of Prosthetic Dentistry Annual Conference, April 2003).
19. Davies SJ, Gray RJM, Whitehead SA. Good occlusal practice in advanced restorative dentistry. *Br Dent J* 2001; **191:** 421–434 or Chapter 4: *A Clinical Guide to Occlusion*. London: BDJ Books, 2002.
20. Dawson PE. *Evaluation, Diagnosis, and Treatment of Occlusal Problems*. St Louis: CV Mosby, 1974; pp. 54–58.
21. Lucia VO. Fixed partial dentures: A technique for recording centric relation. *J Prosthet Dent* 1964; **14:** 492–505.
22. Thomas PK, Tateno J. *'Incremental waxing technique' in Gnathological Occlusion*. Tokyo: Shorin Ltd., 1980.
23. Lynch CD, McConnell RJ. Prosthodontic management of the curve of Spee: Use of Broadrick flag. *J Prosthodont Dent* 2002; **87:** 593–597.
24. Ibbetson RJ, Setchell DJ. Treatment of the Worn Dentition: 1. *Dent Update* 1989; **11:** 247–253.

GLOSSARY

articulating paper – Paper impregnated with dye that will mark teeth when they are closed onto it. Ideally 40 microns or less.

centric occlusion – The occlusion between the teeth to which the patient habitually closes (habitual bite/bite of convenience), or the occlusion between the teeth when they fit together the best (maximal intercuspation/intercuspation position).
(Author's Note: This is not the definition given in the current Glossary of Prosthetic Terms, which is the terminology 'bible' which is published by the *Journal of Prosthetic Dentistry*. The definition of centric occlusion given now is what was in the previous edition as the definition of centric relation occlusion. They may change it again!)

centric relation (CR) – 1. A position of the mandible to the maxilla with the disc in place, when the head of the condyle is in its most superior position against the distal facing incline of the glenoid fossa (an uppermost and foremost). This definition is purely of academic interest because there is no way of establishing the position of the head of the condyle in the glenoid fossa.
2. A position of the mandible to the maxilla with the disc in place, when the mandible is in terminal hinge axis (see below).
3. A position of the mandible to the maxilla with the disc in place, when the muscles that support the mandible are at their most stable and least strained. This is more a concept than a definition.
(Author's Note: Again the Glossary of Prosthetic Terms is not especially helpful as it gives several definitions, some of which (to this reader) appear to contradict each other.)

centric stop – A static occlusal contact.

conformative approach – The process of restoring teeth with the intention of not changing the occlusion between teeth that are not involved in the restoration

dynamic occlusion – see ideal occlusion

habitual bite – see centric occlusion

ideal occlusion – 1. Static occlusion: centric occlusion (or intercuspation position) occurs in centric relation (or retruded contact position).
2. Dynamic occlusion: the anterior guidance (of the mandible) is provided by only teeth at the front of the mouth; i.e. no posterior interferences.

intercuspation position – see centric occlusion

jaw relationship – The spatial relationship between the maxilla and mandible.

Miller forceps – Paper holders.

neuromuscular release – A description of the sensation that the patient and the operator can feel when, during bimanual manipulation of the mandible, there appears to be a muscular release which allows the mandible to arc freely in terminal hinge axis (see above).

occlusion – The contacts between teeth.

Pain Dysfunction Syndrome – see TMD

re-organized approach – The process of restoring teeth with the intention of changing the occlusion to one that is ideal.

retruded contact position (RCP) – see centric relation

stabilization splint – An occlusal splint designed and adjusted to provide an ideal occlusion.

static occlusion – see ideal occlusion

temporomandibular disorder (TMD) – A generic term used to describe a group of disorders and dysfunction of the articulatory system. Usefully classified into common, uncommon and rare. Common disorders include Pain Dysfunction Syndrome (a myalgia), internal derangements (disc displacements), and osteoarthrosis (a wear and tear of the articulatory surfaces of the bones of the TMJ).

terminal hinge axis – The head of the condyle is purely rotating (not started to translate forwards and downwards), and so the mandible is rotating about a relatively stationary centre of rotation. Consequently, the point of the chin and lower anterior teeth are describing a relatively perfect arch of opening and closure.

unorganized – *Oxford English Dictionary*: Not formed into an orderly whole.