Advanced restorative techniques and the full/partial mouth reconstruction: part four – articulator selection and clinical stages

Following on from the third article in this series, which dealt mainly with the diagnostic stages of a full mouth reconstruction, Paul Tipton explores the clinical stages

The full mouth or partial reconstruction is one of the most challenging procedures in restorative dentistry. In order to successfully restore and maintain teeth, the dentist must find out why the teeth arrived at this state of destruction. Tooth wear can result from abrasion, attrition and erosion, as well as iatrogenic problems with previous restorations. Research has shown that these mechanisms rarely act alone and there is nearly always a combination of the processes. Evaluation and diagnosis should account for the patient’s diet, the present state of the occlusion and dental history. Emphasis must be placed on the evaluation of occlusal prematurities preventing condylar seating in RAP. Factors that may contribute to parafunctional habits or bruxism are important to understand and manage in order to successfully restore and maintain the newly restored dentition. When there is a complete understanding of the etiology of the current condition, a treatment plan can be established, taking into account the number of teeth to be restored, condylar position, space availability, the vertical dimension (VD) of occlusion, the choice of restorative material and the choice of articulator and ways of programming it.

Articulator selection
There is a large choice when assessing what type of articulator is correct for the patient and restoration. In terms of classification, articulators range from handheld casts or simple hinge articulators to fixed condyle or average value articulators to semi-adjustable and fully-adjustable.

When dealing with the complexity of the full mouth or partial reconstruction the choice narrows to average value versus semi-adjustable versus fully-adjustable. The accuracy of the articulator also depends upon how it is used and programmed. All of these articulators require the use of facebow, arbitrary or kinematic (to record the true hinge axis) to mount the upper cast. Mounting the lower cast to upper cast is then done with an individual jaw registration taken at an open vertical if mounting around RAP and closed vertical if mounting around ICP.

Aims and objectives
To demonstrate the importance of understanding the factors that may contribute to parafunctional habits or bruxism to successfully restore and maintain newly restored dentition.

Expected outcomes
Correctly answering the questions on page xx will demonstrate you understand the importance of knowing and managing the factors that may contribute to parafunctional habits or bruxism to successfully restore and maintain newly restored dentition.

Verifiable CPD hours: 1

Finally, with the semi-adjustable and fully-adjustable, programming of the posterior (condylar) determinants of occlusion can be done using lateral and protrusive check bites, cadiax recording or by using a pantograph.

The more adjustable the articulator, the more accurate the restoration can be. However, all articulators have limitations and are only as accurate as the dentist/technician that is using it.

Restorative stages
Following on from the third article in this series, which dealt mainly with the diagnostic stages of a full mouth reconstruction, we now look at the clinical stages that will be illustrated by the first case study. The gentleman in Figure 1 was referred for treatment of his severe upper anterior wear. The patient was over closed and, due to the wear, now in a pseudo-class III edge-to-edge occlusion.
After initial diagnostic stages, which included cosmetic imaging (Figure 3), diagnostic waxing (Figure 4) etc, the patient was ready for initial tooth preparation.

**Tooth preparation**

Tooth preparation will be dependent upon the type of restorative material to be used, for instance PFM, scanned and milled porcelain, adhesive porcelain. While the shift in recent years has been to all ceramic restorations, the PFM is often the restoration of choice as it allows a more conservative preparation on both anterior and posterior teeth with only part of the gingival margin area prepared for porcelain (labial) and the rest a conservative 0.5mm light chamfer for metal (Figure 5). There is also the added longevity in both of these areas of the mouth (the reader is referred to the work of Shillingburg for a full description of PFM crown preparation). In this instance, the classic PFM crown was used to restore the upper 10 anterior teeth.

Tooth preparation should be done in stages to maintain control of the condylar position and vertical dimension. Providing the patient has adequate posterior stability (from amalgams, cores, prototype crown etc), the initial tooth preparation should be the upper and lower anterior canine-to-canine teeth.

When completing a full-mouth reconstruction, upper and lower preparations should done together to be able to establish ideal anterior guidance in both protrusive and lateral movements. Once prepared, the dentine is sealed and prototypes are relined, trimmed and fitted (Figure 6). No impressions or jaw registrations are taken at this time.

The aim of the tooth preparation stage is, over three long visits, to place prototypes on all the teeth and then to spend time reassessing occlusal planes, aesthetic concerns and, of course, occlusal scheme and comfort of the patient.

The long-term success of the final restoration is directly proportional to the skill and time in preparing and planning prototypes and their adjustments. It is easy to lose vertical dimension, occlusal stability and ideal sealing of the condyle in the fossa if this stage is hurried.

If increasing vertical dimension then either the timing of the preparation and prototypes is changed to accommodate all initial procedures in one week or full occlusal contacts need to be re-established on posterior teeth during the interval between fitting of the anterior prototypes and the final segments of the posteriors.

**Impressions/jaw registrations**

Once the patient has confirmed that they are happy with the aesthetic appearance, is symptom free, having an ideal occlusal scheme with multiple contacts on all teeth and the condyles in RAP with smooth shallow anterior guidance, the next stage of treatment is to take impressions and jaw
registrations. This can be done in several ways.

A similar sequencing of events can occur as anterior prototypes are removed, retraction cords placed, teeth re-prepared, sealed and impressions, jaw registrations and facebow recordings made with the posterior prototypes maintaining occlusal contacts, vertical dimension and a stable RAP position.

Alternately there are times when the full arch needs to be delivered to the patient at one go. This may be the case when anterior and posterior teeth are linked together in bridgework, there are limited number of appointments, patients are travelling long distances or vertical dimension is being increased on the fully adjustable articulator. This then requires the use of duralay bonnets or copings on all teeth and the use of a pick-up impression, which will be described later in the series.

Once anterior impressions, jaw registrations and facebow recordings are taken again, the prototypes are relined, trimmed, cemented and adjusted once more.

Try-in stage
The anterior restorations are now produced by the technician to the biscuit bake or ‘try-in’ stage and are tried in the mouth, the occlusion is then adjusted using the mouth as the ultimate articulator.

Cementation
As discussed earlier, all articulators have limitations as do the materials and techniques we use. Once upper and lower have been checked and adjusted they are sent back to the technician for glazing and then to the dentist for cementation (Figure 7). This same sequence is then performed on one side of the mouth with upper and lower posteriors and then finally the other side of the mouth.

Conclusions
Patients requiring full mouth or partial reconstruction usually are, or have been, bruxists. As such they may often brux again, which is one of the limiting factors to the
longevity of our restorations. Careful post-restoration occlusal adjustment and refinement are essential, followed by the post-restorative occlusal splint for night-time wear (Figure 8). The final smile is shown in Figures 9 and 10.

Case study
This lady was referred with a failing dentition, periodontal disease and TMJ dysfunction (Figure 11). Her examination revealed several hopeless teeth and an almost edge-to-edge occlusion with limited anterior guidance on her anterior teeth.

In view of the limited guidance available the fully-adjustable articulator was chosen as the posterior determinants of occlusion and posterior guidance (condyles) have a greater bearing on mandibular movements and occlusal anatomy.

Following our standard diagnostic procedures, several teeth were removed (Figure 12), prototypes fitted (Figure 13), implants placed and the occlusion was adjusted so that RCP=ICP around RAP. A reorganised approach was used to reduce TMJ dysfunction and provide the patient with the ideal five principles of gnathology (occlusion) as discussed in earlier articles.
The fully-adjustable was programmed by using a facebow (Figure 14) the cadiax (Denar) (Figures 15 and 16) to record intercondylar distance, immediate and progressive side shifts and the shape of the superior and posterior walls of the fossa (Figures 17 and 18).

The goal of the restoration was to move the maxillary teeth forwards and move the mandibular teeth posteriorly by occlusal adjustment, thereby establishing a deeper overbite, overjet and better anterior guidance (Figure 19).

The final restoration and smile can be seen in Figures 20 and 21.

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