

The clinical-laboratory interface: occlusal records

Siobhan Owen,¹ David Reaney², Philip Newsome³

The results of a survey published in 2000 in *Lab Management Today* highlighted the problems technicians face with fixed prosthodontic work submitted to them by dentists.

One of the most commonly encountered problems was poor interocclusal records, which ultimately and almost inevitably translate into some form of occlusal discrepancy in the final restorations(s). Usually the end result is that the restoration is too high and requires adjustment, although the opposite can occur, i.e. the restoration is out of occlusion. Such errors are magnified the greater the number of prepared units and/or whenever the most distal tooth in the arch is prepared.

While there are a number of reasons why occlusal errors can arise, including distorted impressions, air-blows on the surface of the impression and improper use of face-bows and articulators, one of the most common causes is incorrect, or inappropriate use of occlusal records - seemingly simple items that are often given little (if any) thought and all too frequently produced hurriedly at the end of the treatment session. It is not uncommon even to find that textbooks of crown and bridgework and dental materials skirt around the subject of occlusal recording materials, often with no mention being made at all. This is surprising given the influence these simple items bring to bear on the success or otherwise of the final restoration and reflects the general lack of importance placed upon them.

Restorative procedures that require the mounting of casts often need accurate interocclusal registrations. From the technician's point of view, it is important that the casts can be mounted on the articulator in such a way that the relationship between the casts corresponds to the relationship in the patient's mouth in lateral, vertical and anteroposterior dimensions. These relationships are recorded by means of interocclusal records, of which there are three basic 'static' types.

Centric Relation Record

This is a 'tooth-apart' recording of the patient's retruded arc of closure. It is normally used to carry out a pre-operative occlusal analysis where problems have been diagnosed with the existing centric occlusion. Alternatively, it may be used in the construction of extensive restorations when centric occlusion is lost - for example in complete dentures.

¹ Siobhan Owen BDS, Private Practice, London UK

² David Reaney, BDS, Private Practice, Moy, Co Tyrone, Ireland

³ Philip Newsome, Associate professor, Faculty of Dentistry, University of Hong Kong

Centric relation (CR) is a position determined by the temporomandibular joint and it is vital that no muscular activity interferes with the mandibular position. In some patients it can be difficult to record the correct condylar position (usually on the terminal hinge axis) because of loss of proprioception and simply because the patient's musculature resists manipulation. In such cases a 'deprogrammer' may be needed. This can be made at the chairside from cold-cure acrylic and forms a flat-bite plane on the incisal edges. The occlusal record is then re-attempted about 10 minutes after the deprogrammer has been removed.

Lateral and protrusive check records

These are used whenever articulator condylar angles need to be set. Each articulator manufacturer will specify the records required for its own articulator.

Centric occlusion record

This is a 'tooth-together' record of the position of maximum intercuspation and is used for mounting preoperative and master models when no change to the existing centric occlusion (i.e. confirmative occlusion) is proposed. Given the very large number of 'conformative' indirect restorations placed every year, centric occlusion (CO) is by far the most commonly taken occlusal record in general dental practice. That said, the best way of aligning models is to avoid the use of an interdental record altogether and place them in the position of 'best-fit'. This can be checked against the patient and then marked on the models. In many cases, however, disturbance of the natural occlusion means that such freehand articulation is not possible and an occlusal record is required.

Materials

Any material used to produce an occlusal record should ideally possess the following characteristics:

- ease of handling
- low viscosity initially, to avoid displacing the teeth or mandible during closure
- ability to record sufficient detail to allow accurate orientation of the casts
- sufficient rigidity when set to stabilise the models during mounting on an articulator
- acceptability to the patient
- low cost

A wide variety of materials have been used, with varying degrees of success depending on how closely they match the above, including wax, zinc oxide-eugenol paste, acrylic resin and polymers. Plaster of Paris and reversible hydrocolloids have also been recommended but are rarely used these days. Features of some of the more commonly used materials are described below.

Wax

Waxes are frequently advocated for recording centric relation (i.e. with the teeth apart) and for lateral and protrusive records. The most commonly employed method is to soften pink wax in a flame or hot water, shape it to the approximate size of the occlusal arches, lay it onto the lower teeth and close the jaw into the required position. The wax is then allowed to cool or is chilled with water and then removed.

The typical wax 'squash-bite' has, however, a number of major disadvantages. To begin with, it interferes with the path of closure and secondly, such records are easily distorted because of wax's thermoplastic nature and dimensional instability. While preformed wax rims are available, they nevertheless possess the same disadvantages.

To help overcome these problems, a hard variety of wax is preferred and softened in a water bath as this will heat the wax more uniformly. The wax can then be cooled thoroughly outside the mouth and relined with either a temporary crown and bridge cement or zinc oxide-eugenol paste to produce a more resilient and reliable form of occlusal record.

A further problem with the wax record is that firm pressure is needed to seat the casts, easily leading to distortion, especially if all the teeth have been prepared or are missing on one side of the arch. Aware of this risk, the technician may be reluctant to press the casts into the record firmly enough, so leaving them slightly unseated. This is compounded by the fact that the wax tends to obscure the position of the teeth, something that can be avoided if the buccal part of the record is cut away so that the fit of the cast into the record is clearly visible.

Zinc oxide-eugenol

A special hard-setting zinc oxide-eugenol occlusal registration paste is available and is used by spreading the mix onto a gauze mesh in a plastic frame. The advantages of this material are that it does not distort, can be trimmed with a scalpel out of the mouth and resists firm pressure during seating of the casts. Disadvantages, however, are that it is messy, time-consuming and expensive. As mentioned, zinc oxide-eugenol is often used to refine wax records.

Acrylic resin

Acrylic resins are commonly used to make simple interocclusal 'stop' records and the great advantage of rigidity and minimal distortion once set. As with wax, such copings (which can be made either directly or indirectly) can be used as a vehicle for a more fluid recording material such as zinc oxide-eugenol.

Polymeric impression material

By and large, these are now considered the materials of choice for most clinical situations, and especially for 'teeth-together' centric occlusion records. They are accurate, dimensionally stable, exhibit minimal resistance to mandibular closure and do not require a carrier vehicle.

Such materials are predominantly polysiloxanes, e.g. Blu-Mousse (Parkell) and Jet Blue Bite (Coltène Whaledent), but other materials such as polyether, e.g. Ramitec (3M Espe), are also available. They are usually delivered using an auto-mixing gun that can feature a flat nozzle to allow a broad band of material to be laid over the occlusal surfaces of the lower teeth.

Christensen (2000) described the following method for use with polymeric materials:

- Make proper preparations
- Place the interocclusal record material on the prepared teeth only
- Close the patient's jaw into the preferred position (usually centric occlusion)
- Allow the material to set (Christensen recommends materials that set with 90 seconds. Not all materials match this - while Blu mousse sets in between 30 and 120 seconds, the recommended setting time for Ramitec is five minutes followed by a further 30 minutes for the material to attain its final rigidity)
- remove the material and cut away any excess material that touches soft tissue
- try the interocclusal record in the mouth to verify its accuracy
- make sure the opposing casts are accurate and that they do not have bubbles or other defects on their occlusal surfaces

One potential disadvantage of such materials is that, being rubber, the casts tend to spring out and have to be held firmly in place while being articulated. The use of 'triple-trays' can potentially overcome this problem, as the occlusal mounting and pouring of the casts can be done simultaneously.

Conclusion

Accurate, well-made occlusal records can make a huge difference to the outcome of crown and bridgework. Almost all currently available materials will produce excellent records if used correctly - for example, wax in combination with a material such as zinc oxide-eugenol is an excellent material, but given its physical properties may not be the best material to send through the post to the laboratory.

A little time spent reviewing the use of occlusal records will undoubtedly pay dividends when the time comes to cement the restoration.

References

- Christensen GJ (2000) Improving the quality of fixed prosthodontic services. *J Am Dent Assoc* 131: 1631-2
- Survey respondents are upbeat and optimistic about the state of our industry (2000) *Lab Management Today* 16:9-15