

Bite-Management Considerations for the Restorative Dentist



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Managing a bite relationship is one of the most critical aspects of any restorative dental procedure. The bite registration is a key component in recording intraoral relationships for effective reconstruction of a single prepared tooth, a quadrant of prepared teeth, or a full arch of teeth prepared for restorative aesthetic reconstruction. Bite registrations are used to help orient the maxillary and mandibular relationship during the mounting of study models, provisional restorations, removable appliance construction, and restorative dentistry.

The bite registration or interocclusal record can be used for diagnostic mountings in a habitual accommodated centric position or in a physiologic maxillo-mandibular relationship to assess jaw relationships. The bite registration can assist the clinician and laboratory technician to better understand pathologic and physiologic relationships that exist when diagnostically analyzing the mounted study cast. The bite registration or interocclusal bite record is also used for treatment purposes. A bite registration should be easily and precisely transferred to stone models without rocking or flexing in order to reproduce an accurate, yet stable upper and lower jaw relationship.

THREE TYPES OF BITE REGISTRATIONS

Interocclusal registrations or bite records can be divided into 3 categories: 1. bite registrations for one to 2 teeth (limited treatment segments), 2. bite registrations for a group of teeth such as a quadrant of teeth, and 3. bite registrations for a single arch or both dental arches together for treatment and transferring of intraoral information to the laboratory mounting.

When treating a limited segment of teeth or a quadrant of teeth the intercuspal position can be recorded to the habitual centric occlusion accurately and precisely as long as there is sufficient occlusal support from the adjacent teeth in that quadrant or dental arch (no mandibular torque) (Figs. 1 and 2).

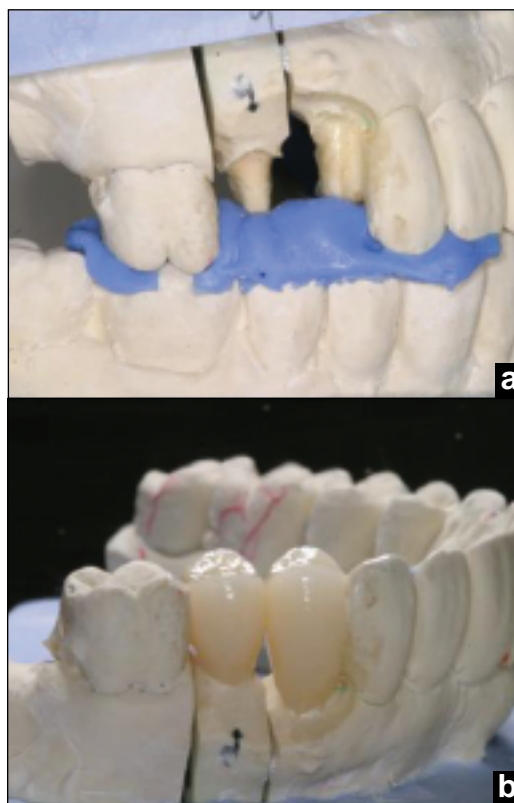


Figure 1. LuxaBite (Zenith Dental/DMG) allows for precise model mounting and orientation to accurately fabricate the occlusal contacts of the upper right first and second bicuspid all-ceramic crowns (Empress, Ivoclar Vivadent).



Figure 2. The occlusal contacting marks immediately after bonding the upper right first and second bicuspids before any occlusal adjustments. Further refinement was made to balance the bite with the Myomonitor TENS.

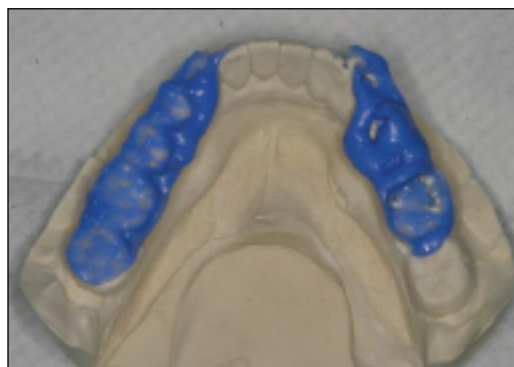


Figure 3. Note the detail in the thin areas (right quadrant vs. left quadrant) of the LuxaBite bite registration, indicating imbalances in the terminal contact of this case. This rigid (nonflexing) intraoral bite record allows for precise transfer to the models for accurate mounting.



Figure 4. Using a rigid bite registration (LuxaBite) avoids vertical compression transfer error during the mounting of the master die models for precise crown fabrication and occlusal management.

continued on page 110

Bite-Management...

continued from page 108

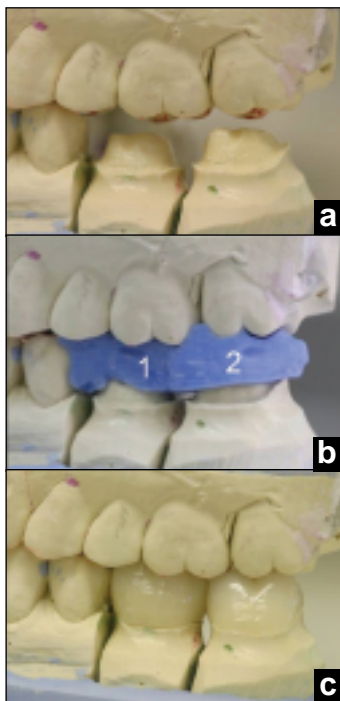


Figure 5. (A) The first molar was prepared first and a bite registration was immediately recorded to hold the bite relationship (stage 1). (B) The second molar was then prepared and LuxaBite was injected over the second molar prep (stage 2) while the first molar bite registration was held in position to hold the vertical dimension (preventing joint collapse). (C) Empress (Ivoclar) crowns were fabricated to the recorded bite relationship.



Figure 6. Articulating paper markings (40 µm, Bausch Thin) immediately after cementation of the first and second molar before any occlusal adjustments.

Registering the existing habitual bite relationship via any bite registration material relies on the ability of the patient to close reproducibly into a centric position. Whether the bite is balanced precisely or not, a bite registration can be made as long as the patient is able to proprioceptively close to a terminal contact position. Any premature contacting incline that goes unnoticed during habitual closure can induce an inaccurate bite recording during the bite registration (Figure 3). If the patient closes slightly into another position other than the position intended for

treatment, an inaccurate mounting of the opposing casts will reproduce unwanted prematurities on the new restorations at the time of crown delivery, resulting in undesired occlusal adjustments. Most experienced laboratory technicians have an ability to identify these bite registration inaccuracies during the mounting and articulating stages of the dental casts, and will immediately correct for the error and problem by altering the mount of the casts themselves without any bite record.

BACKGROUND

Dental practitioners around the world spend a considerable amount of time adjusting the occlusion, especially when delivering posterior crowns.¹ Why? Some may blame the laboratory technician for not mounting the models accurately. Others may say that the shrinkage or expansion ratios of stone, mounting plaster, and the processing of the crown fabrication lends itself to minor occlusal changes. Others blame the patient's poor bite. Some may blame the impressions for their inaccuracies. Inadvertent grinding of the occlusion due to slightly high premature contacts on the new crown(s) or bridge(s) can be less than desirable and frustrating to the dentist. Excessive adjusting of the occlusion, even at successive office visits, can be an indicator that other underlying problems may exist, compromising the functional integrity, morphology, stability, and aesthetics of the restorations.

A full upper and lower set of dental casts can be hand mounted to the existing habitual bite with relative accuracy when one or 2 crown preparations are done, as long as there exist good interdigitation of the teeth and supportive opposing abutments. If free ended edentulous ridges exist in posterior regions of the mouth (eg, missing first and second molars), or molars that are severely worn down with no supportive occlusion, it is imperative that judicious care be taken to determine a physiologic bite

relationship and re-establish a proper posterior vertical relationship of the jaw (Figures 4 to 6).²

Sequencing which tooth to prepare first while maintaining a vertical stop with a firm bite registration is critical when treating multiple units of teeth for crown preparations.

BITE-MANAGEMENT CONSIDERATION OF THE OCCLUSALLY COMPROMISED

Bite recording errors and mismanagement of the bite can affect the central nervous system's feedback loop, resulting in debilitating pathologic reactions (myopathy and TMD) at all levels of the craniomandibular/neuromuscular/cervical postural complex.

The adaptive and accommodating capacity of most people's bites certainly can be attributed to high levels of tolerance of the muscles and temporomandibular joints during restorative procedures. Fortunately, not all patients present with masticatory dysfunction, pain, and/or joint derangement.

Dentists treating the complex arch type cases involving severely worn dentition with accompanying musculoskeletal occlusal problems may need to rehabilitate a complete dental arch to a more physiologic vertical dimension. Establishing a new bite position for these myogenic or arthrogenic compromised cases is often required. The Council on Dental Care of American Dental Association (ADA) Guidelines for initial TMJ treatment recommends a phase I (reversible) treatment approach for those cases that are not stable; proving the jaw relationship with time and implementing a reversible appliance is highly recommended to prevent further harm. A phase II level of necessary therapy may be required after the patient is pain free (3 to 6 months).³ Many within our profession recognize that a majority of individuals with internal derangement and associated myofascial pain will respond favorably to orthotic and functional jaw orthopedic appliance therapy.^{4,5}

Managing a proven bite relationship after pain symptoms have been alleviated should not be a casual or routine procedure. It requires an ability to manage the interocclusal space accurately in multi-dimensions, which includes the vertical, antero-posterior, frontal/lateral, pitch, yaw, and roll aspects of the mandible. The maxillo-mandibular vertical relationship should correspond to the physiologic resting tonus of the masticatory muscles to ensure adequate interocclusal freeway space. The physiologic relationship should be recorded and accurately maintained with the condyles and disc in a physiologic position.

RELAX THE MUSCLES BEFORE TAKING A BITE

Pathologic muscle engrammed movement programming and muscular dysfunctions often prevent an unstrained bite registration and optimal condylar position. A useful tip for these types of cases is to relax and deprogram the musculature prior to taking a bite by placing 2 moist cotton rolls over the premolar region bilaterally and ask the patient to close their jaw with minimal pressure for a few minutes before actual registration.

Relaxing the muscles via low frequency Myomonitor TENS (Myotronics) for 60 minutes has been preferred by many clinicians to assist in establishing an optimal jaw relationship 6-dimensionally. Low frequency TENS has been an effective means to assist in removing pathologic engrams, allowing the complete craniomandibular complex to better align itself in a physiologic relationship prior to bite registration.^{2,6}

MANAGING THE BITE IN THE LABORATORY

Techniques used to index the intercuspal/accommodated bite position for restorative and prosthetic dentistry have historically used softened pink base plate wax folded and positioned between the bite to capture the interarch relationship for dental cast mounting and



Figure 7. Diagnostic wax-up of the upper and lower posterior quadrants at the physiologic position after 23 months of stabilization.



Figure 8. A preliminary fabricated acrylic matrix (Sapphire) is made prior to tooth preparation to hold the upper and lower bite relationship. LuxaBite is injected over the acrylic matrix to reline the prepared teeth to capture the details of the bite and hold the bite position accurately. Note the visual ease and control the hard bite registration offers during treatment.

evaluation.⁷ It is no longer recommended to use the traditional wax bite method when full arch models can be directly hand articulated with maximum intercuspation. Even if the wax bite is carefully handled in the mouth, distortions of the wax cannot be avoided when repositioning it back to the stone model. The same applies to wafer bites, which are often recommended and cause definite changes when trying to establish a more physiologic relationship.

Other materials such as acrylic resin-base, composite resins, polyether, polyvinyl siloxane, and irreversible hydrocolloids have been used.⁸ Polyvinyl siloxanes

Extensive effort by experienced laboratory technicians has been given to ensure successful seating of the new restorations, not always to the credit of a good bite registration by the doctor.

(although seemingly convenient to use) have been used with limited success in accurately maintaining the recorded maxillo-mandibular relations.⁹ Most experienced dentists and laboratory technicians value a good solid bite registration, which minimizes compression and flexural characteristics.¹⁰⁻¹³ Extensive effort by experienced laboratory technicians has been given to ensure successful seating of the new restorations, not always to the credit of a good bite registration by the doctor. Some bite registrations are rendered useless and not used when the laboratory technician recognizes distortions and lack of accuracy in registering a correct bite relationship. The ability to compress or flex the recorded bite registration with the softer bite registration materials has been found to increase chair-side occlusal adjustments of the new restorations at the seating appointment. Removing unwanted bubbles and flash from various bite registrations is often required to mount the dental casts correctly. Any small discrepancy in the mounting or distortion in the impression can lead to loss of time and inaccuracies during occlusal waxing and crown fabrication.

IMPORTANCE OF MAINTAINING THE BITE IN THE POSTERIOR QUADRANT

Temporary crowns are important not only to protect the prepared tooth, but also to hold the bite and stabilize the condyles and disc within the glenoid fossa. Few clinicians recognize the importance of maintaining an accurate bite relationship be-

tween the maxilla and mandible during the temporization phase. Many dentists believe that the provisional crowns are "just temporaries" and the final restorations will be seated in a cou-

ple of weeks with little regard to the musculature and jaw joint maintenance.

Temporary crowns are routinely adjusted with light to no occlusal marks to avoid interfering contacts (eg, first

and second molar regions). Teeth that are prepared in the posterior molar regions may be purposefully left with slight contacting occlusion during the provisionalization stage, *resulting in an*

unrealized loss of vertical dimension in that quadrant. With the slight loss of vertical change there will also be a compensating vertical change in the condyle/disc
continued on page 112

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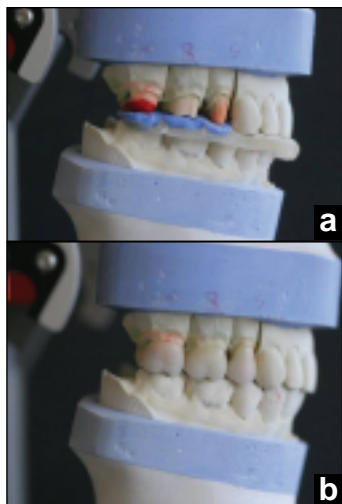


Figure 9. The relined LuxaBite/Sapphire acrylic arch matrix is trimmed and transferred to the master cast models for precise mounting. Upper posterior Empress crowns are fabricated to a hard and rigid bite relationship, increasing occlusal accuracy.

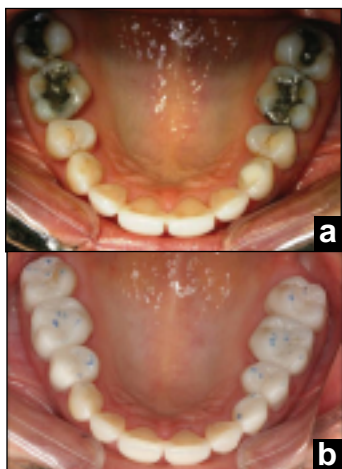


Figure 10. Before restorative treatment of posterior teeth and after restorative treatment. Occlusal contact marks immediately after cementation before adjustments were made, as a result of using a hard rigid bite registration material (LuxaBite/Sapphire matrix) and a quality lab (Mike Milne, CDT, Sunrise Dental Laboratory, Las Vegas, Nev, [800] 933-6838).

relationship within the glenoid fossa.

Accommodation will occur in the bite, joints, and musculature during the temporization period if proper attention is not given to the occlusal issues. Whatever occlusal relationship exists, immediately after restorative treatment the patient's bite is forced to rely on the existing occlusion to support the jaw position. Although a bite registration was taken and recorded at a particular relationship for the laboratory to mount, the patient's temporized bite relationship

may have been unknowingly altered and will adapt to a slightly lower vertical position than what the laboratory actually mounted using the bite registration given for crown fabrication. As a result of the "human articulator" changing vertical position over time, the new restorations that were fabricated in the laboratory will appear high at the time of crown try-in and cementation. Crowns are rarely high in occlusion due to super-eruption of the tooth. Eruption in the molar regions rarely occurs in 7 to 10 days.^{4,14} Most dentists do not realize they have contributed to a subtle vertical loss in their patient's bite.

SIGNS AND SYMPTOMS OF BITE PROBLEMS

Diagnosis of the condition of the jaw joints is often overlooked in our general dental profession. It has been reported that 82% to 90% of TMJ disorders comes from muscles.^{15,16} Although a full series of periapical films and panoramic is a standard of care to most clinicians, we must not overlook the fact that not all temporomandibular joints are healthy, just as not all masticatory muscles (tender muscles) are healthy when evaluated. Jaw joints that present with condylar degenerative changes (eg, flattening, beaking, sclerosing, bend in the neck of the condyle, hyperplastic) and present with displaced discs should be identified as contributing to occlusal management bite challenges. Clicking and popping joints, restricted mandibular opening, joint pain, muscular pain, and tooth sensitivities and aches in other regions of the mouth could be clinical indicators that something is wrong with the jaw joints and muscles. Complaints by the patient that their bite doesn't feel right or that certain contacts hitting prematurely in the anterior region cause irritation should not be taken lightly. Numerous repeat followup adjustment visits and patient complaints about their bite not feeling right would be one of those indicators. To help assist the recognized oc-

clusal, joint, and muscle problem type cases, strict occlusal management protocols should be undertaken to first stabilize the jaw joints and supporting musculature.

INTEROCCLUSAL RECORDS SHOULD BE UTILIZED

A comprehensive evaluation of not only the teeth and existing condition of the restorations should be made, but also the health of the jaw joints and surrounding musculature. The quality of the functional movements of the head, neck, and mandible should be considered as to how they will impact the dentistry performed and vice versa.

A record as to the pre-existing bite should be documented, especially when multiple teeth are involved in restorative dental procedures. Undiagnosed jaw joint problems, unrecognized hypertonic musculature, and poor interdigitation of occlusion will undoubtedly result in occlusal challenges and patient management issues. Diagnostic findings should be discussed and treatment options presented to the patient. Interocclusal bite record protocols should be utilized to confirm and document an existing bite relationship prior to any involved occlusal treatment.

PROPRIOCEPTIVE DETAILS AND THE BITE MANAGEMENT

Not only is a precise impression material necessary for exact bite recordings, but even at an elementary basis a high quality hard bite registration material is necessary to relate the upper and lower casts accurately together. "Elastomeric impression materials are popular for making interocclusal records to mount casts on dental articulators. The resistance of these materials to compressive forces is critical, because any deformation during the recording or mounting process could result in inaccurate articulation of casts and faulty fabrication of restorations."¹²

When bite registration materials do not accurately index the bite relationship of both the opposing arches and tooth preparation along

with supporting abutment teeth, it opens the door to guesswork on the part of the laboratory technician. It is far too common for the laboratory technician to establish the bite of the case, rather than the treating dentist, due to faulty bite registrations. The laboratory technician appreciates an accurate, definite hard bite registration from the treating dentist, making their job and responsibilities easier.

Removing all torque, flexure and unwanted compression in a bite registration material must be considered if treatment casts are to be mounted accurately and precisely.

Precision and accuracy in any bite/occlusion requires an awareness and attention to details. Most dentists demand precision in the fit of the crown. They also expect the restorations to not only accurately fit the prepared tooth, but also fit the bite accurately.

WHY NOT GIVE THE LABORATORY AN ACCURATE BITE REGISTRATION?

The human incisors can discriminate 14 μ m thickness between the teeth.¹⁷ Some investigators suggest discrimination below 10 μ m.⁸ Patients who present with a high level of discrimination may require a high level of precision and treatment from their dentist. If the dentist uses 60 to 80 μ m thick articulating paper to check the bite and the patient unknowingly demands a 10 μ m level of detailed treatment, there may be a mismatch in meeting the patient's expectations. If the dentist is not aware of these very real issues, especially of the high proprioceptive detailed patient, frustration will ensue.

MATERIALS

This Is What I Use—Tips and Techniques to Managing the Bite

I personally like to use a hard bite registration material—LuxaBite (Zenith/DMG)—for which my laboratory technician does not need to guess how to relate the upper and lower casts together. It is the doctor's

It is the doctor's responsibility to determine and establish the bite relationship accurately so that the laboratory technician can mount the case to the same precision as what the dentist observed and established in the patient's mouth at chairside.

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The laboratory technician's responsibility is to maintain the bite relationship that was determined by the doctor and to accurately fabricate the restoration(s) to match the patient's bite.

LuxaBite is the most rigid of all bite registration materials that I have used thanks to its innovative bisacryl chemistry.¹⁸ Its hardness (Shore D-69 or Barcol 25) eliminates compression or flexing when mounting the models. LuxaBite ensures an exact and reliable bite recording. During implant procedures many clinicians have found it effective to assist in fixating multiple impression posts in order to obtain torsion-free implant impressions.

LuxaBite is a bite registration material that is easy to dispense from an automix cartridge using a standard dispensing gun and fine syringe tips for accuracy and placement. Working time is 45 seconds for easy, quick delivery and placement. Setting time is 2.0 to 2.5 minutes. LuxaBite has a thixotropic characteristic, which prevents it from penetrating into proximal areas. Its blue opaque color makes it easy to see in contrast to the surrounding tooth structure. It has been shown to be very stable, firm, and easy to adjust with any dental bur



Figure 11. Final upper posterior restorations bonded to maintain a physiologic relationship with minimal occlusal adjustments.

or diamond.

The benefits of LuxaBite are:

- Shortens occlusal adjustment time.
- Reduces the need to break the porcelain glaze (avoiding re-glazing and polishing steps).
- Reduces surface failure fatigue points from over-adjusting porcelain restorations.
- Ease of crown seating leads to happier patients and dentists.
- Increased confidence level of the dentist.
- Increased recognition from the patients and peers of the precise and accurate treatment.

Why a Rigid Bite

Registration Is Important

A rigid full arch bite registration is a critical component of accurately managing the bite in both the posterior vertical, anterior vertical, and antero-posterior domain, especially for those cases which require attention to detail in managing the maxillo-mandibular occlusal relationships. Losing vertical or antero-posterior (AP) dimensions during tooth preparation can lead to a relapse of neuromuscular occlusal symptoms if careful and methodical steps are not implemented.

In cases that require numerous teeth to be prepared in an arch, I prefer to fabricate a foundational acrylic matrix, which acts as a reinforcing stable bite matrix to hold the jaw relationship. LuxaBite is injected over the Sapphire matrix to reline the bite registration for further detail and accuracy over the prepared teeth. I make the foundational acrylic matrix using Sapphire (Bosworth Company), an ethyl methacrylate acrylic, by mixing it into a doughy rope consistency which is formed (hands lubricated with Vaseline) and placed over the lower teeth during the uncured stage to form a rigid interocclusal arch matrix. The patient is asked to close the bite together and wait until the Sapphire rope firms up. Just before the matrix hardens in the mouth it is loosened with a hand instrument to make sure the material does not lock interproximally. The patient will continue to bite the teeth together firmly until the Sapphire bite matrix hardens.

The Sapphire is mixed to a powder-liquid ratio of 2.5 vials of powder to 1 vial of liquid. This combined relined rigid registration becomes a critical transfer matrix that allows the master

die model to be accurately mounted for final waxing and crown fabrication. A light-cured resin adhesive (Optibond Solo Plus, Kerr) is painted over the hardened Sapphire matrix to bond the LuxaBite to the Sapphire matrix.

CASE HISTORY

A 36-year-old female patient presented with chronic headaches (migraine type), previous orthodontic treatment, awakening with sore jaws, ringing in the left ear, tenderness in the left joint, restricted head movements (flexion and extension), restricted head rotation, and sore and tender occipital region.

Following a comprehensive evaluation and a series of thorough diagnostic records, a physiologic bite relationship was determined after using low frequency TENS (J5 Myomonitor) and the K7 Kinesograph (Myotronics-Noramed) to track the jaw position.⁶ After consultation and discussion regarding the patient's TMJ pain and aesthetic needs, a treatment plan was designed to stabilize her mandible and later restore the upper and lower posterior quadrants once the bite was proven and the jaw stabilized. A lower orthosis was fabricated and worn 24/7. Five weeks after initial placement of the orthosis the patient reported no longer having symptoms and pain. Three follow up adjustment visits were required over a one-year period to fine tune the bite. The orthosis was worn for a total of 23 months prior to restorative treatment.

Once stabilization of the musculature and precision of the bite were established, new upper and lower impressions were taken and models were mounted to the new determined centric occlusion. The upper posterior teeth were cleaned and excavated of all decay. The failing amalgam fillings were removed and replaced with all-ceramic restorations while at the same time maintaining the new stabilized bite without a relapse of pain symptoms. A diagnostic wax-up (Figure 7) was completed at the new physiologic posi-

tion and a provisionalization matrix was prepared and used to temporize the prepared upper posterior teeth. The Sapphire/LuxaBite bite matrix was used to register the physiologic bite relationship intraorally and transferred to the upper and lower models to hold the physiologic bite position (Figure 8).

The master casts and dies were prepared for mounting using the LuxaBite/Sapphire bite registration arch matrix (Figure 9). The final all-ceramic restorations (Empress, Ivoclar Vivadent) were fabricated and bonded with a light-cured resin-base luting material (Variolink Veneer, Ivoclar Vivadent [Low value minus one]). Minimal bite adjustments were required, preserving the beautiful ceramic work done by the dedicated laboratory technicians (Figures 10 and 11). The bite was carefully monitored for stability before proceeding to the lower posteriors.

CONCLUSION

A firm and rigid bite registration is a valuable means to capture the details necessary to accurately manage simple to complex jaw relationships. Reducing the chances of distortion, flexure, and compression from the intraoral bite registration to the bite registration transfer onto the stone models for laboratory mounting is critical if precision restorative crowns are to be achieved. LuxaBite has been shown to be a key bite registration material that is easy to work with when accuracy and precision are required in quality restorative procedures. Implementing good bite taking skills and occlusal management awareness, combined with an understanding of the temporomandibular joint and muscle health, will reduce the needless occlusal adjustments at the crown delivery appointment especially with complex cases. ♦

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Dr. Chan is a dentist dedicated to sharing his passion, and teaches the neuromuscular principles that have worked for him. He is an educator to thousands of dentists around the world as well as mentor, teacher, and counselor to study clubs and organizations. He is considered by many an authority on neuromuscular dentistry and occlusion. Dr. Chan focuses his private practice on aesthetic craniomandibular orthopedics, orthodontics, TMJ, and full mouth rehabilitation, implementing both the gnathologic and neuromuscular principles. He can be reached at clayton@drclaytonchan.com or claytonchands.com.

Disclosure: The author does not have any financial interest in products or companies mentioned in the article. This includes a salaried position in the company (including a consultant position) or funding from the manufacturer for research studies.