Implants and Occlusal Forces

The intersection of occlusion and implants

There are now more options for replacing missing teeth than ever before. Nearly 5 million dental implants are placed every year in the U.S., according to the ADA, and that number is projected to increase.

Proper surgical protocols and improvement of diagnostic technology have helped improve the success of implants. The trend toward screw-retained restorations has helped diminish cement-related peri-implantitis.

Restoration longevity continues to be one of the main complications in implant dentistry. Restorative material options continue to evolve, giving us aesthetic results that should last for many years when handled correctly.

For implant restorations to hold up in the long term, it’s critical to understand that risk factors differ between teeth and implants—especially with regard to occlusal forces.

The role of occlusion in implant dentistry

Implant dentistry is a prosthetically driven discipline and, as such, the restoring dentist must first understand the fundamental principles of a stable occlusion in the full natural dentition. This forms the basis for proper planning—both restorative and surgical—and leads to a comfortable, functional, healthy and aesthetic long-term result.

This understanding becomes even more important in a patient at high functional risk. A complete new patient exam, as taught in The Dawson Academy curriculum, determines the health of the temporomandibular joints, the muscles of mastication, the teeth and the supporting structures. A thorough exam uncovers signs and symptoms of instability and identifies risk factors for each patient.

In other words, one must gain a comprehensive perspective for success, both in
understanding the concepts and in screening for risks. There are three key factors to consider when looking at implants from this perspective:

1. **The occlusion will not be stable if the joints aren’t stable.** Unstable joints continue to change, causing changes in tooth-to-tooth relationship. An undiagnosed joint problem will lead to considerably more occlusal adjustment over time, potential chipping, fracture or loss of a restoration. Occlusal interferences can increase muscle activity, soreness, headaches and continued joint breakdown.

2. **Implants do not adapt like teeth do.** Like an ankylosed tooth with no periodontal ligament (PDL) to act as a shock absorber, implants do not have the mechanoreceptors that natural teeth do, limiting the protective feedback that signals a force overload, shutting down the elevator muscles.

   In the natural dentition, anterior guidance in harmony with the envelope of function decreases muscle force and discludes the posterior teeth in excursive movements. Higher forces are present on posterior teeth, becoming more important to manage when replaced by implants because of the lack of a PDL. Be careful to not build in interferences on posterior restorations—especially implant restorations.

3. **The timing of loading implant restorations is critical to success.** The prevailing thought in implant dentistry is that natural teeth should contact first, then the implant restoration. Under full occlusal load, the natural-tooth PDL will compress slightly before bringing the implant restoration into contact, thus preventing occlusal overload on the implant.

### Checking for occlusal issues

One of the challenges that restorative dentists face is how to practically achieve this occlusal timing with all of the clinical variables present in each patient. There are five ways to check the occlusion in these cases. Dental professionals typically use a combination of these to varying degrees based on training and experience.

1. **Ask the patient.** Soliciting feedback from the patient by asking questions such as, “How does it feel? Do you hit any high spots? Where do you touch first?” can certainly indicate severe discrepancies. But there is not always a high degree of certainty in their report.

2. **Articulating paper.** This is probably the most common method of checking occlusion, and when carefully analyzed is sufficient for finding areas the patient reported or lateral interference. But it does not convey the intensity or timing of the
mark, only that there is contact. A large area of contact does not necessarily mean high force, and it could be normal force over a larger surface area. Of course, it does make it easy to see lateral interferences, which are then eliminated on posterior teeth.

There are many different manufacturers and thicknesses of articulating paper available. My personal preference is AccuFilm from Parkell or blue TrollFoil from Troll Dental, because they are very thin and mark well without a lot of artifact smudges.

3. Shimstock. Traditional shimstock is an 8-micron-thin silver tape that can be trimmed to fit over the occlusal table of the area to be checked. Dentists have the patient close lightly and pull the shimstock through. On the next attempt, dentists have the patient close tightly and the shimstock should hold on the occlusal contact. Arti-Fol Articulating Film from Bausch is 8 microns and has ink on one side so as to mark the contact, indicating where it needs to be reduced.

4. Occlusal Indicator Wax. This thin green wax made by Kerr Dental is adapted to the occlusal surface of the implant restoration quadrant and the opposing arch is lubricated lightly with Vaseline. The patient is asked to bite lightly and open; the wax will stay on the area that’s being checked because the Vaseline prevents it from sticking to the opposing teeth.

The indentations of the wax are read where the contact areas are by seeing where the opposing teeth rub through the wax. An area of an implant crown that shows through the wax on light contact indicates an early contact and is adjusted. After adjusting the “show-through” area, a new piece of wax is adapted and the procedure repeated until the natural teeth show contact, but the implant restoration does not, on light closing. The patient is then asked to bite to full muscle contraction. This should leave a mark through the wax indicating there is contact on the implant restoration as well as the natural teeth.

5. T-Scan Occlusal Analysis System. The T-Scan is a computerized bite-force sensor from Tekscan that can measure all the teeth and restorations simultaneously, determine occlusion time (first point of contact), and quantify the center of force left to right, anterior to posterior. It records each tooth contact and determines location, intensity and duration of occlusal load.

As the patient bites on the sensor, the teeth continue to occlude over time until they reach maximum intercuspatation. After inputting in the software where implants are located, it will display implant warnings indicating overload or earlier contact than surrounding teeth. This adds predictability and confidence to your final result and helps provide patients with comfortable, long-lasting restorations.
Case examples

To illustrate the importance of evaluating occlusion and bite forces when placing implants, we’ll review two brief case studies.

A patient with a high bite force had a history of losing teeth due to fracture. He requested implants to replace the missing teeth, but declined upper molar implants because a sinus graft procedure would have been necessary. His final implant crowns were screw-retained full-contour zirconia crowns, adjusted to be sure there was no premature contact in centric relation or in excursive movements, but did have contact on maximum closure.

The screw access was closed with Teflon tape and composite level with the occlusal table and occlusion checked again. A night-time occlusal guard was fabricated to prevent further breakdown (Figs. 1–2, p. 72).

In another case, tooth #27 was an asymptomatic tooth with severe facial root resorption, rendering it unable to be restored. There was no facial plate of cortical bone left, worsened by a facial position in the arch. The preoperative photo shows wear on the incisal edge of tooth #27 and the other anterior teeth. The final restoration needed to have a shared guidance with teeth #26 and #28 so that the implant did not carry the full load of the working movements on the right side. It was also important to be sure that the implant was not overloaded vertically in CR (Figs. 3–6).

Conclusion

Occlusion plays a vital role in all aspects of dentistry, including implant dentistry. In addition to making the implant restorations aesthetic and comfortable, it is essential to evaluate the patient’s occlusion and bite force using a combination of older established techniques and the latest in technology.

As implant dentistry grows and becomes a larger part of everyday practice, the need for a comprehensive new patient evaluation becomes more evident and forms the foundation of predictable, long-term results.

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