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Crowns & Veneers: Dental Mistakes Cause Physical Pain, Speech Problems, and Concerns for Appearance

Patient presented to my office on 9/17/12 with the chief complaint of a recently placed crown on tooth #10 that had chipped. She said that the treating dentist, Dr. R, said that it could not be fixed and she would need to replace the veneer at her cost. Not satisfied with that response, she consulted another local dentist who gave her the same information. Still frustrated with her situation, she searched the internet and found an article that I published on repairing chipped porcelain.

After speaking with her on the phone about her problem, she appointed for a consultation. At that appointment she presented with the history of the recent dental treatment she received from Dr. R. She described how Dr. R had told her that her occlusion (bite) was the major reason for her jaw pain. The treatment presented to her was to re-establish a bite using a transcutaneous electrical neural stimulator (TENS unit) that would create a new bite for her with an orthotic mouthpiece that would be worn 24 hours a day. She said it was a bulky appliance that was not comfortable to wear but wore it to comply with the treatment. After wearing the orthotic for a period of time, Dr. R prepared 12 teeth (including 2 implant abutments) for crowns. Temporary crowns were placed in the interim while the crowns were fabricated at the dental laboratory. When the temporaries were placed, she found it difficult to chew food and speak but just thought it was an interim problem and probably was because they were just "temporaries".

After several weeks, she said that she returned to Dr. R's office for the placement of the permanent crowns. After the crowns were permanently cemented, she was able to see the restorations in the mirror. Her initial reaction was that the crowns were too long and too white. She was never given the opportunity to approve of the shade of the crowns during the fabrication process.

After commenting on these two concerns, she was told by Dr. R that the shade was right as well as the length and she would get used to it. The problem was that she couldn't get used to the length and still thought the crowns were too white and returned to the dental office expressing her concerns. She was told that everything was done right and she would just have to get used to it.

During my initial examination I found her having difficulty in pronouncing “f”, “v” and “s” sounds. It was noted during phonetic testing that because of the increased length of the maxillary anterior teeth, the incisal edges were encroaching on her lower lip causing problems with the pronunciation of the aforementioned sounds.

The incidence of a ceramic restoration (crowns and veneers) fracture occurs most commonly on the maxillary lateral incisors. That is the same tooth Patient presented. It is imperative that a proper occlusal design is established to allow for a smooth transition to the incisal edge of the maxillary central incisors as the patient moves beyond the cuspid in lateral excursive movements. (Darveniza M. Full occlusal protection – theory and practice of occlusal therapy. *Aust Dent J 2001;46:70-79*.)

Neglecting this occlusal scheme places disproportionate loads on the distal of the lateral incisors, leading to chipping or fracturing of the ceramic restoration. (Cranham JC. Why porcelain chips and breaks. *Inside Dent 2013;9(7):82-85*)

I then discussed how shortening the length of the crowns could possibly solve her phonetic problem and prevent further fracturing of the ceramic crowns and veneers. The reduction in length would also resolve the chipped veneer problem since it was located on the edge of the crown and that chipped portion would be removed as the length of the crowns shorten. As far as the problem with the crowns being too white, the only solution was re-place them using a more natural shade of porcelain.

I also found a lack of posterior separation when her lower jaw moved in a protrusive movement due to the lack of anterior guidance. This means that when her lower jaw was moved to an edge-to-edge position, her back teeth did not separate. Her lower anterior teeth were severely worn and lacked the necessary length for the separation of the posterior teeth to occur. I asked Patient if Dr. R had recommended treatment addressing this situation. She did not remember if this problem was discussed.

It was also noted that there was a problem with her chewing motion which is referred to as the envelope of function. There are two aspects to a patient’s envelope of function. The first aspect is the dental envelope of function which is the pathway of mandibular movement created by the contours of the teeth. As dentist, we can control the placement of the teeth in different locations, and that particular placement will dictate how the patient closes and moves. The other aspect of the envelope of function is neuromuscular. The movement of the mandible is created by the patient’s own neuromuscular movement pattern. This is essentially the dynamic relationship determined by the patient *(McIntyre FM. Designing anterior restoration for function and aesthetics. Oral Health J Apr 2003.)*

It is paramount that the restoring dentist creates harmony with the dental and neuromuscular envelopes of function. Failure to achieve this harmony can lead to catastrophic failure of the restorations, interference in chewing, tooth mobility, fremitus, hypersensitivity, TMJ disturbances, hyper-muscle activity, loss of supportive bone, and excessive wear of the dentition

(*Dawson PE: Evaluation, diagnosis and treatment of occlusal problems. 2nd ed. St. Louis: Mosby; 1989*).

I then recommended that she return to Dr. R with the information we discussed and ask that he alter the length.

(Fig. 1. Initial appointment, frontal view the crowns and veneers placed by Dr. R. Note the chipped porcelain edge on the left lateral incisor (tooth next to the left front tooth)
The 2 front teeth measured 12 millimeters (norm for a female is 10 mm). Her teeth before Dr. R's treatment, measured 10 millimeters.)

Patient called weeks later and said that Dr. R told her the crowns were fine and he would not make any changes. She asked if I would see her and help her with her teeth because they were still causing her difficulty in speaking and chewing. Additionally, she said that she was still having jaw, neck and shoulder muscle pain. She was very unhappy and didn't know what to do. She was appointed to return to my office.

The vertical dimension of occlusion

I believe there is a reasonable degree of medical probability greater than 50% that the increase in length of the permanent crowns contributed to the problems Patient was experiencing.

According Dr. Peter Dawson,*(Dawson P. Functional Occlusion From TMJ to Smile Design, 2007 Mosby Elsevier, St Louis pp.114)* the mandible-to-maxilla (upper jaw and lower jaw) relationship, established by, repetitive contracted length of the elevator muscles (muscles that close the teeth together) determines the vertical dimension of occlusion. The vertical dimension of occlusion (VDO) refers to the vertical position of the mandible in relation to the maxilla when the upper and lower teeth are intercuspated or interdigitated at the most closed position.

In layman terms, if a dot was placed on the tip of a patient's nose and another dot placed on their chin, the distance measured between the 2 dots could be used as a reference measurement of the vertical dimension of the patient's bite when the teeth were closed together. If on that same patient, the teeth were made longer (taller) then when the patient closed their teeth together, the distance between the 2 dots would be increased. One could then say that the vertical dimension of the patient's bite has been increased. In this scenario, the muscle contraction length would then have to increase as well. That means that the muscle fibers would have to permanently lengthen on their own which at this point there is a lack of evidence in the literature supporting this change does, in fact, occur.

Dawson further states the failure to understand physiology and biomechanics of vertical dimension has led to inappropriate overtreatment and has resulted in iatrogenic damage to dentitions and missed diagnosis of Temporomandibular Dysfunction. Failure to understand the true nature of vertical dimension affects a major amount of the decisions every dentist must make in practice.

In Patient's case, when comparing the pre-treatment models and the post-treatment (Dr. R's treatment) models, there is an obvious increase in her VDO. This increased vertical dimension could not be tolerated by Patient which is demonstrated by continuous complaints of difficulty in speak, difficulty in chewing with jaw, neck and shoulder pain.

Treatment plan

At the subsequent appointment 10/3/12, a treatment plan was presented that consisted of 3 phases. The first phase was to change the length of the existing crowns to a length that is considered normal for a female (10 millimeters). At this point phonetic testing would be administered. Once the length was verified then her bite would be equilibrated. These modified crowns would now be referred to as provisional crowns.

A mock-up would be created in the laboratory that would restore the worn areas on her lower anterior teeth. This mock-up would then be temporarily bonded on to her teeth simulating the position, shape and length final restorations. The importance in the role of the lower anterior teeth in developing a self-preserving and comfortable bite was discussed. Therefore, the treatment plan included the restoration her lower anterior teeth.

It was further explained that a symptom-free self-preserving occlusion consisted of the complete seating of the head of the condyle into the glenoid fossa and simultaneous intercuspation of the maxillary and mandibular teeth (the jaw completely seats in the joint when the teeth come completely together). This is referred to as centric relation-occlusion. This type of occlusion allows for relaxation of the muscles of mastication and provides the proper occlusal scheme when the teeth come together in the act of closure.

Anterior guidance is one other element present in a symptom-free self-preserving occlusion. Anterior guidance provides instantaneous separation of the posterior teeth when the mandible glides forward or side-to-side (lateral or protrusive movements) which occurs when chewing. This instantaneous separation allows for a significant decrease in activity of the masticatory

muscles. It also decreases the amount of force applied to the anterior guiding teeth. (*Manns A, Chan C, Miralles R. Influence of group function and canine guidance on electromyographic activity of elevator muscles.* J Prosthet Dent. *1987;57:494-501 and Manns A, Miralles R, Valdivia J, et al. Influence of variation in anteroposterior occlusal contacts on electromyographic activity.* J Prosthet Dent. *1989;61:617-623.)*

Simply, when you slide your jaw forward with the front teeth touching, the back teeth separate and when you slide your jaw side-to-side with your teeth touching, your back teeth separate. This element of Patient occlusion was not present due to the worn and diminished length of her lower anterior teeth. The importance in providing this element in the comprehensive treatment of her bite was presented.

The treatment plan also included the equilibration of her bite. Equilibration is the elimination of any premature tooth-to-tooth contacts when the teeth come together that prevents the condyle (lower jaw) from seating completely in the glenoid fossa (jaw joint space). Pre-mature tooth-to-tooth contacts can lead to muscular dysfunction resulting in pain. There has to be harmony between the complete closure of the teeth and simultaneously seating of the jaw into the joint space. It is only at that position that all of the muscles of mastication release or relax. Sustained muscular contraction leads to muscle fatigue and painful spasm ("Charley horse"). The equilibration process also eliminates posterior tooth-to-tooth contact when the mandible moves forward or side-to-side (anterior guidance). Harmonizing her envelopes of function (dental and neuromuscular) would also be addressed during the equilibration phase.

After these steps were completed then her progress would be monitored over a period of time. Once she was asymptomatic of muscle pain, her bite felt comfortable and her phonetics were effortless then the second phase of treatment would initiated.

The second phase of treatment would consist of replacing the existing modified crowns with new permanent crowns at the length determined in the first phase. These crowns would be fabricated using the "wax injection method" that duplicates the shape contour and length of the provisional crowns. *(Helvey GA. Press-to-zirconia: A case study utilizing CAD/CAM technology and the wax injection method. Pract Proced Aesth Dent 2006;18(9):547-553. Helvey GA. Fabrication of porcelain laminate veneers from provisional restorations: The wax injection method. 2003 Pract Proced Aesth Dent:15(7);538-542. Helvey GA. The wax injection method of replication teeth. 2003 Pract Proced Aesth Dent:15(5);361-3.).*

The third phase of treatment was then to restore the lower anterior teeth duplicating the provisional restorations (mock-up) that had been previously bonded to the teeth.

She agreed to this treatment plan.

Treatment – Phase I

Patient returned to the office on 10/3/12 to begin the first phase of treatment. The initial reduction of the crowns was made in the right maxillary quadrant. The right central incisor was reduced in length to 10 millimeters (Fig. 2). The reduction in length of the remaining crowns was

subsequently performed to the maxillary 1st molar. The same process was then completed on the left maxillary quadrant (Fig. 3).

Fig. 2. The view depicts the amount of reduction that was made and the comparison of altered tooth lengths.

Fig. 3 Frontal view after the length of the all crowns had been reduced.

Using a vacuum-formed stent, the mock-up was then placed on her lower anterior teeth (Fig. 4 and 5).

Fig. 4. The anterior teeth prior to placement of the bonded mock-up depicting the worn lower anterior teeth.

Fig. 5. The mock-up bonded in place to simulate the shape, contour and length of the final restorations.

Immediately, the patient commented that she felt “a lot better and has more freedom with her bite and jaw”. The next step after reducing the length and placing the lower mock-up was to equilibrate her bite.

This step consisted of determining premature contacts between the maxillary and mandibular teeth that prevented her condyle from seating completely into the glenoid fossa. After several bite adjustment steps, the simultaneous seating of the condyle into the glenoid fossa and maximum interdigitation of her maxillary and mandibular teeth could now be verified. Additionally, interferences in the posterior teeth that were identified during her protrusive (forward) and lateral (side-to-side) mandibular movements were resolved.

The next day, Patient called my office to comment on how much easier it was to speak and no longer felt strained in pronouncing the syllables she was having difficulty with when her teeth were longer. She also commented on how comfortable she was in chewing and did not realize how challenging it had been eating food.

She was instructed to call the office of any changes occurred prior to her next appointment on 11/14/12.

Phase II

Patient returned to the office on 11/14/12 to begin the second phase of treatment. She commented on how much better she felt and no longer had any pain in her jaw, neck and shoulder muscles. She also commented on how her speech chewing food was effortless. She said her friends told her that her teeth no longer looked too big for her mouth and there was a significant improvement in her appearance.

This appointment included making an impression of her post-reduction maxillary arch. A plaster model was then poured. This post-reduction model was used to preserve the length of the "provisional" crowns. The model would also be used to fabricate the permanent crowns in the laboratory.

The anterior crowns (tooth # 6-11) were removed. The teeth were prepared and impressions were made. Temporary crowns were then made and inserted using a provisional cement.

Patient returned to the office on 12/5/12 for the insertion of the maxillary permanent crowns. She reported that she had still remained comfortable with the temporary restorations. After removal of the temporary crowns, the permanent crowns were then inserted.

Phase III

Patient returned to the office the next day on 12/6/12 for veneer preparation of the lower anterior teeth (tooth #'s 22-27). Final impressions were made and temporaries were placed.

She then returned to the office on 12/21/12 for insertion of the permanent lower anterior veneers. She again reported that she still remained comfortable with chewing and her speech was without any difficulty.

At the writing of this narrative, Patient still remains comfortable with her bite as well as with her speech and is happy with her appearance.

Dr. Gregg A. Helvey
12/2/14