

## **“FIXED AND REMOVABLE PROSTHODONTICS - 2004”**

TERRY T. TANAKA, D.D.S.  
Clinical Professor, University of Southern California,  
School of Dentistry,  
Private Practice, Chula Vista, CA  
619/420-6915 FAX Email: ttanaka@usc.edu

WEB SITE [WWW.TERRYTANAKADDS.COM](http://WWW.TERRYTANAKADDS.COM)

Recent advances in the science of tooth colored restorative materials have resulted in the evolution of materials that are more fracture and wear resistant. The success of an “esthetic practice, or “a metal-free practice” however, involves much more than selecting the proper material, shade and contour of these restorations. Long-term clinical success requires an understanding of masticatory function and static occlusion and includes: the recognition of anatomical facial guidelines, the proper alignment and positioning of the anterior teeth, a functional anterior guidance, a stable posterior occlusion, the recognition of tooth loading habits, and the ability to control these habits.

The purpose of this paper is to present anatomical and clinical guidelines that will help the clinician to achieve these goals in unstable, dysfunctional occlusions.

The lecture program will feature a series of “decision trees” that will aid the clinician in making decisions and in establishing comprehensive treatment plans. Important restorative and prosthodontic guidelines will be presented that will help the clinician to recognize esthetic/occlusal problems and to make appropriate clinical decisions. Participants will be able to compare treatment plans and outcomes for each patient.

### ***Anatomical factors that affect anterior esthetics:***

**(1) Length of the upper lip:** Some patients may display less of the maxillary teeth because of a shorter upper lip. (a) The patient may have a maxillary dysplasia with a shorter midface and a short upper lip; the patient may have a normal mid-face but a longer upper lip which may not allow adequate visibility of the maxillary incisors; the patient may have a normal midface, but a short upper lip. A simple surgical release can lengthen the upper lip 2-3 mm for patients with a “gummy smile.”

**(2) Thickness of the lips:** The lips may vary in thickness from patient to patient. Thicker lips usually will not allow the patient to retract the upper lip high enough to show all of the maxillary incisors. Thinner lips will sag or droop down more as the patient ages than thicker lips will.

**(3) The age of the patient:** as the patient ages the lips and skin (dermal layers of the face) become thinner and sag or drape downward.

-At age 30, at the “rest position”, the average male will display 3.0 mm of the maxillary incisors

-At age 65-70, he will display only 0.5 mm. of the maxillary incisors.

-At age 30, he will display 0.5 mm of the incisal edges of the mandibular incisors.

-At age 65-70, he will display 3.3 mm of the mandibular incisors.

-If a face-lift is anticipated, it should be done at least one year prior to starting the dental procedure to allow the soft tissues and incision lines to relax

**(4) Anterior open- bite (Apertognathia):** In patients who present with an anterior open-bite, two significant possibilities should be considered: (1) Vertical maxillary excess (VME) of the posterior of the maxilla, and (2) the possibility of a TM Joint problem with injury or loss of condyle height related to remodeling of the disc, the condyle and or the articular eminence in children and adults.

**(5) Anterior alignment of the maxillary incisors:**

**(Mid-line discrepancy):** Patients will not notice a maxillary mid-line discrepancy until it is 3-4mm. off center. (Kokich)

Patients will notice however, if there is a 1-2mm inclination (tilt) of the maxillary incisors from the horizontal or transverse occlusal plane. (Kokich)

**(6) Dentoalveolar extrusion: (Anterior deep-bite; Two-step occlusion),** is a commonly overlooked problem that may result in significant wear of the anterior teeth when bruxing habits are present. This should be the first consideration when restoring worn incisal edges of anterior teeth.

**(7) Occlusal wear and alteration of the "occlusal vertical dimension:** remember that mandibular 2<sup>nd</sup> molars are inclined 18°-19° lingually. This means that the buccal cusps will always be higher than the lingual cusps. If the mandibular buccal cusps are shorter, the OVD is decreased, unless the maxillary and mandibular molars are in an edge-to-edge relationship. The lingual cusps of the maxillary 2<sup>nd</sup> and 1<sup>st</sup> molars should be longer than the buccal cusps. If the lingual cusps are found to be shorter than the buccal cusps, the OVD is decreased.

**What should the "esthetic dentist" know about bruxing and clenching habits?**

**Anterior esthetics and occlusal parafunction (bruxism):**

**(1) Bruxism is a CNS (central nervous system) disorder:** Current research has demonstrated that occlusal adjustment and splints will not stop patients from bruxing. Splints should be used however, to protect the teeth and restorations.

**(2) Patients can apply 70% of the maximum daytime bite force to 5X the maximum daytime bite force during sleep. It should be obvious therefore, that most of the tooth wear and stress upon restorations occurs during sleep.**

**(3) Etiology of tooth wear:** Acid Erosion, Abrasion, Abfraction (tooth bending forces), Attrition.

**Guidelines for the restoration of worn incisal edges of anterior teeth:**

**(1) Rule of Thirds the E-Line and the Curve of Spee:**

**(a) Rule of Thirds:** Tell the patient to say a gentle "eee" and determine the position of the incisal edges of the maxillary incisors between the upper and lower lip.

**(b) E-Line:** the E-Line can be used to determine how much to add to the incisal edges of the worn maxillary incisors.

**(c) The Curve of Spee** and the E-Line must be considered together when making a

decision to add to the incisal edges of the maxillary and or mandibular incisors.

(2) *The inter-incisal tooth contacts* of the maxillary and mandibular incisors can be used as a guide for determining the type of restorative material for worn anterior teeth.

(3) Acrylic splints or nightguards are recommended during sleep to protect the teeth and restorations.

(4) *Do not use splints that contact only the anterior teeth during sleep. They should be used during the day only. Splints worn during sleep must contact both anterior and posterior teeth because the heaviest forces are applied during sleep. If the splints do not offer posterior support, the forces will be applied to the TMJs when the patient clenches and or bruxes.*

#### THE RESTORATIVE DILEMMA:

- 90% of the dental curriculum time is spent teaching the student how to restore teeth.
- 10% or less of the dental curriculum time is spent teaching the student how teeth articulate and function against each other.
- 0-5% of dental curriculum time is spent in teaching how muscle dysfunction, (TMD), can cause changes in the dental occlusion.
- 75% of restorative problems including worn teeth and fracture of restorations are related to TMD and occlusal parafunction.

#### EXPECTATIONS:

- Should the restorative dentist expect the newer dental materials: ceramics, porcelain laminates, composites, and resins to last as long as gold or porcelain fused to metal restorations?
- How long should we expect the newer tooth colored restorations to last?
- \*There are surfaces in the mouth where they are clearly the restorations of choice however,
- \* If past studies are any indication, less than 50% of the tooth colored restorations on the market today will still be in the mouth 10 years from today.
- •\*\*\*The principal reason for the failure of these restorations may not necessarily be the poor physical properties of the restorative materials but may be poor site selection and the occlusal loads placed upon the restorative materials.

#### OCCLUSAL PARAFUNCTION (Clenching, Bruxism)

- Occlusal habits are the primary cause of restoration failure.
- Occlusal habits are the principal cause of muscle dysfunction, (muscle soreness, muscle pain, muscle incoordination, face pain, and TM joint pain and dysfunction.
- Occlusal habits are the principal reason why dentists have difficulty making centric records.
- Occlusal habits are the principal reason why multiple crown and bridge adjustments are necessary.

- Occlusal habits are the principal reason why patients develop sore spots under complete dentures.
- Most of the patients who used to clench or brux on their natural teeth, will continue to do so on their complete dentures.

#### RESTORATIVE IMPLICATIONS:

- Splinting of natural teeth should be considered in patients who parafunction.
- Splinting of multiple force planes is indicated for patients who parafunction.
- Splinting of multiple implants is indicated in patients who parafunction.
- Unilateral anterior group function is indicated in patients who brux laterally with great force, as opposed to cuspid guidance.
- Deeper, more positive rests are indicated for removable partial denture patient with strong parafunctional habits.

#### TOOTH WEAR

- Do teeth touch when we chew?
- Does tooth wear occur as normal phenomena, as a result of chewing?
- How much tooth wear is normal? When does tooth wear become pathologic and require restorative intervention?
- Why do Mandibular incisors wear faster than maxillary incisors?
- Do CR-CO slides cause the teeth to wear?
- Will elimination of CR-CO slides stop the patient from clenching or bruxing?
- How effective are splints in the reduction of parafunctional habits?

#### DIAGNOSIS AND MANAGEMENT OF TOOTH WEAR

##### Why do teeth wear?

- Erosion - mouth acids (reflux), Citrus fruits, foods
- Abrasion - Toothbrushes, toothpicks
- Attrition - Tooth grinding
- Abfraction - Tooth bending forces. (Heyman, H)

##### Why Do Teeth Wear? ((SEE VIDEO/CD-ROM "THE WORN DENTITION"))

- Anterior tooth wear may be the result of:
  1. normal functional chewing movements
  2. parafunctional habits
  3. inadequate posterior stops
  4. deflection of the mandible anteriorly.

##### Anterior Guidance: (SEE VIDEO/CD-ROM "ANTERIOR GUIDANCE/CONDYLAR GUIDANCE")

##### Tooth Wear Is Observed:

1. At the point of initial contact as the patient closes. Usually on posterior teeth.
2. At the end of the slide. Usually on anterior teeth.
3. In a continuous parafunctional plane

##### Tooth Contact Forces:

- Bite forces 85 lbs. - anteriors; 150 lbs. posteriors
- Maximum bite force - up to 975 lbs.
- Chewing forces - 58 lbs.

- Swallowing forces - 68 lbs.  
(Gibbs C, Mahan et al)

(SEE "ADVANCED DISSECTION" VIDEO/CD-ROM FOR DEMONSTRATION OF JOINT STRUCTURES AND MUSCLE INTERACTION)

- Denture wearers can apply 24-40 pounds of bite force.

What can the restorative dentist do to counteract the excessive occlusal forces?

- Splint teeth when indicated (fixed or removable prosthodontics)
- Combine at least two force planes whenever possible
- Combine three force planes whenever possible
- Utilize occlusal splints

Procedures for reducing occlusal forces in the maxilla:

- Use as broad a coverage as possible on the palate for removable partial dentures
- Use cross-arch stabilization when indicated.
- Splint teeth with soldered joints, solderless joints and attachments.
- Splint the "isolated abutment" to the next anterior tooth, if practical.

Guidelines for splinting teeth:

- Combine at least 2 force planes
- "Turn the corner"

Rule Of Thirds

- Anterior tooth wear only
- Posterior tooth wear only
- Anterior and Posterior tooth wear with loss of OVD
- Curve of Spee

Rule Of Thirds - Anterior Wear Only:

- Ask patient to say EEEE and determine the position of the incisal of the maxillary incisors.
- -Upper 1/3 -May add 1.5 mm incisally + gingival crown lengthening.
- -Middle 1/3 -May add 1 mm incisally + gingival crown lengthening.
- -Lower 1/3 -Should not add to incisal edge + gingival crown lengthening

Rule Of Thirds - Posterior Wear Only

- Include posterior bite collapse in this category.
- Decrease of Occlusal Vertical Dimension

Rule Of Thirds

- Anterior and Posterior Wear with loss of OVD
- Complete mouth rehabilitation
- Segmental rehabilitation

Management of occlusal loading forces

- Splint therapy

- Medications (SEE CHAPTER IN TEXT “PHARMACOLOGY FOR TMD AND MUSCLE/ JOINT DISORDERS)
- Behavioral interventions

#### Management of occlusal forces

- Medications
- (For Muscle pain) Flexeril 10 mg. tabs, Disp. 30 tabs, Sig. 1 tab at bedtime or 1/2 tab at bedtime or 1/2 tab at bedtime and 1/2 tab in AM
- (For muscle pain) NSAIDs: Voltarin or Relafen
- Elavil 10 mg. tabs, Disp. 30 tabs, Sig. 1/2 to 1 tab at bedtime, for nocturnal bruxism.

#### Management of occlusal forces

- Behavioral interventions
  - Biofeedback
  - Red dots
  - Splint therapy (SEE “SPLINT THERAPY” VIDEO/CD- ROM)
  - Occlusal Adjustment:
  - 
  -

(SEE VIDEO /CD-ROM “RESTORATIVE AND OCCLUSAL THERAPY PART I”)

Videotapes/CD-Roms available. Check website for short clips of each of the video/CD-Rom programs. For further information regarding the topics, products, or videotapes/CD-Roms shown in the program, please contact - Terry T. Tanaka, D.D.S.  
 Clinical Professor, University of Southern California, School of Dentistry  
 Private Practice, 212 Church Avenue, Chula Vista, California 91910  
 619/420-6915 FAX Email: ttanaka@usc.edu

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1. Denar Articulator Systems -TeledyneWaterPik (800)925-0022 X8947  
Mark II Articulator; SlideMatic Face Bow
2. Panadent Face Bow (Kois); Panadent Bite Tray - 800/368-9777; 909/783-1841
3. Temporary Crown Matrix Buttons - Advantage Dental Products 800/388-6319; 810/391-1625.
4. Fit Checker - White Silicone Fit Examining Material; Pattern Resin (for superior accuracy)- GC Dental Prod. Corp. - 800)323-7063
5. Bosworth Superbite - Zinc Oxide Eugenol Bite Registration Paste  
Harry J. Bosworth, Co. Skokie, IL 60076
6. Examix (Polyvinylsiloxane) impression material 800/323-7063
7. Perfec Temp – 2 min. set. Bio-acrylic composite Discus Dental 888-203-4378
8. Zeza - A filled resin to repair provisionals and anterior splinting- 800/527-8937
9. Shim Stock .001"; .0005" Artus Co. 201/568-1000; Fax 201/568-8865
10. Ethyl Chloride Vapocoolant Spray - Gebauer - Purchase from pharmacy
11. Attachments and Implants Reference Manual 6th Ed. Peter Staubli, CDT  
800/999-3003
12. Physical Therapy – [www.physicaltherapy.com](http://www.physicaltherapy.com)
13. Crown Polishing "White Diamond" 80-.0360 High shine Pearson Dental Supply  
800-535-4535

## SPLINT THERAPY PRODUCT LIST

1. # 085-030 acrylic bur (straight handpiece), Great Lakes Orthodontics (800)828-7626
2. # 085-031 (slow speed) acrylic bur (straight handpiece), Great Lakes Orthodontics (800)828-7626
3. 104 Acrylic bur, (straight handpiece. For bulk acrylic removal.) Brasseler (800)841-4522
4. .028 ball clasps Unitek Orthodontics. (800)538-5500.
5. #6 C (high speed), bullet shaped diamond bur, Charles Rode Diamonds (714)492-3524.
6. 699 tapered fissure bur, (high speed or slow speed). Friction grip or straight handpiece bur. Brasseler
7. Articulating paper made by "Surgident", (Full Arch) two sided, two color (red and blue) horseshoe shaped articulating paper with a paper handle.
8. AlCote Separating Agent, available dental supply dealer. Reorder #652500.

## RECOMMENDED READING:

1. TMD and Restorative Dentistry, Terry Tanaka, Clinical Research Foundation, 619/420-8697
2. Management of Temporomandibular Disorders and Occlusion, Jeffrey Okeson, 4th Edition. CV Mosby, 1998
3. Science and Practice of Occlusion, Edited by Charles McNeil, Quintessence, 1997.
4. Tooth Colored Restoratives, Harry Albers, DDS 8th ed. FAX 707/575-4033

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**TEXTBOOK: "TMD AND RESTORATIVE DENTISTRY" 6th Ed. TEXTBOOK (July, 1998) by Terry T. Tanaka, DDS \$49.00**

The new 6th Edition TEXTBOOK, has been revised and edited, and contains the updated material and references from Dr. Tanaka's study group lectures and research. New Restorative and Prosthodontic sections.

**"RESTORATIVE AND OCCLUSAL THERAPY, PART 1" by Terry T. Tanaka, D.D.S.**

**VHS \$79 CD \$99**

Demonstrations of the Denar slidematic, '30-Second' face-bow transfer and articulator mounting, making centric records using the Dawson bimanual manipulation technique with a Panadent metal tray, complete step-by-step occlusal adjustment procedure. These techniques must be mastered before advanced restorative procedures are attempted.

**"MANAGEMENT OF THE WORN DENTITION - RESTORATIVE DENTISTRY, PART 2" by Terry T. Tanaka, D.D.S.**

Restorative guidelines for the selection of tooth-colored restorative materials for anterior teeth. Lecture/demonstration of the "Two-Step Occlusion" and why teeth wear. The Rule of Thirds is explained to help the restorative dentist treatment plan the worn dentition.

**"TOOTH PREPARATIONS FOR THE RESTORATIVE DENTIST" 2 Tape Set \$109.00 VHS \$149.00 CD-ROM**

(Part 3 of the Restorative and Occlusal Therapy Series) by Terry T. Tanaka, D.D.S.

A concise review of tooth preparation procedures and how to save valuable chair time and effort for the restorative dentist. Step-by-step demonstrations of the tooth preparations. Great for State Board Examinations. Preparations for full and partial coverage crowns, MOD onlays, Porcelain fused to metal crowns on molars, pre-molars and maxillary incisors.

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**"TMJ MICROANATOMY: AN ANATOMICAL APPROACH TO CURRENT CONTROVERSIES VHS \$79 CD \$99**

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**"ADVANCED DISSECTIONS OF THE TMJ"\*\*\* by Terry T. Tanaka, D.D.S.**

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**"DISSECTIONS OF THE HEAD, NECK AND TMJ" \*\* by Terry T. Tanaka, D.D.S.**

**Fresh cadaver**

dissections of the gross anatomy of the head and neck demonstrating the muscles of mastication, vascular and nerve supply of the face, anatomy of the submandibular triangle and cervical anatomy. Special section demonstrating adhesions and perforations of the articular disc.

**"ABC's OF SPLINT THERAPY" (NEW REVISED EDITION, Aug, 2000) by T. T. Tanaka, D.D.S.** The new revised edition shows how to adjust the splint at the insertion appointment. Tips on what burs to use and how to use them, along with follow-up instructions on what to do if the initial splint design does not produce the desired results. New product list of materials is also included.

**\*\* "TMJ RADIOGRAPHY" by Terry T. Tanaka, D.D.S.**

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