

**“ADVANCES IN FIXED AND REMOVABLE PROSTHODONTICS: 2003”**

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*“The purpose of today’s program is to provide the clinician with guidelines that can be applied to restorative and prosthodontic problems.”*

*“Knowledge in the sciences and technology doubles every 4.8 years.”*  
Hal Slavkin, DDS, PhD 1999  
Dean, USC School of Dentistry

80% of the current restorative, prosthodontic, orthodontic and surgical procedures that are used today were developed in the last 8-10 years.

*“It takes 8-10 years before one acquires enough information to feel comfortable treatment planning the more difficult patient problems.”*

*“Much of what we were taught in dental school is no longer valid in 2003”*

What is the etiology of Tooth wear and tooth fracture?

Tooth Wear:  
Erosion  
Abrasion  
Abfraction  
Attrition

*“Parafunctional habits (clenching and bruxing) are the primary causes of TM Disorders and tooth wear is most likely the result of functional (chewing) contacts.”*

*“TMD is involved in 65-75% of Restorative and Prosthodontic complications and failures”*

Where do I obtain the necessary information about TM disorders and occlusion?  
(Journals and books)?

Management of TM Disorders & Occlusion, 4th ed.: Okeson- CV Mosby  
Journal of Prosthetic Dentistry CV Mosby

Why read the Scientific Dental Literature?

Refereed journals usually provide a critical review of current topics: tooth-colored restorative materials, new composites, resins, ceramics, luting agents  
Articles include studies on wear, fracture and other properties

“Dentistry Today” and “Dental Products” magazines are not scientific journals. They are publications designed to help the dentist understand how to use or manipulate the dental materials. They are technique publications.

Just because a clinician presents an article on how to use brand X, does not mean that Brand X has passed the scientific criteria for being a reliable and durable material. Remember 2 out of 3 of these new tooth colored materials will not be on the market 3 years from today. Why?

Newer materials will have replaced them?  
They will have failed the field testing in your offices?  
Enough complaints will have been received by clinicians that the product will have been withdrawn from the dental market and.....  
Remarketed under a different name or  
Discarded and never seen again.

Why read the Scientific Dental Literature?

2 out of 3 tooth-colored restorative materials are no longer being sold 3 years later.

(“CRA Report” Aug. 1997, by Gordon Christensen’s Clinical Research Associates, 119 dentist evaluators and over 1100 different composites, resins and ceramic materials)

Why read the Scientific Dental Literature?

Unless you read the scientific literature, you will probably accept what the advertisements say about a product or what the dental salesperson is selling this week.

“The patient expects you to read this information and not just the dental technique sales manuals.”

*“Marketing Hype?”*

*“The trends in dentistry today are more the result of marketing hype than the result of a dental necessity.” (Richard Simonson)*

Literature Review

“Read not to contradict,  
nor to take for granted,  
but to weigh and consider.”

Problem Solving Skills:

“You are what you read”  
 (“You are what you eat”)

### Problem Solving Skills:

“If you expand your areas of interest you will begin to see that more factors are involved than you initially considered.”

This also allows you to consider several other treatment options

### The Dentist in the year 2003 must understand:

- Pain and Pain Management
- Masticatory Function
- Parafunction and Occlusion
- New Classification of Malocclusion
- Force Management
- Problem Solving Guidelines

### Muscle Pain:

Pain does not originate from muscle tissues

Pain originates from the nerves and nerve endings that supply the muscles

( TMJ Anatomy Videos)

### What should the dentist know about tooth contacts?

Do they touch when chewing?

How much bite force is applied?

Is the bite force different during the day and during sleep?

What protective mechanisms exist for the dentition?

### Tooth Contacts & Bite Forces:

Teeth touch during the chewing cycle during closing and opening

58 lbs. of force during chewing

68 lbs. of force during swallowing

85 lbs. of force between anteriors

160 lbs. of force between posteriors

120- 975 pounds during sleep

### What protective mechanism is present to protect the teeth?

Sensory nerve fibers in the periodontal ligaments relay messages to the...

Central Pattern Generator in the brain stem of any changes in tooth contacts which in turn acts to reduce the bite force and tooth contacts

### The Adaptive Response, Restorative Implications:

Changes in tooth contacts initiate an adaptive response with a new mandibular (centric) position, or,

May result in pain and dysfunction.

Lateral pterygoid is very important

Adaptive responses occur during the day and night.

### TMD and Occlusion: Muscle Incoordination Treatment

Splint Therapy - stabilizing splint (Type A)

Muscle relaxants (Flexeril)

NSAIDs  
Behavioral therapy

Medication for TMD:

Muscle relaxants - Flexeril 10 mg at bedtime (1/2 tab may be OK)  
NSAIDs - Ibuprophen 1800 mg/day:  
Aleve - 900-1125 mg/day  
Relafen - 500 mg tabs (1000 mg/day)  
Voltarin - 50 mg tabs (100 mg/day)  
Elavil - 10 mg at bedtime

Anatomical factors that affect occlusion:

The mandible bends 1 mm or more as the mouth opens  
The wider the mouth opening, the greater the flexion (Burch)  
Rest Position (Freeway Space) will vary with muscle physiology  
Tooth contacts will vary depending upon muscle tonicity

A New Classification of Malocclusion for Restorative and Prosthodontic Problem Solving

Terry T. Tanaka, DDS  
Richard Mc Laughlin, DDS, MS

Classification of Malocclusions

Tanaka/McLaughlin  
Vertical Disorders  
Horizontal Disorders  
Transverse Disorders

Classification of Malocclusions

Tanaka/McLaughlin  
Vertical - Anterior, posterior or unilateral open-bite occlusions  
Horizontal - Anterior slides, retrusive forces, cross bite or edge-to-edge occlusions  
Transverse - Side-to-side discrepancies

Transverse Disorders:

Congenital disorders  
Surgical complications at birth  
Trauma during growth stages  
Trauma after growth complete  
TMJ arthrosis  
Iatrogenic - (orthodontic, etc.)

Transverse Problems

Transverse angle of occlusal plane  
Etiology  
-Developmental:  
-Trauma, fracture of maxilla

- Iatrogenic: surgical, restorative
- Orthodontic

What is the significance of the CR-CO slide?

Is the CR-CO slide causing the pain and dysfunction? Why don't all patients with slides have pain?

Is parafunction a factor?

Is muscle incoordination a factor?

Is the pain related to a previous painful experience or referred?

When is occlusal adjustment not indicated?

*“Do not attempt any occlusal adjustment procedure in the presence of pain and/or dysfunction of the muscles or joints.”*

Why should you “not” adjust the teeth while the patient is experiencing pain and dysfunction?

After the joint pain due to synovitis or disc displacement is resolved, the condyles will settle back into the previously stable, physiologic position

Canine Guidance:

How frequently does bilateral canine guidance occur in a normal population?

3%, 30%, 60%, 90%?

2.3% bilateral canine guidance

10.7% unilateral canine guidance

-Ogawa, Koyama, JPD, 1998

How often do non-working side contacts occur?

40% of a normal population

Ogawa and Koyama, JPD, 1998

60% of a normal population

Ingervall, JPD 1975

Stallard and Lytle

*“The reason we have trouble understanding the coupling of teeth is that we diagnose relationships by movements not used in chewing.”*

Harvey Stallard, Nov. 1970

Non-Working Side contacts should not be removed when:

The etiology of the contacts is a worn canine on the opposite side

The proper treatment is to build up the worn canine

\*Remove the contacts if they still exist after the build-up

Non-working side contacts should not be removed when:

Pain and crepitis is noted on that side

If a decreased point space is noted on that side

Korioth, 1998 Science and Practice of Occlusion

( “Anterior Guidance and Condylar Guidance Video)

## Semi-adjustable Articulators

### Settings:

- Panadent
  - Denar Mark II
- SAM
- Whip-Mix
- Hanau-Teledyne

### Semi-adjustable Articulators Adjustments:

- Intercondylar distance is pre-set at 110 mm
- All models have the same intercondylar distance

### Eminentia Angle: 36°

- Set at 30° for unworn teeth
- Set at 20° for worn teeth

### Semi-adjustable Articulators \_Adjustments:

#### Eminentia angle:

- Set at 30° for restoring teeth with minimal tooth wear
- Set at 20° for restoring severely worn teeth

### Incisal Guidance and Protrusive Angle

- 10 Protrusive Angle studies:

- Average 36°

How far does the condyle travel from a closed position to anterior edge-to-edge position?

(Anterior Guidance Video)

### Protrusive / Condylar Angle Studies:

- 35.7°-Zamacoma et al, JPD, 1992
- 36.7°- Beard et al, JPD, 1986
- 32.4°-wax rec.-Ecker et al, JPD, 51;1989
- 48.4°-Whip-Mix-Ecker et al, JPD, 51;1989
- 37.4°-Panadent-Ecker et al, JPD, 51;1989
- 33.0°-Preti et al, JPD, 48;1982
- 37.7°-Aull, JPD 15, 1965
- 35.5°-Issacson, JPD 9, 1959

### Guidance System During Protrusion

- The influence of the incisal path on any tooth path was consistently greater than that of the condylar path.

- Ogawa, Koyama, Suetsugu, J.Oral Rehab, 1992

### Semi-adjustable Articulators Adjustments

#### Progressive side-shift:

- Set at 7°-10° for patients with minimal tooth wear
- Set at 10° to 13° for patients with extensive canine and posterior tooth wear.

Immediate Side-shift: (does not exist)

Set at 0 side-shift for patients with minimal to no wear  
Set at .5 mm for patients with moderate canine and posterior tooth wear  
Set at 1.0 mm for patients with extensive canine and posterior tooth wear

#### Determinants of Mandibular Movements - Side-shift

Progressive SS = 7-10° (unworn teeth)  
Progressive SS = 10-13° (worn teeth)  
Immediate SS = 0.5 mm (unworn)  
Immediate SS = 1.0 mm (worn)  
(Hobo, Clayton)

#### SPLINT THERAPY FOR THE RESTORATIVE DENTIST

##### Type A and B Splints

##### Type A - Stabilizing Splints

Minimal thickness; wear part or full-time

##### Type B - Stabilizing Splints

Made slightly thicker for decreased OVD; wear full time

##### Type C Splints

##### Type C - Repositioning Splint

For acute disc displacement; wear 3-4 weeks only, then adjust to ICP

*“Anterior deprogrammer type splints are recommended only as long as the contacting surface of the splint is flat.”:*

- Splints should be used with NSAIDs, muscle relaxants, or analgesics, when pain is involved
  - Pain memory
  - Deep Pain input
  - Orofacial Pain Disorders

( Splint Therapy Video)

##### TMD and Rehabilitation

- Establish occlusal stability first
- Use a splint to determine the proper OVD, CR position, and anterior guidance before final restorations are started
- The splint is the same as complete rehabilitation in acrylic

*What should the restorative dentist know about occlusal forces?*

*Time*

*Load*

*Direction*

Occlusal Forces:  
How much force is applied?

- Day forces:
  - 58 pounds when chewing
  - 68 pounds when swallowing
  - 85 pounds bite force (anterior)
  - 150 pounds bite force (posterior)
- Night forces: 200-975 pounds

Are the forces constant (sustained) or intermittent?

- Okeson and others have determined in sleep lab studies that patients clench and/or brux in 4-8 second periods, stop, and then resume clenching.
- These clenching periods usually occur during REM sleep, but can also occur during NREM sleep.
- Significantly less load is applied to the teeth during the day due to the sensory nerve fibers in the PDL and the Peripheral System
- Parafunctional habits and loading during the day can be altered with biofeedback training
- Nocturnal habits are more difficult (biofeedback is not effective during sleep)

How effective are splints in reducing loading forces on the teeth and TM joints?

Splints are effective during the day

Initially, splints used at night are effective, however 10-15% may start to clench and brux again on the splint

Splints, therefore, serve two purposes:

Day use- splints act as a biofeedback device or as a reminder to not touch the teeth together

Night use - splints act to protect the teeth from wear

Splints serve two purposes:

\*\*\*Make splints for all clencher and bruxers after restorative treatment is completed to protect the restored crowns from wear and/or fracture.

Restorative procedures for the management of occlusal forces:

Splint teeth together: fixed and removable

Make vertical the occlusal (incisal), forces

Decrease the B-L surfaces of the posterior teeth

Improve the crown to root ratio

Occlusal Vertical Dimension

What is it?

Why is it important?

How is it determined?

How stable is it?

Can it be altered without harmful effects?

*"Whether or not the OVD can be increased is no longer in question. The real questions are when and how much?"*

### Interocclusal Rest Space

is synonymous with Freeway Space: GPT-6

*"The difference between the vertical dimension of rest and the vertical dimension while in occlusion"*

Why is occlusal vertical dimension important?

For maintaining:

Proper face height and esthetics

Over-closed = Popeye appearance

Over-opened = strained muscles

A stable occlusion

### OVD Controversy No.1:

*"The neuromuscular system has an optimal vertical dimension" ?*

Skeletal muscles have a certain resting muscle length determined by neuro-anatomical characteristics of the active length of the muscles

Muscle pain and/or dysfunction do not mean that the OVD is decreased.

*It usually means that the patient is engaging in parafunction, (clenching or bruxing)."*

Question #2: Can you restore the patient at the current OVD? (worn dentition)

Is there is enough interocclusal space at rest?

No: Do gingival crown lengthening (limited to anteriors and premolars)

If there is not enough interocclusal space at rest:

What are the restorative possibilities?

Reestablish the OVD using:

Occlusal splint (2-3 months)

Bonded occlusal restorations

Provisional restorations

### Literature Review

*"Vertical dimension problems are more likely to be inherited than antero-posterior problems"* (Study of twins)

Tr. European Ortho Soc pp 103-119; 1965

### Alteration Of OVD

Univ. Washington study

When patients went from natural teeth to an edentulous condition, the OVD decreased 5.1 mm. and the rest position decreased 3.5 mm

OVD and effect on muscle length:

Ref.: Dahl - J Oral Rehab, 1985

### Clinical Evaluation Parameters

Four Esthetic concerns:

1. Phonetic concerns - SS sounds  
( patients adapt easily to new lingual designs)
2. Functional concerns
3. Structural concerns
4. Visual concerns

Problem Solving:

A series of patients with the various Vertical, Horizontal and Transverse problems were presented and the participants were able to follow the clinical slides and apply the guidelines regarding the management of occlusal forces, centric relation to centric occlusion slides and problems related to occlusal vertical dimension.

*“Restorative Tips”*

FUJI-ROCK .04% expansion (brown)

DI-KEEN expansion (green)

Tooth Preparations:

*“More time is wasted during tooth preparation appointments than any other restorative procedure.”*

Bien Air (electric handpiece)

What Is The Etiology Of Tooth Wear?

Erosion - acidic foods, reflux

Abrasion

Abfraction

Attrition - Tooth contact wear:

-Enamel-enamel; enamel against gold, porcelain, composites, resin

Why Does Tooth Wear Occur?

Normal function

Parafunction (peripheral, central, extrapyramidal)

Failure of restorative materials

Medications (Compazine, Phenergan)

Terminology:

Overbite - Vertical overlap

Overjet - Horizontal overlap

Balancing side - Non working side

Working side - Working side

(Video: “Worn Dentition”)

For preview of this video or CD-ROM, logon to [WWW.TerryTanakaDDS.Com](http://WWW.TerryTanakaDDS.Com)

Treatment Planning the Worn Dentition:

The E Line

The highest smile line

The gingival excess line

## The Rule of Thirds

Upper third  
Middle third  
Lower third

## Age Related Tooth Display

Male, age 30

3.0 mm of max. incisor  
1.3 mm of mand. Incisor

Male, age 70

0.5 mm of max. incisor  
3.0 mm of mand. incisor

## Prosthetic Guidelines

Esthetics: Function

Rule of Thirds

Anterior guide

Posterior guide

Curve of Spee

## Anterior-Posterior guide

*"Fabricate a full arch splint for these patients as opposed to an anterior programmer. This will allow the patient to get used to the final prosthesis."*

*"If implants are to be placed in the posterior, keep the anteriors as vertical stops until the implants are uncovered and then crown the anteriors with the posteriors."*

Whenever possible splint the remaining anterior teeth together

*"Place a ledge on the lingual of the maxillary anteriors in order to apply more vertical closing forces."*

*VIDEOTAPES/CD-ROMS shown in this program are available. Check website for short clips of each of the video/CD-Rom programs.*

*For more information regarding the above topics and other lectures, logon to:  
WWW.TerryTanakaDDS.Com*

## PRODUCTS USED BY TERRY T. TANAKA, DDS

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, Editor Charles McNeil, Quintessence, 1997
4. Tooth Colored Restoratives, Harry Albers, DDS 8th ed. FAX 707/575-4033

**QUICK AND EASY ORDERING**

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AGD Continuing Education Credits, 2 hours per tape.

**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.

**"ANTERIOR GUIDANCE AND CONDYLAR GUIDANCE" (Restorative -Occlusal Therapy, Part 4 VHS \$79 CD \$99**  
Anterior Guidance: How much is necessary and Why? When is it not necessary? Are Anterior Guidance and Condylar Guidance related? There are over 30 eminentia angles - Which one is the right one? How is Anterior Guidance developed,? Fabrication of a custom guide and criteria for the selection of an articulator.

**"TMJ MICROANATOMY: AN ANATOMICAL APPROACH TO CURRENT CONTROVERSIES VHS \$79 CD \$99**  
"Fresh, perfused, cadaver dissections demonstrating TMJ anatomy and the blood supply to the condyle. Addresses possible avascular necrosis and the structural relationship of disc dysfunction and arthroscopic surgery and ligamentous attachments to the disc. Special section on ligamentous attachments connecting the retrodiscal tissues to the middle ear.

**"ANATOMY FOR IMPLANT DENTISTS" \* by Terry T. Tanaka, D.D.S. Fresh cadaver dissections demonstrating the sinus membrane, tenting procedures, and the osseous configuration of the maxilla and mandible .Made for the surgeon and restorative dentist.**

**"ADVANCED DISSECTIONS OF THE TMJ"\*\*\* by Terry T. Tanaka,D.D.S. VHS \$79 CD \$99**  
Fresh cadaver dissections starting from the skin surface, exposing the nerves directly over the TMJ, and continuing down into the TMJ. This is the view seen by surgeons during surgery. Tape also demonstrates facial muscles and a new medial disc attachment, cross-sections through the TMJ and the dynamic movements of the condyle-disc assembly.

**"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. VHS \$79 CD \$99**  
The complete instruction video on TMJ imaging. How to read and interpret Transcranials, APs, Tomograms, Arthrograms, CTs and MRIs of the TMJ. Learn which type of imaging produces the best image for soft tissue, bone, the disc and for disc displacement. Tapes available in Japanese.\* Manuscript available in Japanese. \*\*PAL AND OTHER FORMATS AVAILABLE. ADD \$35.00/TAPE.  
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