Aesthetic and Biomechanical Precision in Fixed Prosthodontics

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Slow, Progressive, Predictable, Steps to precision (fit, occlusion, aesthetics)

Provisional / Temporary Restorations

Continuous cross checking between surgery and laboratory
Precision of Fit

- Together with good resistance form, protects underlying cement
  - stresses absorbed by preparation walls rather than cement e.g. gold onlays with ZnP cement.
    Wiskott HW et al., Int J Prosthodont. 1999
- Reduced quantity of cement = reduced manifestation of undesirable properties (e.g. shrinkage, cohesive fracture, dissolution, etc)
Occlusal Precision

Control of forces on restorations is a key factor in their longevity.  

Torbjörner et al. Int J Prosth, 2004

• Dental materials e.g. porcelains, cements, resins, work better under compression than tension.
• Convert unfavourable, off axial, tensile/shearing forces to more favourable, axial, compressive forces.
• Avoid high areas of stress by distributing forces over as many teeth as possible.
Aesthetic Precision

‘Tombstone teeth’ killed my marriage

From Tim Reid in Washington

THE woman who made a fortune with The Rules, the bestselling dating manual on how to find your ideal man and keep him, has a new piece of advice for female lonely hearts: choose your dental wisely.

Ellen Fein, whose step-by-step guide to capturing a man became an international bestseller, revealed yesterday that her own marriage of 16 years collapsed because of her "gigantic teeth". The result, she claimed, was bashed dentistry.

Ms Fein, now engaged to another man and on her fifth years ago, but, in a lawsuit filed in New York yesterday, Ms Fein, 46, alleged that cosmetic surgery performed by the society dentist Larry Rosenthal left her with a smile so unattractive "my marriage disintegrated". She said that her dental problems drove her husband away. In a complaint filed with the New York Office of Professional Discipline, which handles medical grievances, Ms Fein said that routine dental work eight years ago left her with "life-altering" injuries: "I wake up every morning with teeth and jaw pain," she charged.

The surgery, she added, "deliberately altered my bite by the placement of oversized veneers on my teeth."

She continued: "My marriage disintegrated — of course there were other issues — but all the complications that came from the procedure were the things that led to divorce."

The Rules told women that the right way to a man's heart was to play hard to get. Months after its publication, it emerged that Ms Fein's husband Paul Feingertz had left her.

Mr Rosenthal said in a statement that the complaint was "baseless. He speculated that

Agreement between all parties (patient, technician, dentist) on final aesthetic result. No surprises!!
Precision of Fit

• Tooth Preparation
• Impressions
Success rate of impressions.

Johnson et al JPD, 2010

Problem

• Most common critical defect was located on the preparation finish line
• Most common operator error was inadequate gingival displacement

Solution

• Retraction cord and tissue conditioning
Impressions

Any problems?
Easier to read a stone model than an impression
Take time to read your impressions

You can only recognise what you can see.

Air blow

Tear

Moisture contamination
Tissue Health and Support
3 weeks later
Remargination
Inadequate tissue support

- Leads to tissue collapse over retraction cord
- Requires over aggressive packing of retraction cord
You get out what you put in
Good tissue health and support = Good impression
Full Arch Impressions
Full arch impressions

Requirements
(same as for single tooth impressions)
• Excellent impression of each prep
• All preps accurately located on a single working cast

Problems
• Time – polymerisation starts as catalyst and base start mixing
• Saliva/moisture control (especially in lower arch)
• One faulty area can compromise entire procedure. No means of checking until entire impression is complete
• Excessive retraction
• Excessive pain
• Excessive stress
You only see what you look for!
Sectional impressions, with resin copings and pickup impression
Silver-plated dies. Marginal accuracy

The marginal accuracy of crowns fabricated on the silver-plated dies is statistically as accurate as that of crowns fabricated on stone dies in all cases and significantly more accurate in some instances.

Cross checking
Accuracy of transfer technique vs direct technique

No difference

- Greer PJ, Stevens L. Dimensional variability of die/model systems.
- Azizogli et al. Comparison of the accuracy of working casts made by the direct and transfer coping procedures.
  – J Prosthet Dent 1999;81:392-8
Occlusal Precision
(JRR records)
JRR record requirements (1)

- At VDO of final restorations
  - controlled by physical stop (jig or temps)
- Minimal neuro-sensory disturbance
  - No manual guidance. "normal and comfortable" closure pattern
  - No deviation of Md on closure – no interferences from other teeth or registration material
The problem with a manipulative technique “controlled” (i.e., “guided”) by the dentist to achieve a “centirc” condylar position is the unpredictability of the patient’s subliminal psychological trigger response to aggression, which then generally results in muscle guarding similar to a noxious reflex response.
JRR record requirements (2)

- Verifiable
  - Reduces need for multiple records and “centri-check”
- Goes in soft, sets rigid, slightly forgiving against stone casts
  - Composite - too unforgiving
  - Silicone – too forgiving
- Dimensionally stable
  - Composite?
Progressively equilibrated and refined to precise, reproducible and stable position ($M_i = C_o$)

Temps vs Temps
Articulated in MI
(photos and occlusal sketch)

Technician - S Sgro'
Ensure correlation between models and mouth of articulation in Mi

Model equilibration to match intra-oral situation. Loos et al. JPD, 2001
Temps vs Preps
• verifiable
• at correct VDO
• minimal neurosensory disturbance
• goes in soft sets hard
• dimensionally stable
Preps vs Preps
• verifiable
• at correct VDO
• minimal neurosensory disturbance
• goes in soft sets hard
• dimensionally stable
Fit Check and Bite Verification
(to ensure coincidence between inra-oral and lab)
Verification jigs on framework copings
Fit-check of copings
Confirm markings correlate with those in the lab
Post cementation occlusal adjustment
temps

provisionals

finals

occlusal progression to precision
Once neuro-muscular passivity has been achieved during an appropriate period of provisionalization, subsequent intercuspal precision becomes the controlling factor in maintaining a stable occluso-condylar (mandibular) position. In the absence of pre-occlusal deflections, the mandible is capable of bringing the teeth together—and both condyles—into exactly the same intercuspation every time occlusion takes place.
Aesthetic progression to precision

Subjective:

- Make sure you, the patient and the technician are all satisfied with the proposed final restorations..............No Surprises !!!
Visualise before you Finalise

• Pre-treatment
  – mock-up

• After commencement of tx
  – temporaries/provisionals, wax evaluations, biscuit bake
Biscuit bake
Aesthetic transfer of Facial Planes from Patient to Articulator (accuracy in all 3 planes)
Replicate what you see in the face on the articulator
Replicate what you see in the face on the articulator
Tamburrino. The Axis-Horizontal reference line for precision diagnosis

Figure 10: Comparison of the patient’s head and traditional face-bow orientation in ANHP (left) and when the face-bow is oriented to horizontal (center) with the traditional technique. The resultant maxillary model mounting is shown on the right.

Figure 13: Patient with an Axis-Horizontal oriented hinge axis face-bow (left), and then, superimposed on a CBCT oriented to ANHP (right).
INNOVATIONEN
ZAHNTECHNIK INTERDISZIPLINÄR

Abb. 9 Die Modellorientierung.
Abb. 10 Die Gesichtsmitte entspricht der Artikulatlitten.
Abb. 11 Die Camper'sche Ebene.
Abb. 12 Die Mitte des Artikulators kann sagittal die Schädel- und die Kieferbahn repräsentieren.

“Head – Lines” system

Camper'sche
Frankfurter

Schottl. Quint Zahntech. 2010
Ditramax transfer system

Morgossian et al. EJED 2011
Three-dimensional assessment of the reliability of a postural face-bow transfer

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Purpose: The aim of this study was to assess the reliability of a postural face-bow transfer.

Materials and methods: Three-dimensional position of the occlusal plane was assessed in 10 subjects with a computer assistance in both arches with a postural face-bow. An imprinted hydrocolloid impression of the maxillary arch was made for each subject and poured in dental stone. The maxillary arch was then mounted in an articulator with use of a postural face-bow. The 3-dimensional position of the occlusal plane was then measured and compared to the values obtained with the use of a previously certified, compensated, computarized instrument. The measurements were compared using the Wilcoxon signed-rank test.

Results: The postural face-bow appeared reliable and consistent with the compensated assistance, with mean differences ranging from 2.0° to 3.6°.

Conclusion: In the population tested, a postural face-bow reliably reproduced the spatial orientation of the occlusal plane relative to the true vertical plane. This position was transferred to an articulator with limited errors.

CLINICAL IMPLICATIONS

In this study, use of the postural face-bow allowed the dental technician to orient the master casts with the same precision seen when facing the patient.
An Improved Esthetic Control System

The use of an improved system for controlling certain esthetic parameters during prosthodontic treatment is presented. A measuring device, known as a facial clinometer, is used to determine correct tooth and incisal plane angulation, and a similar laboratory clinometer is attached to the articulator so that these parameters may be controlled during fabrication of the prosthesis. A life-sized photograph of the patient’s smile can also be attached to the articulator, enabling the teeth on the cast to be viewed as they relate to the lips and facial features present in the photograph. *Int J Prosthodont* 1988; 1:80–86.
Abstract

Purpose: Orientation of the occlusal plane is important in number of clinical situations. Using the reported soft and hard tissue landmarks is difficult and requires experience, as the landmarks are located on the face or by use of a cephalometric radiograph. Improper use of these landmarks may compromise the functional and aesthetic result of prosthetic reconstruction. This study evaluated the reliability of the hamular notch/incisive papilla plane (H/IP) in establishing the occlusal plane.

Materials and Methods: Ninety healthy, Indian adults (40 females, 50 dentulous) participated in this study. The occlusal plane of the subjects was compared with their HIPS. In dentulous subjects, the maxillary stone cast was mounted on the Wilcos surveyor with HIP which was made parallel to the horizontal plane using the tipography method. The vertical distance between the occlusal plane and floor of the surveyor was measured at four points. When the measured values were equal, the two planes were considered to be parallel for that situation. In turn, this relative co-ordination between the occlusal plane and HIP in the edentulous subjects, the occlusal plane, established clinically using the ala buccal line, was compared with the HIP radiographically using lateral cephalograms. Paired t-test was used to test the equality of the mean differences as a 0.05 significance level.

Results: The mean differences from the right canine were 0.05 mm at the right canine, 0.05 mm at the right molar, and 0.005 mm at the left molar in dentulous subjects and 0.001 mm between the incisive papilla and hamular notch in edentulous subjects. The HIP appears parallel to the occlusal plane as the paired t-test showed no statistically significant differences (p = 0.005).

Conclusion: In the population tried, the HIP was parallel to the occlusal plane. Therefore, this may be a viable reference in complete dentures prostheses.
Conclusion

- Traditional facebow may be inadequate for transfer of facial / occlusal planes
- Need additional info from photos and facial/occlusal plane analyser – cross checking
Kois Analyser
Correction from Temporaries to Provisionals
Correction from Provisionals to Finals
Thank You
www.mizrahi-dental-teaching.co.uk