

Dentoalveolar Extrusion - The Most Difficult Patient to Treat in Dentistry

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1. The face height measured in repose from the glabella to the base of the nose equals the measurement from the base of the nose to the inferior border of the chin. This means that the middle third of the face should approximately equal the lower third of the face.
2. The lower third of the face is approximately 1/3 above mid-commissure line (maxilla) and 2/3 below mid-commissure line (mandible)
3. Lip length measured in repose from the base of the nose to the inferior border of the maxillary lip in the young adult is approximately:
Females: 20-22 mm
Males: 22-24 mm
4. Average lip mobility from repose to full smile is 6-8 mm.
5. The upper lip lengthens with age. Rough guideline: 1mm per decade starting at age 40.
6. In an antero-posterior plane, the posterior edges of the maxillary teeth should be a continuation of the anterior smile line. There should be no step-up or step-down from maxillary canine to first premolar.
7. In a full smile, the incisal edges of the maxillary anterior teeth are cradled by the lower lip. There should be minimal or no negative space between the maxillary incisal edges and the lip (i.e., reverse smile). If there is space, it should be symmetrical. Conversely, none of the incisal edge of the maxillary anterior teeth should be hidden by the lower lip.
8. In full smile, the upper lip should drape across the maxillary central incisors and the canines at the tooth-gingiva interface (gingival line), displaying the entire clinical crown but very little marginal gingiva.
9. In gentle repose (say "M" or Emma), 3-4 mm of the incisal edges of the maxillary central incisors are displayed in the youthful female smile.

10. The average length of the maxillary central incisor is 10-11mm. It is difficult, if not impossible, to develop optimum esthetics with short maxillary anterior teeth. The ratio of height to width in the maxillary central incisor should be approximately 1.2 to 1.

“Global Diagnoses”

1. Short or Hyperactive Upper Lip
2. Short Teeth (Altered Passive Eruption, Wear, Microdontia)
3. Dentoalveolar Extrusion
4. Vertical Maxillary Excess

Short Upper Lip

1. Upper Lip Surgery
2. Behavior Modification
3. Botox
 - 3-4 Month Duration
 - www.mariopolo.com
 - Polo M. Am J Orthod Dentofacial Orthop 2008;133:195

Short Clinical Crown

1. Normal Eruption
 - Active Eruption – Movement of tooth down through bone and soft tissue within 1mm until it couples with opposing tooth in a stable position
 - Passive Eruption – Apical migration of gingival up the anatomic crown until it reaches of the CEJ where it stabilizes
 - Passive Eruption is essentially complete at approximately age 15
Morrow L, Robbins J. et al. J Dent 2000;28;469-73.

2. Altered Passive Eruption
 - Prevalence - 200 post-orthodontic patients
-66% had a height/width ratio greater than 80%
 - Diagnosis
 - Tooth is short
 - Can't feel CEJ In sulcus
 - Esthetic Crown Lengthening Surgery Goals
 - Move alveolar bone 2 mm apical to CEJs from facial line angle to facial line angle
 - Place gingival crest 3 mm coronal to new alveolar crest
 - Level tissue at new position

Dentoalveolar Extrusion

- Overeruption of teeth
- Gingiva and bone move with teeth
- Curved or Concave gingival line in relation to horizon
- Can occur in any teeth in the mouth
- Etiology
 - Uncoupled anterior teeth, ie. Class 2 malocclusion
 - Supereruption secondary to incisal wear
 - Supereruption secondary to lack of opposing teeth
 - Developmental cant

Vertical Maxillary Excess

- Excess vertical length of maxilla
 - Lower third of the face is longer than middle third of face
- Treatment Options
- Maxillary Le Forte I osteotomy
 - Botox (masking treatment)

The 5 “CORE” Questions

1. **Face Height** The face height measured in repose from the glabella (mid-brow point) to the base of the nose equals the measurement from the base of the nose to the inferior border of the chin. This means that the middle third of the face should approximately equal the lower third of the face.

DX: Lower Third of the Face is Longer - Vertical Maxillary Excess

TX: Orthognathic Surgery

2. **Lip Length** Measured in repose from the base of the nose to the inferior border of the maxillary lip in the young adult is approximately:
Females: 20-22 mm
Males: 22-24 mm

Lip Mobility

Average lip mobility is 6-8 mm

DX: Short or Hyperactive Upper Lip

TX: Botox

3. **Gingival Line** Drawn from Canine to Canine. Centrals should be on that line.

DX: Concave Gingival Line - Dentoalveolar Extrusion

TX: Orthodontic Intrusion, Crown Lengthening Surgery, Segmental Osteotomy

4. **Length of the maxillary central incisor** 10-11mm.

DX: Less Than 10 mm - Microdontia, Wear, Altered Passive Eruption

5. **Feel the CEJ in the sulcus?**

DX: Can't Feel CEJ in the Sulcus - Altered Passive Eruption

TX: Esthetic Crown Lengthening Surgery

Instrumentation

1. Facebow

3 Purposes:

- a. Orient maxillary occlusal plane to horizon in the frontal plane
- b. Orient maxillary occlusal plane to horizon in sagittal plane
- c. Orient maxillary anterior teeth to the hinge axis to approximate the arc of closure

2. Stick bite

3. Dentofacial Analyzer (www.panadent.com) (800-368-9777)

Jumping The DFA Jig To Another Articulator

1. Tie a piece of string between condyles of articulator.
2. Tie a second piece of string in the middle of the first string which will be the midpoint between the condyles.
3. Make a mark with a sharpie marker on the second string, 100 mm from the center of the hinge axis (the point where the second string is tied to the first string). This will determine the antero-posterior placement of the mounting jig.
4. Place the white plastic plate into the correct position on top of the mounting jig.
5. Place a mounting plate on the lower member of the articulator.
6. Place a piece of utility wax on the lower mounting plate which will be large enough to support the mounting jig.
7. Place the mounting jig on the utility wax and center the mounting jig in the articulator from top to bottom and right to left.
8. Use the sharpie mark on the second string to determine the antero-posterior position of the jig in the articulator. The mark should be at the point where the vertical (portion of white plate which fits against the maxillary incisors) component is attached to the white plate. This will place the incisal edges of the maxillary central incisors 100 mm from the center of the hinge axis.
9. Place a small bubble level on the white plate and insure that it is parallel to horizon in the frontal and sagittal planes.
10. Do not move the jig; it is now in the correct position and is being held there by the utility wax.
11. Mix dental stone and place between the mounting plate and the jig. The wax will be left in place and the stone will surround the wax and attach the jig to the mounting plate.
12. Once the stone is hard, the jig can now be taken on and off of the articulator and used to mount the maxillary cast.

Dentoalveolar Extrusion Treatment Options

1. No treatment

2. Functional crown lengthening surgery

- A. Full facial and palatal flaps for access
- B. Margin of crown should be a minimum of 2.5mm from alveolar bone
- C. Differential diagnosis for chronic inflammation around a crown:
 - Biologic Width impingement
 - Fidelity of the crown/veneer
 - Allergy
- D. Instrumentation
 - Wedelstaedt Chisels Hu Friedy CP 1/2 20-15-3
CP 3/4 11.5-15-3
 - Rhodes Back Action Chisel Hu Friedy 36/37
 - Burs Brasseler 856 Round tapered diamond
7009 Carbide finishing bur
169 L Carbide bur
- E. Disadvantages
 - Bond to root
 - Rolled gingival margins
 - Triangular shaped teeth
 - Black Triangles

3. Segmental Osteotomy

- Used infrequently today

4. Orthodontic Intrusion and restoration

- Orthodontic Intrusion
 - 6-12 months duration
 - Absolute vs. Relative Intrusion
 - Relapse high, retention is critical
- Temporary Anchorage Devices
- Periodontally Accelerated Osteogenic Orthodontics (Wilckodontics)
 - Advantages
 - Expanded scope of treatment
 - Rapid 2-3x faster than conventional orthodontics
 - Long-term stability

5. Restoration at increased vertical dimension

Literature - Vertical Dimension of Occlusion

- 1939 Schuyler – Avoid increasing VDO, at all costs
- 1946 Thompson – Mandibular rest position is established shortly after birth and does not change throughout life
- 1954 Beyron – Increased muscular activity, trauma to the dentition, excessive ridge resorption
- 1974 Dawson – VDO should rarely be increased

Increased VDO with molar coverage in humans.

Results: Increased headaches, muscle fatigue, parafunction.

Christensen J. Dent Practitioner 20;233:1970

Bite raising appliances in posterior teeth in monkeys.

Results: Re-established original VDO over time

Ramfjord S. JPD 45;74:1981

EMG study increasing VDO with coverage of canines, premolars, molars

Results: Muscles adapted and new vertical dimension of rest; re-established within 1 week

Carlsson G. JPD 41;284:1979

Increased VDO with coverage of all teeth, 3.5-4.5mm interincisally on 8 patients.

Results: Muscles adapted in 1 week. Clinical rest position re-established at new VDO

Gross M. Int J Pros 7;216:1994

EMG Study increasing VDO 3.5 mm with full coverage splint of all teeth

Results: muscles adapted. Immediate neuromuscular re-establishment of rest position

Rugh J. JPD 45;670:1981

Full mouth rehabs at increased VDO for 8 patients. Followed face height and rest position for 2 years.

Results: Clinical rest position re-established at new vertical dimension and remained stable at new VDO

Ormianer Z. J Oral Rehab 25;877:1998

Human Study – increase in VDO causes decrease in jaw elevator muscle activity and increase in depressor muscle activity. This maintains the new rest vertical position.

Carr A. J Oral Rehab 18;185:1991

Increased VDO in monkeys with full coverage splints for 48 weeks.

Results: stimulated condyle remodeling

Sim Y. Craniomandibular Practice 13;182:1995

Raised bite with anterior appliance in Guinea Pigs.

Results: changed the phenotype of the masseter muscle fiber, resulting in a slower shortening speed and more economical ATP consumption. (With increased function, the normal masseter exhausts greater amounts of ATP, which in turn causes muscle spasm.)

Ohnuki Y. Archives of Oral Biology 44;329:1999

Clinical Diagnostic Determinants

1. Gingival line to upper lip in full smile.
2. Incisal edge position
 - a. Incisal edges cradled by lower lip in full smile
 - b. No step-up or step-down from canine to first premolar
 - c. 3-4 mm of incisal display in repose in young female; 2 mm less in young male
 - d. Average central incisor is 10 mm long
3. Esthetics of maxillary post occlusal plane.

Laboratory Determinants

1. Diagnostic Mounting.
 1. Accurate alginate impressions.
 2. Facebow registration.
 3. CR record using leaf gauge – if increasing VDO, place enough leaves to make CR record at approximate new VDO.
 4. Mount maxillary cast with facebow.
 5. Mount mandibular cast with CR record.
2. Wax incisal edges of maxillary anterior teeth to approximate length based on 4 Incisal Edge Guidelines
3. Wax lingual of maxillary incisors to correct contour
4. Wax incisal edges of lower anterior teeth to correct incisal contour, length, and coupling with maxillary incisors
5. Set incisal guidepin; this is your proposed VDO
6. Make PVS matrix of upper and lower arches if increasing VDO
7. Wax maxillary posterior teeth based on the esthetic position of the posterior occlusal plane in full smile
8. Open or close incisal guide pin, as required (seldom necessary)
9. Complete wax-up of mandibular posterior teeth
10. Make second set up of PVS matrices of completed diagnostic wax-up

Clinical Procedures When Restoring at Increased VDO

1. Confirm an acceptable joint position with a leaf gauge.
2. Using first mandibular matrix, mock up lower anterior restorations with Bis acryl provisional material.
3. Using first maxillary matrix, mock up #8,9
4. Adjust upper and lower mockup to gain desired separation of anterior teeth at new VDO.
5. Bond composite to posterior occlusal surfaces at the new VDO. Now the new VDO is established.
6. Equilibrate with a leaf gauge.
7. Using a depth bur to provide 2 mm incisal reduction in the maxillary mockup and complete preparations #5-12.
8. Using a depth bur to provide 2 mm incisal reduction in the mandibular mockup and complete preparations #22-27.
9. Make final impressions #5-12, 22-27.
10. Make facebow, and CR record. Posterior teeth will determine the VDO.
11. Place maxillary and mandibular provisionals and adjust to even contact with posterior teeth.
12. Check provisionals in 7-10 days to determine esthetics, function, and phonetics. Adjust until patient is satisfied. Make impression of maxillary provisionals (goby cast), facebow and CR record. Make photos of face in repose and full smile.
13. Insert maxillary and mandibular restorations #5-12, #22-27.
14. Adjust, anterior occlusion to desired position-ie. canines holding shimstock, light drag with shimstock #7-10.
15. Add or subtract composite on posterior teeth to balance with new anterior restorations.
16. Using the mandibular matrix, mock up #18-21 with bis-acryl.
17. Prepare #13-15 with correct occlusal reduction in relation to mandibular mockup.
18. Fabricate provisionals #13-15 with maxillary matrix (don't cement)
19. Remove mandibular mockup and prepare #18-21 with correct occlusal reduction in relation to maxillary provisional restorations.
20. Make final impressions #13-15, #18-21
21. Make CR record and facebow.
22. Cement provisional restorations.
23. Insert crowns #18-21 and then insert #13,14,15 individually and adjust occlusion one at a time
24. Prepare #2-4, #28-31 as described in steps 16-22.
25. Insert crowns #28-31 and then insert #2,3,4 individually and adjust occlusion one at a time.
26. Equilibrate with a leaf gauge. Using mock chewing equilibrate envelope of function.
27. Make impressions for nightguard.
28. Confirm occlusion and insert nightguard.
29. Annual engineering appointment.

6. Equilibration to create restorative space

7. Extraction of extruded teeth

- Most commonly lower incisors