DRC4DENTISTRY.COM · MASTER OF ORTHODONTICS · 4TH EDITION

Module 13 · Treatment of Excessive Vertical Dimension

Vertical Discrepancies

A Clinical View on Open Bite & Deep Bite

Dr. Talya Young · 25+ Years of Clinical Orthodontic Excellence

drc4dentistry.drtalya.com

The Vertical Dimension · Two Views

Structural View

The Vertical Dimension · full module

A	Fundamentals of the Vertical Dimension	CONTEXT
B	Vertical Diagnosis & Cephalometrics	COVERED
C	Vertical Discrepancies ★	COVERED
D	Vertical Control in Treatment Mechanics	COVERED
E	Surgical Management of Vertical Problems	NOT COVERED
F	Stability & Retention of Vertical Correction	COVERED

Clinical View

THIS PRESENTATION

Vertical Discrepancies

C1 Open Bite

C2 Deep Bite

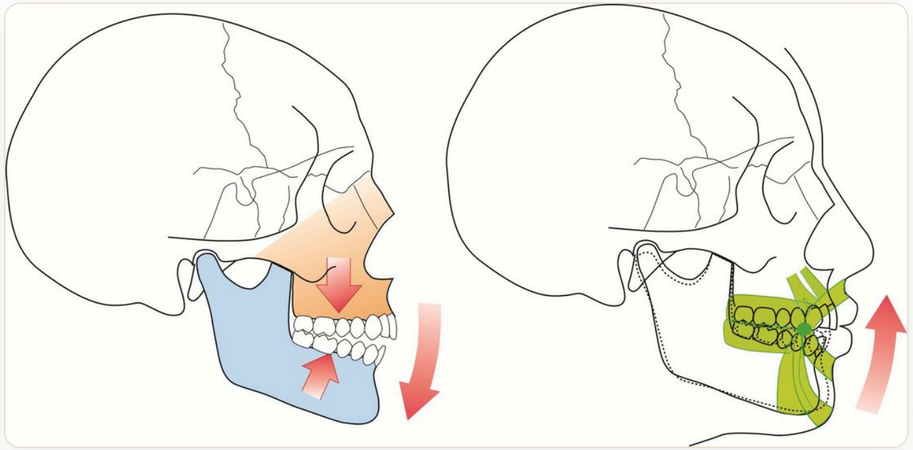
disease by disease, end to end

PART 1

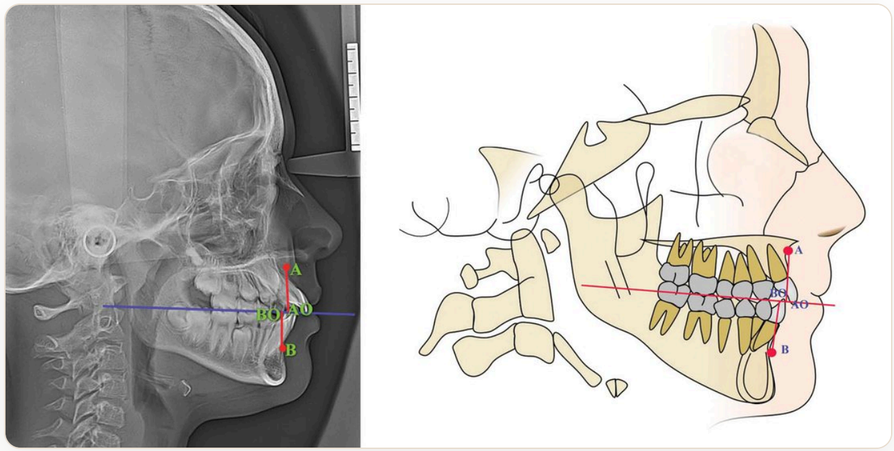
Foundations of Open & Deep Bite

Diagnosis, facial pattern & the cephalometric toolkit

The Vertical Paradigm



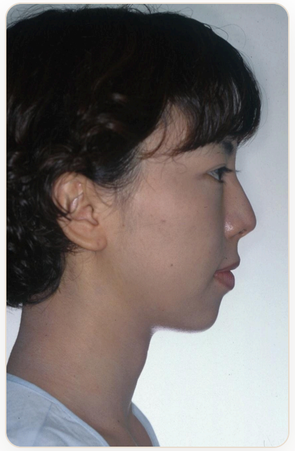
1 Hyperdivergent open bite vs hypodivergent deep bite, skull diagram



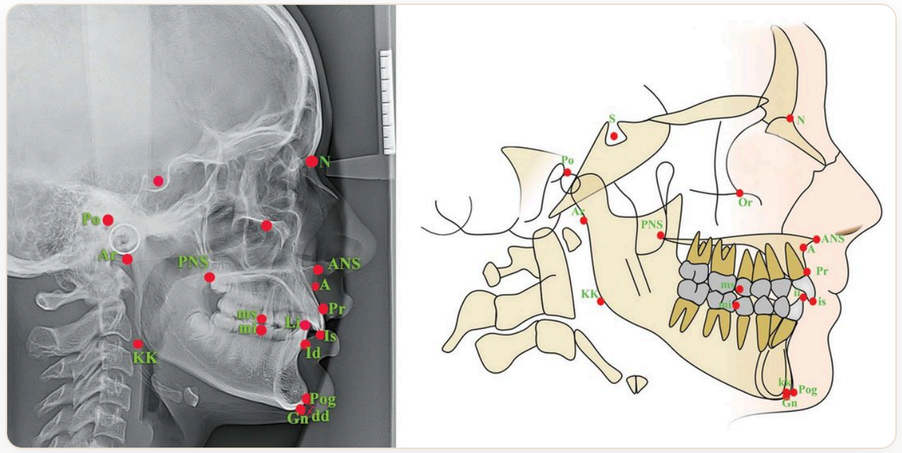
2 Tweed analysis: the Frankfort–mandibular plane angle (FMA) triangle that defines the vertical growth axis

- **Core rule**: everything in orthodontics is extrusive, vertical control is the organising idea
- **Low angle** (square jaw, deep bite) → molar **extrusion** + mandibular **translation**
- **High angle** (open-bite tendency) → molar **intrusion** + mandibular **autorotation**
- **High angle**: never run Cl II elastics, only short Cl II and anterior trapezoid
- **Easiest**: low-angle / deep-bite / dental
- **Hardest**: high-angle / open-bite / dental

Diagnosis: Facial Pattern & Long Face



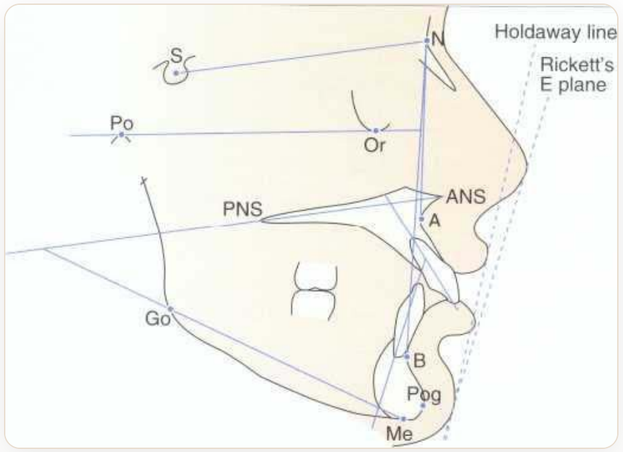
3 Class II high-angle open bite, lateral facial profile



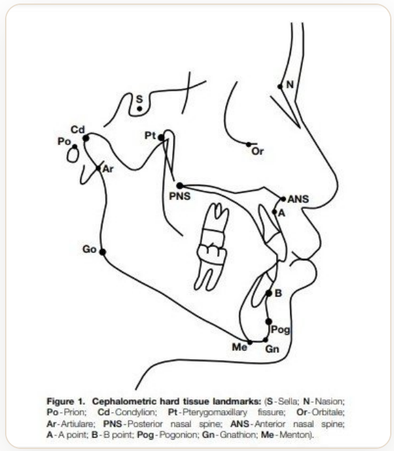
4 Björk analysis: saddle, articular & gonial angles predict the direction of mandibular growth rotation

- **Dental vs skeletal**: localise & quantify; dentoalveolar compensation can mask severe skeletal discrepancy
- **Long-face Type I, environmental**: mouth breathing, open-mouth posture (adenoids / tonsils / deviated septum)
- **Long-face Type II, genetic**: short upper lip, VME (excessive downward maxillary growth)
- **Long-face Type III**: short ramus height, antigonial notch, steep MP, backward (clockwise) rotation
- **Hyperdivergent**: FMA >28°, SN-MP >32°; dolichofacial; open-bite tendency; low bite force
- **Hypodivergent**: FMA <25°, SN-MP <32°; brachycephalic; deep overbite; strong masseter

Cephalometric Toolkit, Vertical



5 Cephalometric landmarks and planes, standard tracing



6 Hard-tissue cephalometric landmarks (S, N, Or, Po, A, B, ANS, PNS, Go, Gn, Me) on a lateral tracing

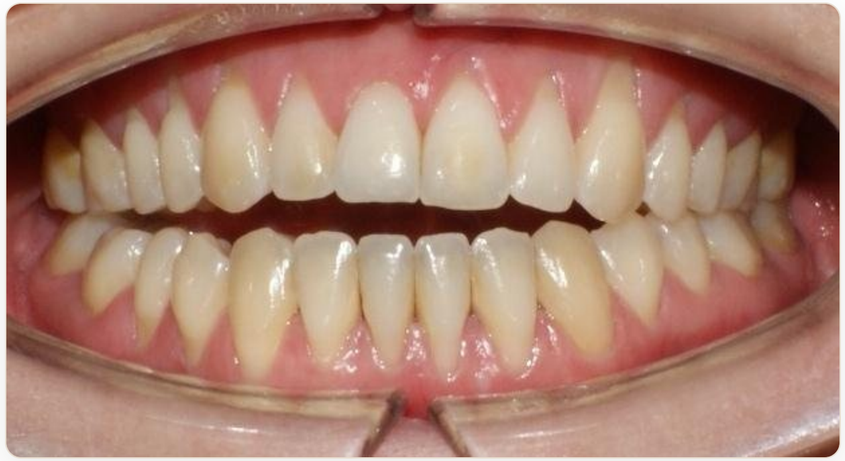
Y-axis (S-Gn / FH)	**59° ± 6** <53 counter-CW / brachycephalic; >65 clockwise / dolicho
FMA (FH–MP)	**<25° hypo; >28° hyper** hyperdivergent MP >30° = long-face syndrome (33.3)
SN-MP	**<32° hypo; >32° hyper** corroborates FMA
MMPA (Mx–Mn planes)	**27° ± 4** >27° open-bite tendency; <27° deep-bite tendency (Millett)
Jarabak ratio (PFH/AFH)	**posterior at fault → skeletal** anterior at fault → postural
NSBa / Saddle angle	**>135° vertical growth** ~118° brachycephalic
LAFH (% total face)	**35% normal** <35% decreased; >35% increased

PART 2

Open Bite

Etiology, the Sato model, closure mechanics & stability

Anterior Open Bite: Definition & Prevalence



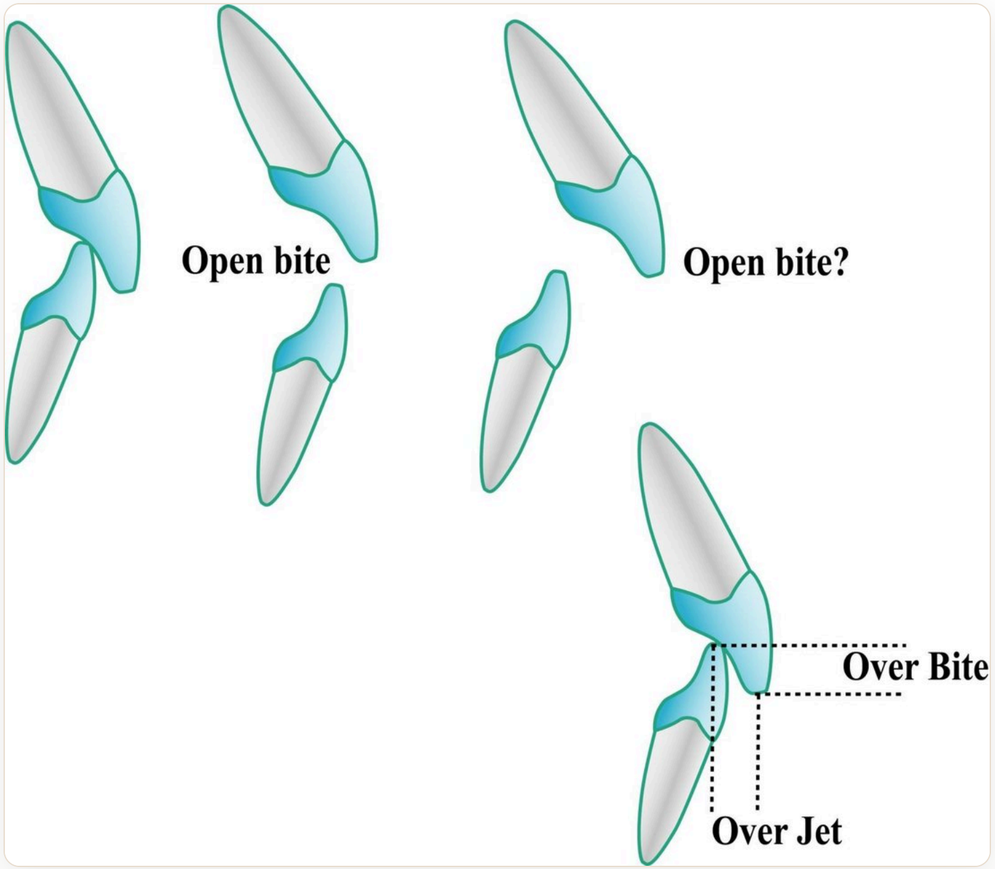
7 Frontal intraoral view showing anterior open bite gap

- **Definition (Carabelli/Sato)**: incisors fail to overlap vertically; occlusal planes do not meet at incisor level
- **Peak age**: most common 8–10 y in the mixed dentition
- **Prevalence**: ~4% of schoolchildren and adolescents
- **Self-correction**: ~50% of 3-year-olds show AOB; most resolve once sucking habits cease
- **Sustained AOB** in permanent dentition is not self-correcting

Etiology: Local vs General Factors

- **Tongue thrust/posture**, rests between incisors, disrupts muscular equilibrium
- **Mouth breathing**, nasal/adenoid obstruction forces tongue down, posterior over-eruption
- **Genetics & congenital**, disturb size, shape, proportion of skeletal structures
- **Digit/pacifier sucking**, inhibits alveolar growth, increases AOB risk
- **Macroglossia / muscular hypotonicity**, molar over-eruption, alveolar separation
- **Lip morphology & tone**, absent lip seal allows tongue to unbalance occlusion

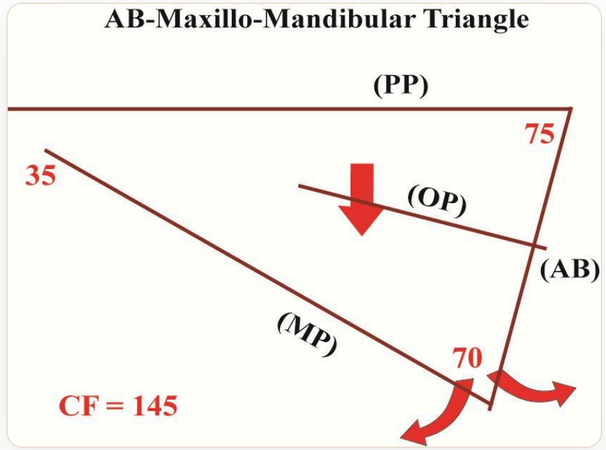
Classification of Open Bite



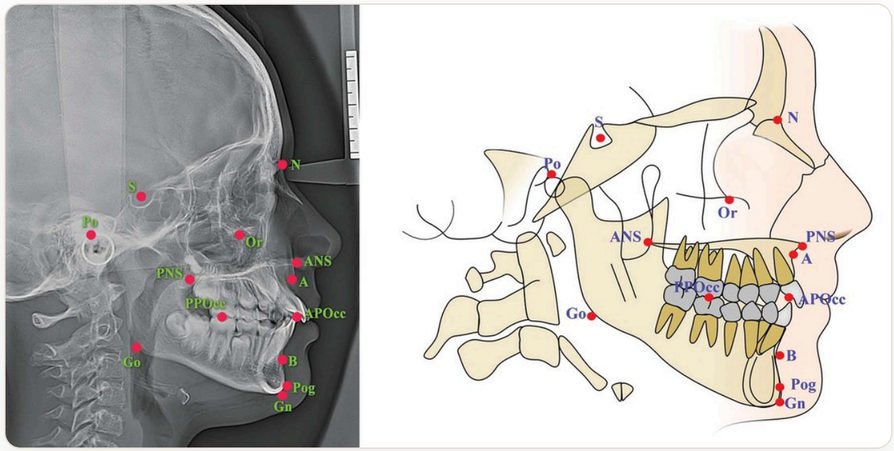
8 Diagram contrasting open bite vs overbite/overjet at incisor level

- **False/dental**: teeth proclined, osseous bases normal, not beyond canines
- **True/skeletal**: alveolar processes deformed, dolicho/hyperdivergent, increased lower facial third
- **By zone**: anterior / posterior / complete
- **Anterior subtypes**: dental (eruption impediment) vs skeletal (posterior facial growth)
- **Early Tx types (23.1)**: Type I simple dental · Type II combined · Type III dentoskeletal
- **Severity**: incomplete / simple / complex / compound

Cephalometric Differential Diagnosis



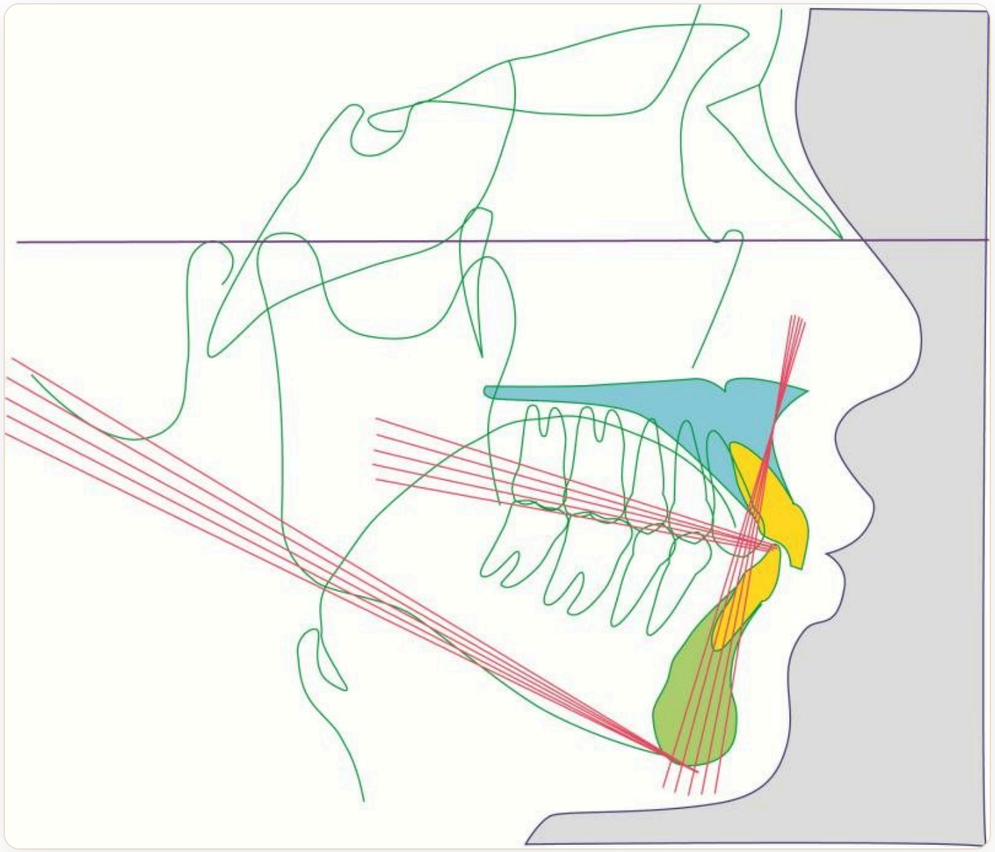
9 AB-Maxillo-Mandibular Triangle: decreased ODI with flat occlusal plane



10 Downs analysis: the Y-axis (S-Gn to Frankfort) and mandibular plane angle quantify the open-bite / vertical tendency

- **Localise with MP/PP angle** (~30° in normal occlusion; occlusal plane bisects it equally)
- **Normal molars + incisor under-eruption** → anterior dental cause only
- **Over-eruption maxillary molars** → posterior maxillary cause
- **Over-eruption mandibular molars** → posterior mandibular cause
- **Low ODI** (< 67°) = open-bite tendency; **low APDI** (< 77°) = Class II frame
- **Hyperdivergent signs**: steep MP, large gonial angle, short ramus, antegonial notch

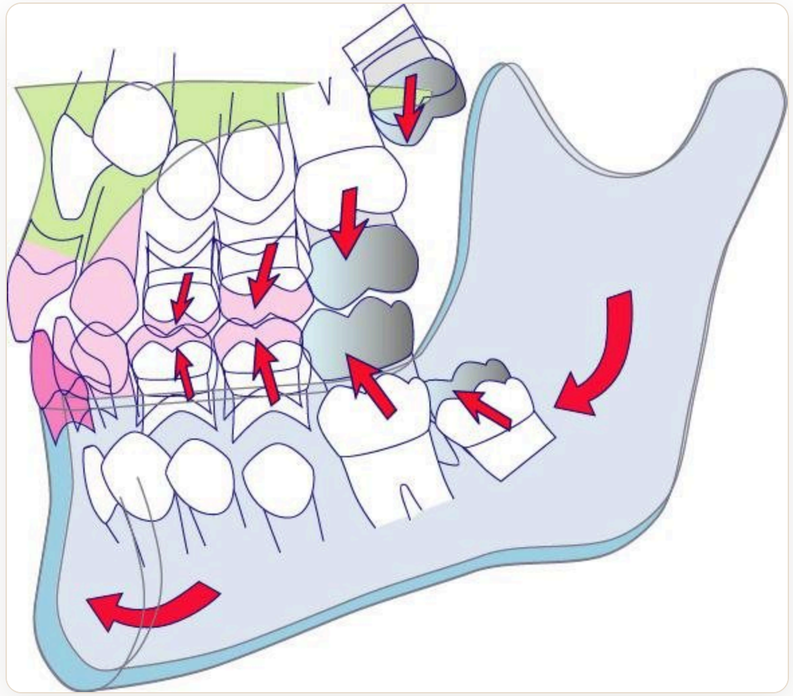
Sato Model: Posterior Discrepancy



11 Cephalometric superimposition showing backward mandibular rotation and posterior molar eruption

- **Prime cause**: molar over-eruption + mesial tipping alters the posterior occlusal plane (POP)
- **Born Class II** → normal vertical molar increase → POP flattens → forward mandibular rotation → Class I
- **Insufficient vertical** → mandible cannot rotate forward → opens (Class II high-angle AOB)
- **Excessive vertical** → strong forward rotation → prognathism with AOB (Class III)
- **POP steeper** → backward mandibular rotation; **POP flatter** → forward rotation + TMJ decompression

Closure Mechanics I: Principles



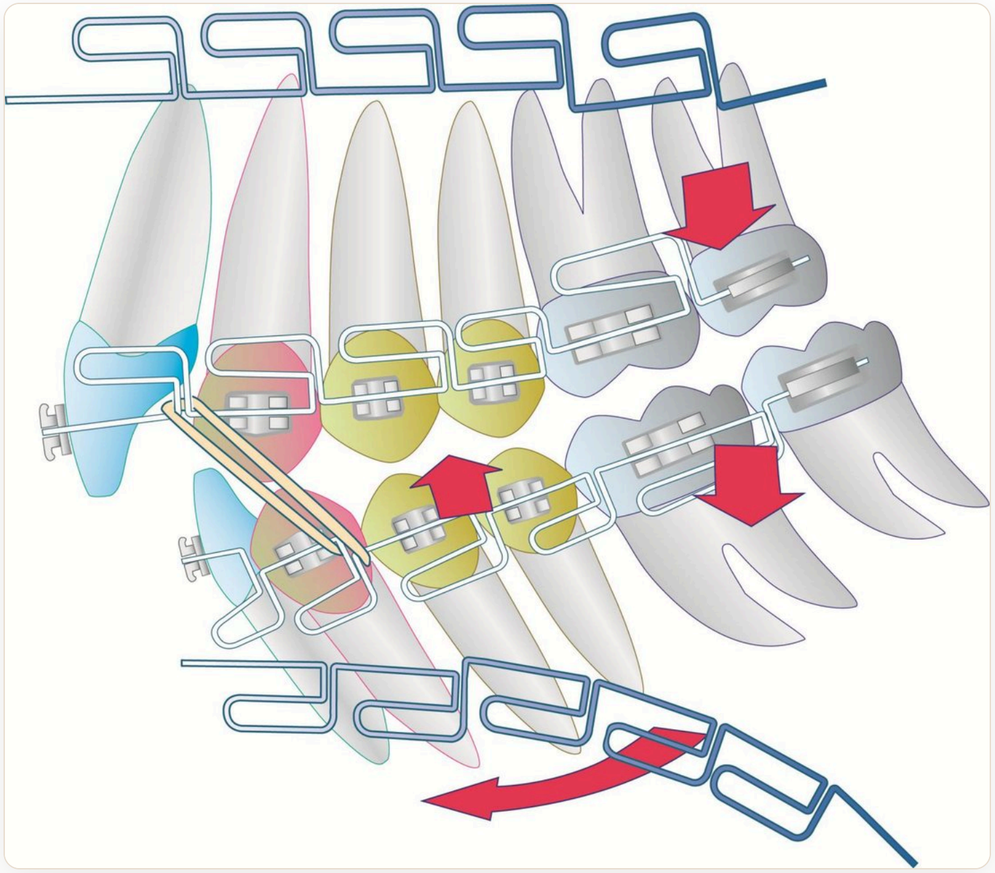
12 Force-arrow diagram: molar intrusion and anterior extrusion mechanics

- **Extrusion** closes fast (~1 mm/month) but is UNSTABLE; leave arch 2–4 months after closure
- **Posterior intrusion** is slower but more stable; scissor effect: 1 mm posterior bite block → >3 mm anterior opening
- **In-block extrusion bend**: 0.5–1 mm step; force 800–1000 g; pain + root-resorption risk
- **Individual extrusion**: 30–40 g per upper incisor, 20 g per lower incisor
- **Bypass arches** (NiTi/TMA 0.012–0.020"): 1–2 mm/month, no tip/torque control
- **Vertical-pull chin cup (VCC)**: growth control in the high-angle open bite, restrains vertical growth & drives forward autorotation, prevents molar extrusion, ~12 h/day ± posterior bite block

Closure Mechanics II: Appliances

Posterior bite block (acrylic)	**9–12 y** intrusion 0.25–0.5 mm/month; 24 h/day 6–8 mo; mandibular autorotation
TMA spring intrusion plate	**helicoidal 0.032" TMA** AOB ≤ 6 mm; less violent than acrylic block; 9–12 y
High-pull headgear	**≥ 16 h/day** force through maxillary CoR, 4 mm above 1st molar apices; intrudes upper molars
TPA with intrusion button	**~80 g** 1 mm per 2–3 months; tongue presses disc on swallowing; cement 2–3 mm from palate
Intermaxillary/anterior elastics	**2–6.5 oz; 1/8–5/16"** replaced every 12 h; 1 mm/month; rect. wire 0.017 × 0.025" preferred
TAD/AOB splint + mini-screws	**skeletal anchorage** reliable molar/premolar intrusion where conventional mechanics fail

MEAW Approach



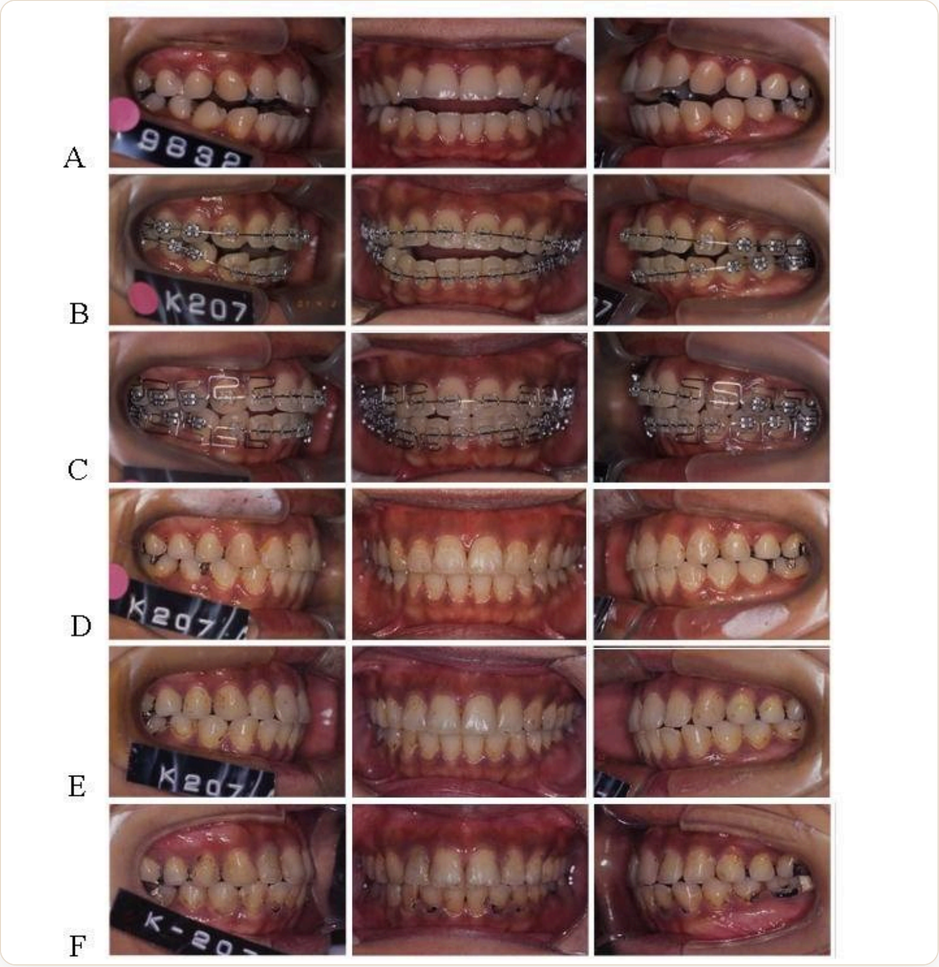
13 MEAW multiloop archwire with tip-back bends and vertical elastic hooks

- **Wire**: 0.016 × 0.022" Elgiloy in 0.018 slot; L-loops at every interproximal space
- **Tip-back bends**: 2–3° per tooth, cumulate to 15–20°; upright buccal segments; control POP
- **Elastics**: 3/16", 6 oz, ANTERIOR ONLY, never in molar zone (molar elastics cause over-eruption)
- **Extract third molars** in ALL AOB cases (never premolars, Sato: no P1 extractions in ~40 y)
- **Class II elastics abandoned**: move anterior back + posterior forward, oppose desired forward mandibular adaptation

Course Emphasis: Detorque, Don't Extrude

- **Close by detorquing**, not extrusion: lower incisor extrusion + upper incisor detorque + posterior intrusion
- **Pitts technique**: high-torque brackets inverted on 1 & 2 to close AOB without extruding incisors
- **Cleats** behind lower incisors to improve tongue posture and control torque
- **Lingual arch** (lower) to prevent molar extrusion
- **AOB splint** (acrylic + mini-screws TAD anchorage) for reliable molar intrusion

Surgery & Stability



14 Intraoral treatment series A–F: open bite case from pre-treatment through retention

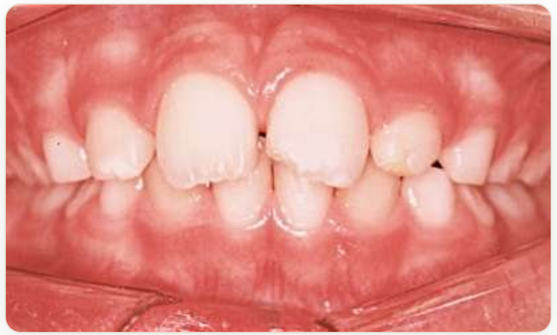
- **Le Fort I maxillary impaction** → mandibular autorotation; bite closes in hours
- **Indications**: AOB > 6 mm + high MP + weak chin → impaction + BSSO
- **AOB surgical relapse**: highest at 42.9%, because occlusal planes not corrected, molars not leveled
- **Non-surgical stability**: correct the vertical dimension; results hold at 10–16 y follow-up
- **Pre-surgical prep**: heavy arches, surgical hooks; models every 6 months during presurgical Tx
- **Stability key**: upright the buccal segment (~15° → 4.5 mm space/side); short retainer 3–6 months

PART 3

Deep Bite

Classification, intrusion mechanics, forces & decision-making

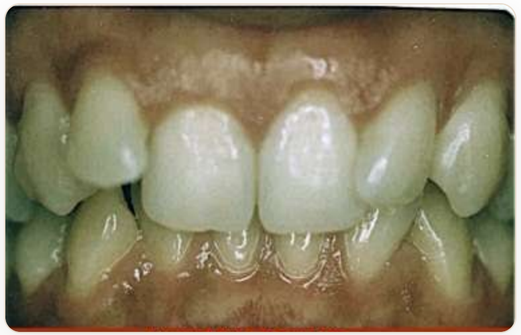
Deep Bite: Definition & Norms



15 Initial deep bite, pronounced overbite pre-treatment

- **Overbite norm**: 2–3 mm; percentage more accurate (crown-length variation)
- **Nanda**: 25–40% acceptable if TMJ function sound
- **Neff**: 20% ideal; **33.3**: 5–20% normal range
- **Deep curve of Spee**: hallmark of dental deep bite
- **Freeway space**: 2–4 mm, must be preserved after bite opening

Deep Bite Classification



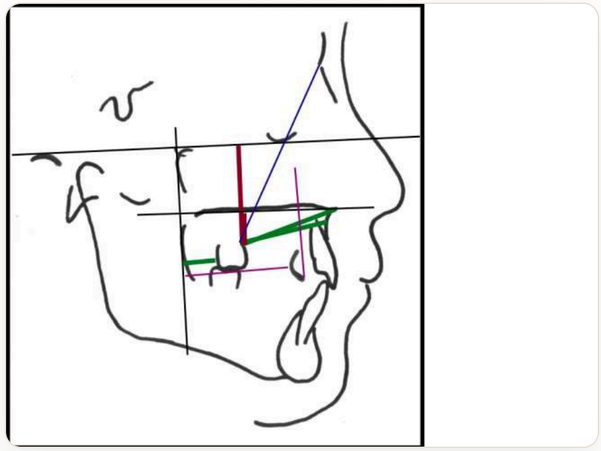
16 Deep bite: full upper incisor coverage of lower anteriors

- **Dental (simple)**: teeth/alveolar only, acquired, deep curve of Spee, normal vertical skeleton
- **Skeletal (complex)**: basal malrelationship, hereditary, two-step occlusion, high relapse
- **Skeletal signs**: reduced LAFH, long PFH, small gonial angle, short broad symphysis
- **Brachy pattern**: counterclockwise mandible rotation, convergent facial planes
- **Dental cause**: molar infraocclusion and/or incisor over-eruption (or combination)
- **Cl II Div 2**: most frequent clinical association with deep bite

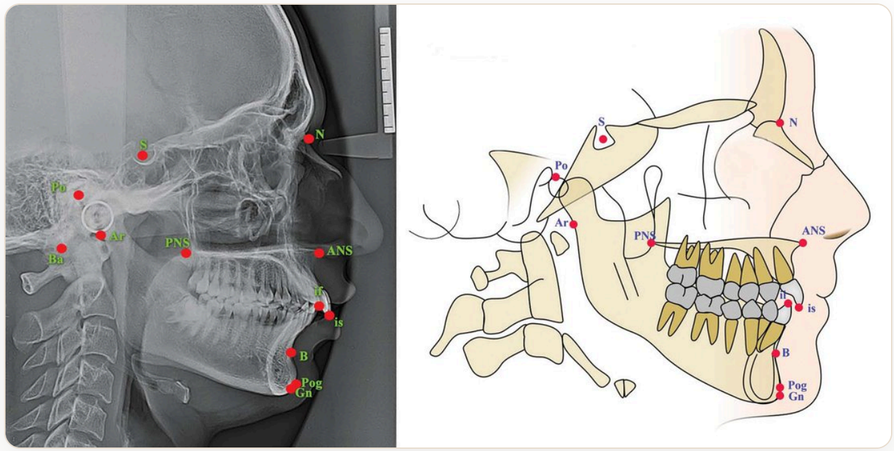
Neuromuscular Basis & Consequences

- **Posterior vertical chain**: masseter, temporalis, internal pterygoid, anteriorly positioned & strong → deep bite
- **Mechanism**: strong anterior position depresses dentition, blocks posterior eruption
- **Periodontal**: occlusal overload, traumatic overbite, circumscribed radiolucencies (Roque)
- **TMJ**: condyles forced backward/upward in fossa, clenching, disc displacement, headache
- **Incisal consequences**: labial migration, wear of mandibular incisors, maxillary anterior spacing

Cephalometric Localisation



17 Cephalometric tracing with palatal, occlusal & mandibular planes overlaid



18 Jarabak analysis: the posterior/anterior facial height ratio (PFH/AFH) localises the vertical pattern

- **Key comparison**: palatal-plane/OP angle vs mandibular-plane/OP angle
- **PP/OP > MP/OP**: maxillary incisor over-eruption or maxillary molar intrusion
- **PP/OP < MP/OP**: mandibular incisor over-eruption or mandibular molar intrusion
- **Low-angle signs**: decreased MP angle, large ramus, small gonial angle (FMA < 25°, SN-MP < 32°)
- **Jarabak ratio**: PFH/AFH, posterior fault → skeletal; anterior fault → postural

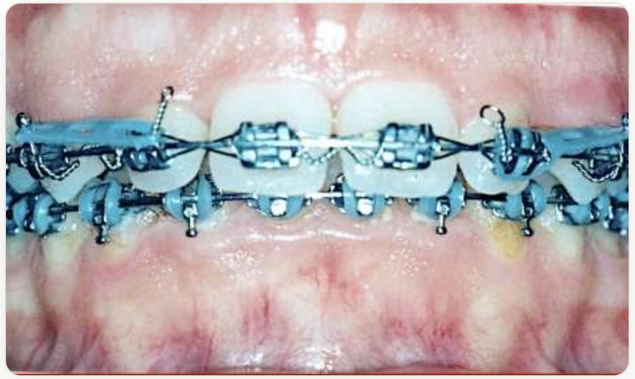
Treatment Principles: Four Levers

- **Lever 1**: intrude maxillary incisors, incompetent lips, gummy smile, steep MP
- **Lever 3**: extrude maxillary posteriors, increase LAFH, improve convexity
- **Gate, lips**: incompetent → intrude anteriors; competent → extrude posteriors
- **Lever 2**: intrude mandibular incisors, over-erupted lower anteriors
- **Lever 4**: extrude mandibular posteriors, Cl II Div 2, reduced AFH
- **Key rule**: 1 mm posterior extrusion = 2.5 mm anterior face-height increase (avoid high-angle)

Force Specifications

Intrusion (Gottlieb)	**15–20 g/incisor** no root resorption
Intrusion bend (upper)	**30–40 g/incisor** second-order bend
Intrusion bend (lower)	**20 g/incisor** negative root torque
Tip-back bend	**100–125 g total; 15–20 g/tooth** 0.017×0.025 SS, 45°
CIA (Connecticut)	**40–60 g; 1 mm / 6 wk** NiTi, continuous
Utility arch	**~80–100 g lower / ~140 g upper** 100 g/cm² root surface
Reverse-curve arch	**300–400 g continuous** Gregoret: negative torque

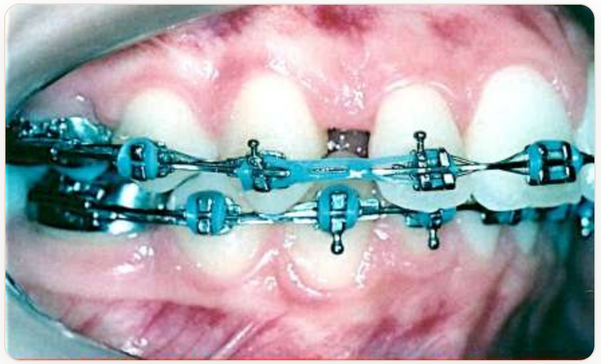
Intrusion Appliances I



19 Curve of Spee in upper arch fully engaged for deep-bite levelling

- **Anterior bite plane / Hawley**: disoccludes posteriors → passive eruption; scissor effect 1 mm extrusion = 2–3 mm bite opening
- **Bite turbos**: resin on palatal upper incisors, comfortable, hygienic; 6.5 oz elastics q24 h
- **Growth-direction rule**: favourable hypodivergent; contraindicated hyperdivergent
- **Cl II Div 2**: turbos procline retroclined incisors (reversing incline plane)
- **Utility arch (Ricketts 2×4)**: 45° tip-back + negative torque ~10–15° → pure incisor intrusion

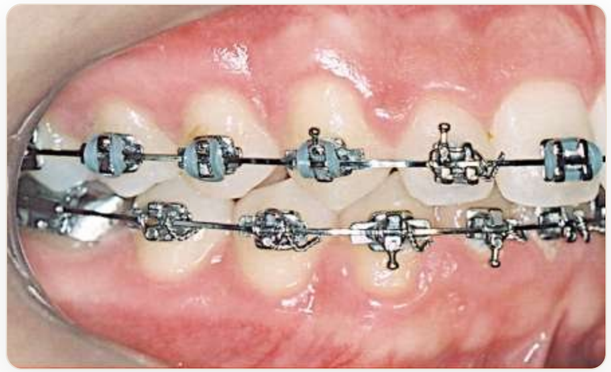
Intrusion Appliances II



20 Deep-bite patient: Spee curve wire during incisor retraction phase

- **Burstone segmented arch**: 0.018×0.022 SS, ~3 mm helix anterior to molar tube, pure anterior intrusion
- **Reverse-curve / anti-Spee (Gregoret)**: negative torque seats apices in trabecular bone → intrusion without proclination
- **Round reverse-curve**: 300–400 g continuous, suits brachycephalic, intrudes + proclines (no root control)
- **Intrusion arch with loops**: 5–7 mm vertical loop, 20 g/tooth, 2–3 months; negative torque essential
- **Lip bumper**: corrects curve of Spee, distalises/uprights molars, lip dysfunction cases

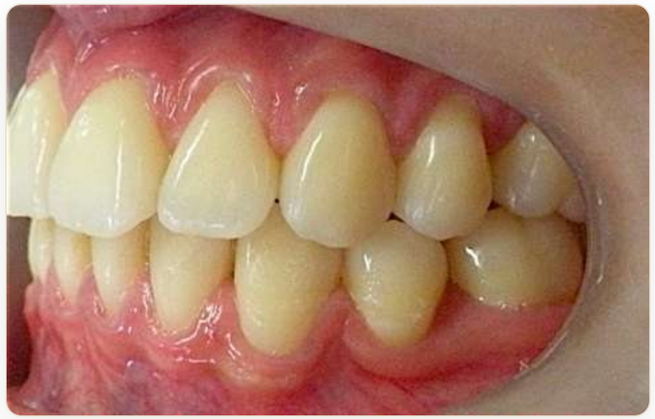
TAD Intrusion & Alexander Discipline



21 VSD .017×.025 steel arch adapted for curve-of-Spee implementation

Best lower incisor intrusion	**TMA 17×25 + loop tied between incisors** stable, less tipping, less resorption
Force: intermittent light	**15–30 g/tooth** continuous → resorption risk
Sydney Intrusion Spring (SIS)	**~400 g at 5 mm activation** zygomatic plate anchorage
Alexander/Werneck prescription	**0.018" slot, 0.017×0.025 SS** posterior anchorage unit key
TAD lower intrusion	**1.5 × 8 mm between canines–incisors** power chain to pretorqued wire
Distal jet / Beneslider	**palatal TADs — 1 mm/month** PAOO: 1 mm/week

Decision Pearls & Stability



22 Ten-year post-treatment result with excellent interdigitation

- **Extraction controversy (Viazis)**: premolar extraction lingualises remaining teeth → deepens bite, avoid
- **Bite plane**: favourable hypodivergent (0.5 mm posterior clearance); contraindicated hyperdivergent
- **Skeletal deep bite**: high relapse, hereditary pattern; combined surgical–orthodontic if severe adult
- **Stability**: correct CR = CO at end of treatment; lower inter-canine width must not be expanded

PART 4

Synthesis

Stability of vertical correction & the master decision gate

Retention & Stability of Vertical Correction

- **Intrusion is more stable than extrusion**, prefer upper incisor intrusion over extrusion; decide based on VME
- **Real retainer = correcting the vertical dimension / occlusal plane** (Sato), not an appliance
- **Anterior open bite is the least stable** correction; greater skeletal contribution → poorer prognosis
- **Habit / airway / myofunctional follow-through** essential: break digit-sucking / tongue-thrust first; screen airway
- Leave the arch **passive** after closure; avoid jiggling forces (root resorption risk)

Decision Framework: Master Gate

- **HIGH angle** → intrude posteriors → mandibular autorotation → TADs / intrusion arch / AOB splint
- **1 mm posterior extrusion = 2.5 mm ↑ AFH**, never extrude in high-angle patients
- **Growth direction** modifies: forward rotator benefits from posterior extrusion; backward rotator does not
- **LOW angle** → extrude posteriors → mandibular translation → anterior bite plane / functional appliance
- **Lip competence** modifies: incompetent → intrude anteriors; competent → extrude posteriors
- **Surgery gate** (adults): >6 mm open bite + steep MP + weak chin → Le Fort I impaction ± BSSO

Image Credits & Sources

1 Hyperdivergent open bite vs hypodivergent deep bite, skull diagram
Sato S. Open Bite: Different Types & Treatment (2013)

2 Tweed analysis: the Frankfort–mandibular plane angle (FMA) triangle that defines the vertical growth axis
Phulari BS. An Atlas on Cephalometric Landmarks (2013)

3 Class II high-angle open bite, lateral facial profile
Sato S. Open Bite: Different Types & Treatment (2013)

4 Björk analysis: saddle, articular & gonial angles predict the direction of mandibular growth rotation
Phulari BS. An Atlas on Cephalometric Landmarks (2013)

5 Cephalometric landmarks and planes, standard tracing
Millett & Welbury. Orthodontics & Paediatric Dentistry, Colour Guide (2000)

6 Hard-tissue cephalometric landmarks (S, N, Or, Po, A, B, ANS, PNS, Go, Gn, Me) on a lateral tracing
WAW Course: Vertical Parameters & Growth Prediction (course slides)

7 Frontal intraoral view showing anterior open bite gap
Sato S. Open Bite: Different Types & Treatment (2013)

8 Diagram contrasting open bite vs overbite/overjet at incisor level
Sato S. Open Bite: Different Types & Treatment (2013)

9 AB-Maxillo-Mandibular Triangle: decreased ODI with flat occlusal plane
Sato S. Open Bite: Different Types & Treatment (2013)

10 Downs analysis: the Y-axis (S–Gn to Frankfort) and mandibular plane angle quantify the open-bite / vertical tendency
Phulari BS. An Atlas on Cephalometric Landmarks (2013)

11 Cephalometric superimposition showing backward mandibular rotation and posterior molar eruption
Sato S. Open Bite: Different Types & Treatment (2013)

12 Force-arrow diagram: molar intrusion and anterior extrusion mechanics
Sato S. Open Bite: Different Types & Treatment (2013)

13 MEAW multiloop archwire with tip-back bends and vertical elastic hooks
Sato S. Open Bite: Different Types & Treatment (2013)

14 Intraoral treatment series A–F: open bite case from pre-treatment through retention
Sato S. Open Bite: Different Types & Treatment (2013)

15 Initial deep bite, pronounced overbite pre-treatment
Werneck. Alexander's Discipline: A Simple Decision (2009)

16 Deep bite: full upper incisor coverage of lower anteriors
Werneck. Alexander's Discipline: A Simple Decision (2009)

17 Cephalometric tracing with palatal, occlusal & mandibular planes overlaid
Werneck. Alexander's Discipline: A Simple Decision (2009)

18 Jarabak analysis: the posterior/anterior facial height ratio (PFH/AFH) localises the vertical pattern
Phulari BS. An Atlas on Cephalometric Landmarks (2013)

19 Curve of Spee in upper arch fully engaged for deep-bite levelling
Werneck. Alexander's Discipline: A Simple Decision (2009)

20 Deep-bite patient: Spee curve wire during incisor retraction phase
Werneck. Alexander's Discipline: A Simple Decision (2009)

21 VSD .017×.025 steel arch adapted for curve-of-Spee implementation
Werneck. Alexander's Discipline: A Simple Decision (2009)

22 Ten-year post-treatment result with excellent interdigitation
Werneck. Alexander's Discipline: A Simple Decision (2009)

Dr. Talya Young

25+ Years of Clinical Orthodontic Excellence

Specialist in Orthodontics · Educator

Niederdorfstrasse 61
8001 Zurich, Switzerland
mail@drtalya.com
www.drtalya.com
+41 76 525 45 78

drc4dentistry.drtalya.com

- Presentation Download
- Self-Assessment

DRC4DENTISTRY · Master of Orthodontics, 4th Edition · Module 13, Treatment of Excessive Vertical Dimension
Vertical Discrepancies, A Clinical View on Open Bite & Deep Bite · Warsaw Presidential Hotel · June 2026

WARSAW PRESIDENTIAL HOTEL