Physiologic Anchorage Control

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1 year and 3 months

2009/1
Purpose: Accuracy and reliability of CBCT diagnosis on alveolar dehiscence and fenestration

Sample: 14 cadaver specimens, 355 teeth

Method: CBCT imaging comparing to actual dissections
What is Fenestration & Dehiscence?

Fenestration—
a circumscribed defect
that creates a "window"
through the bone over
the prominent root

Dehiscence—
the bursting through
bone of a root from
alveolar crest

Results

The diagnostic values of CBCT, such as sensitivity,
specificity and Youden’s index, were high, indicating a
good accuracy of CBCT for detection of alveolar
fenestration and dehiscence.

The positive predictive values were 0.71 for fenestrations
and 0.75 for dehiscence. In other words, when a defect
was found on CBCT, it was a true fenestration over 70% of
the time and a true dehiscence about 75% of the time.

The negative predictive values were high at 0.99, indicating
that, when a defect was not found on CBCT, most likely
there was no defect.

Consequences of
dehiscence?

- Increase risk of gingival recession
- Increase risk of periodontitis
- Worsen the prognosis of periodontal
disease because of less bone support

Consequences of
fenestration?

- Naturally occurring fenestration usually
located in apical half or third of the root, the
morphology of alveolar crest may be normal,
may thus be of less clinical significance
- Orthodontically tipping incisor may move root
apex outside the alveolar housing in the
opposite direction, thus inducing damage to
blood vessels entering the pulp canal, leading
to loss of pulp vitality. (Yamaguchi et al. Seminars
in Orthodontics 2007)

Predisposed area

- Anterior teeth area with thin alveolar bone
(78.33%) > posterior teeth area with thick
alveolar bone (21.67%)
- Most natural defect found in labial
side (91.67%) — expanding?
- Fenestrations are found more in
maxilla (85.19%) than in mandible (57.14%).
The goal of orthodontic treatment

- Function
- Esthetics
- Stability
- Health

A randomized clinical trial (RCT) comparing control of maxillary anchorage using two retraction techniques Xu TM, Baumrind S, etc. AJODO, 2010

U1 apex retracted 0.1±1.8mm (63 maximum anchorage cases)
Extraction space 7.5mm±/per side
U6 mesial movement 4.3mm at cusp, 2.7mm at apex
Why we lost so many anchorage even with headgear?

Conventional leveling upper arch actually lose anchorage
Continuous light force>intermittent heavy force!

July, 2011 bonding+TAD
0.014 NiTi wire, canines laceback to TAD

2011-11-19

G Chen, S Chen, XY Zhang, RP Jiang, Y Liu, FH Shi, TM Xu,
Stable region for dental cast superimposition in adults, studied with the aid of staple miniscrews.
Orthod Cranifac Res. 2011; 14: 70-79

The gliding path of the mandible along the skull
Spee F G, Archives of Anatomy and Physiology,16:285-294, 1890

The upward concave occlusal curves exist in human and animals that own tuberculum articulare

"In the beginning, the curve of the masticatory surface of the mandible is sometimes not very clear and is much flatter than in the upper jaw where it is seldom missing. In such cases, the varying pressure exerted on the teeth appears to gradually induce compensation of the curve difference."
Tweed anchorage preparation? Vs. Physiologic anchorage reservation?

Statistics from 1838 cases treated in PKU Orthodontic department

<table>
<thead>
<tr>
<th>Class II</th>
<th>U6/PP1</th>
<th>77.5±5.7</th>
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<tbody>
<tr>
<td>Class III</td>
<td>U6/PP1</td>
<td>81.2±5.9</td>
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For Class II or high angle cases, natural molar compensation to the skeletal discrepancy is backward tipping

Why do we decompensate it with straight archwire?

The conventional anchorage control methods are not based on physiologic character of dentition, but on straight wire mechanics.
What are the difference between the mechanical anchorage and the physiologic anchorage?

Anchorage based on straightwire mechanics

Anchorage based on Physiologic Curve of Spee
If using 0° buccal tube...

If using XBT....

Upgraded XBT consists of two crossed tip back tubes

-7°  -25°
5 months later (2009/09)

Bonding lower arch (2009/10)

4 months later (2010/01)
Conclusion

If we are aware of physiologic limit of alveolar bone, accept natural compensation of molar angulation, and pay more attention to physiologic characters of oral cavity, we may not need headgear or TAD for sagittal anchorage control in extraction cases.

----Physiologic Anchorage Control----