Orthodontic Root Resorption

Sign, Symptom or a Disease?

A new perspective

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The number of works related to ORR significantly increase

Clinical relevance?

- 90 years: 150 articles, 1.66/year
- 10 years: 170 articles, 17/year
- 10 years: 500 articles, 50/year

The knowledge versus solutions

- Identification of the vulnerable patient?
- Prevention?

Periodical changes in the medical discourse

- Influence of nutrition metabolism
- Autoimmune diseases
- Human Genome Project
- Molecular biology
- Personalized medicine

- Vaccines against factors involved in the inflammation

Human Genome Project

- October 1990 - initiation
- 2000 - working draft was announced
- 2003 - completed
- 2006 - the sequence of the last chromosome was published in Nature

Where are we today?

- Short term goals
  - The genome was decoded and sequenced
  - Innovative technology accelerated sequencing
- The major long term goal is far from being achieved

Human Genome Project

- Short term goals: “mapping the human genome and develop innovative technologies for the procedure”
- Long term goal: “to obtain a base sequence of the human chromosomes, and to make DNA sequencing technology readily available to search for disease related variations and to make biological comparisons”
The dream

- Identify current and future diseases
- Identify characters

The biological language
The genes act in different ways in changing environment

- Stress and strain
- Disease
- Body's temperature
- Night sleep
- ...

- No gene works by itself!

Genome versus Proteome

- 4 Nucleic Acids versus 21 Amino Acids

Human Genome Project and Orthodontics

- Genetic provide explanation
- Genetic and epigenetic variance between individuals

- The last word has not yet been spoken

Definitions for ORR

- OIIRR = IRRCWO - Inflammatory Root Resorption Concurrent with Orthodontia
- Physiologic RR
- Pathologic RR

- IRRCWO is iatrogenic

The responsible tissues to ORR:

- Bone tissue?
- Root fatigue?
- Periodontal ligament and the inflammation?
RR is part of normal remodeling physiologic process

- Erupted teeth
- Unerupted teeth
- Control teeth

The remodeling process is controlled by the inflammation mechanism

- The known biological language for remodeling in normal circumstances
- Coupling

Remodeling needs accurate Coupling

- A-ctivation
- R-eosorption
- R-eversal (coupling)
- F-ormation
- Q-uiesence

- Full regeneration in morphology and function

Force Application to TPLBS – Tooth, Periodontal ligament and Bone System

- Immediate changes in the physiological and anatomical environment
- This unexpected stimulus does not belong to the normal growth and development pathway
- The body has to react.
- The biological language is probably changed

The reaction to the force

- Initially – controlled remodeling reaction
- The coupling is lost
- Later - Uncontrolled resorption – partial or full
- Remodeling moves into modulation and minimodulation

What about the coupling?

- Fibroblast or cementoblast lineage
- Osteoclast or cementoclast lineage
- Insufficiency

- Is this genetically controlled?
- Is it preprogram controlled?
Extreme Circumstances – Hypovolemic Shock
• autonomic positive feedback programmed mechanisms
• Heart and brain are above the kidneys and guts
• Bone and PL are above the roots

Forces and Inflammation

Remodeling with no RR
• Mesial drift
• Eruption
• Occlusal trauma
• Biting/mastication
• Periapical lesion
• Occlusal trauma +Orthodontics

Remodeling with RR
• Orthodontics
• Impacted tooth
• Space occupying lesion: Tumors, Cysts
• Trauma

Is there only one kind of Inflammation?
• Different circumstances might evoke different kinds of inflammation?
• Different inflammation? – different reaction?

Different inflammation reaction?
• Is this genetically controlled?
• Is it preprogram controlled?

Preprogram?
• Why scarifying the roots?

Does our body has an objective to this irreversible roots shortening?
Answers? Hypothesis? Theleology?

- WHY IT HAPPENS?
- Why the dinosaurs disappeared?
- Why Water induces finger wrinkles?
- Why???

Tissue hierarchy?

- Brain, heart, kidneys, guts
- Bone, periodontal ligament, root
- Periodontal ligament, bone, root
- Fully regeneration versus irreversible damage

Extreme Conditions – Orthodontic force

- Increased stress
- Pre-Programmed inflammation remodeling
- Stress increased or continued
- Hyalinization and necrosis
- Remodeling insufficiency
- Irreversible damage to the dentine
  - ???
- All levels are individually determined
- Preprogrammed destructive reaction???

A new parameter


Why?

- Why shortening the roots?
- Why damaging the other surfaces?
- Why the teeth and not the bone?

Why root shortening?

- Self defense mechanism
- Decrease the pressure
- Reduce the entropy (disorder)

- individually determined
Second Orthodontic treatment


Why surface resorption?

- To increase the stability and adherence
- Overcome root shortening

Why the teeth?

- There are 32 of them in the mouth
- In many cases different types of un-odontia occurred
- The importance of the bone

Water-induced finger wrinkles
ORR

- Sign?
- Symptom?
- Disease?

There will be no ORR if there is no orthodontic treatment

Thank you