

大学の世界展開力強化事業
東南アジア医療・歯科医療ネットワークの構築を目指した
大学間交流プログラム

国際セミナーⅢ

第 1 回 チュラロンコン大学・東京医科歯科大学
矯正科合同セミナー

The 1st Joint Symposium on Orthodontics
between Chulalongkorn University
and Tokyo Medical and Dental University

2013 年 5 月 13 日



東京医科歯科大学
TOKYO MEDICAL AND DENTAL UNIVERSITY

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1. 開催概要

本セミナーは、大学の世界展開力強化事業「東南アジア医療・歯科医療ネットワークの構築を目指した大学間交流プログラム」の一環として、日本の東京医科歯科大学歯学部とタイの Chulalongkorn 大学歯学部間で最新の研究内容についての発表、意見交換、知識の共有を行うことにより、今後両大学が密接な連携を保ち、相互に刺激しあうことで、その教育・研究・臨床を高めることを目的に開催された。

式次第

8:45 – 9:00	Registration
9:00 – 9:45	“How do we incorporate neurophysiological way of viewing/thinking into orthodontic practice: an invitation to Neuro-Orthodontics” Takashi ONO Professor and Chair, Orthodontic Science, TMDU
9:45 – 10:15	“Acemannan sponges stimulate alveolar bone, cementum, and periodontal ligament regeneration in a canine class II furcation defect model” Pintu-on Chantarawaratit Ph.D. candidate in Dental Biomaterials Junior Lecturer, Orthodontic Department, CU
10:15 – 10:30	Coffee break
10:30 – 11:00	“Molecular pathogenesis of tooth agenesis, and orthodontic treatment” Takuya OGAWA Junior Associate Professor, Maxillofacial Orthognathics, TMDU
11:00 – 11:15	“Mechanical properties of super engineering plastic made orthodontic wires” Minami MAEKAWA Graduate Student, Orthodontic Science, TMDU
11:15 – 11:30	“Evaluation of bone availability after secondary bone grafting in cleft lip and palate patients” Pol. Maj. Narin Jenyuthana Graduate Student, Orthodontic Department, CU
11:30 – 11:45	“Comparative study of three remineralizing products on changing the enamel white lesion in vitro” Pimsiri Kanpittaya Graduate Student, Orthodontic Department, CU
12:00 – 13:30	Lunch hosted by Orthodontic Department, CU

2. 講演内容

国際セミナー

“How do we incorporate neurophysiological way of viewing/thinking into orthodontic practice: an invitation to Neuro-Orthodontics”

日時 2013 年 5 月 15 日 (水) 9 : 00 ~ 13 : 30

場所 Petchara Techagampuch room, Somdech-Yha Building, 2nd floor,
Chulalongkorn University, Thailand

演者 小野卓史 (東京医科歯科大学 歯学部副学長、咬合機能矯正学分野教授)

参加者 34 人

要旨

顎口腔領域は多器官によって構成されており、咬合だけでなく、咀嚼や嚥下、呼吸や発音など様々な機能が営まれている。咬合の不調和が、顎口腔領域機能の障害を惹起することがあり、また悪習癖などの機能的要因によって不正咬合が惹起されることもしばしば経験され、その関連性について数多くの報告がなされている。すなわち、矯正歯科治療を行うにあたり、審美的な側面だけでなく、機能的な側面も合わせ包括的な改善を目指さなくてはならない。

一方、脳は全身の器官を統制する最上位のコントロールセンターである。脳の不調和が全身に与える影響は計り知れない。最新の MRI 技術を応用した顎口腔機能の解析から得られた知見により、顎口腔機能が脳の活動に影響し、脳内の可塑的变化を起こすことが分かってきた。つまり、矯正治療は顎口腔領域だけに目を向けるのではなく、脳機能との関連についてもこれから注目すべきだと思われる。

そこで、本セミナーでは、症例や基礎研究データを用いて、咬合高径や発音、咀嚼などの顎口腔機能に関わる可塑性についての説明や、早期治療の妥当性検証まで話を展開し、「神経矯正学」と題して、歯科矯正学と神経生理学の接点について紐解く。

3. 発表スライド



How do we incorporate neurophysiological way of viewing/thinking into orthodontic practice?

An invitation to **Neuro-Orthodontics**

 Takashi Ono, D.D.S., Ph.D.
Professor and Chair
Orthodontic Science, Graduate School
Vice Dean for International Relations
School of Dentistry
Tokyo Medical and Dental University, Tokyo, Japan

Bangkok, May 15, 2015

Orthodontic treatment & “plasticity”

Dysfunction ⇒ Malocclusion

- Oral respiration ⇒ Adenoid face, narrowed Mx arch, etc.
- Low tongue position ⇒ open bite, widened Mld arch, etc.
- Abnormal swallowing ⇒ open bite, etc.

Malocclusion ⇒ Dysfunction

- Mx protrusion, facial deformity ⇒ chewing disorder
- Left lip/palate ⇒ speech disorder

Success of Tx depends on functional “plasticity”

Bangkok, May 15, 2013

Role of muscle spindles & occlusal vertical dimension

- Several reports indicate that jaw-muscle spindles, which are sensitive to muscle length and changes therein, would be responsible for the perception of jaw position and opening magnitude (Brill and Tryde, 1974; Zhang *et al.*, 2003)
- Changes in the occlusal vertical dimension (OVD) are often associated with certain syndromes, such as TMDs (Christensen, 1970) and headache (Hellsing, 1990)
- The perturbation of a habituated OVD may have such a strong effect on the entire body that even symptoms of tinnitus and vertigo will appear (*e.g.*, Costen, 1936)

Bangkok, May 15, 2013

Bite-raising & orthodontic treatment

- con**
 - Mandible usually returns to its original position after treatment
 - Riedel, Angle Orthod. 1960.
 - Werslander, Am J Orthod. 1974.
- pro**
 - Mandibular opening as a consequence of orthodontic treatment does not invariably return to pretreatment value
 - Ryan, Am J Orthod Dentofacial Orthop. 1996.
 - Joang-Gyu, Am J Orthod Dentofacial Orthop. 2000.

Bangkok, May 15, 2013

iOVD & muscle spindles: short-term effects

RESEARCH REPORTS

Abstract

1. Nakubuku¹*, P. B. Zandi², K. Vitor³, and K. Suen⁴

¹ Department of Health, Behavior, and Society of Harvard University, Harvard School of Public Health, Boston, MA 02115, USA; ² Department of Neurology, Harvard Medical School, Boston, MA 02115, USA; ³ Department of Neurology, Harvard Medical School, Boston, MA 02115, USA; ⁴ Department of Neurology, Harvard Medical School, Boston, MA 02115, USA

J. Neurosci. 34(2):347-352, 2014

Role of Occlusal Vertical Dimension in Spindle Function

Adult animals

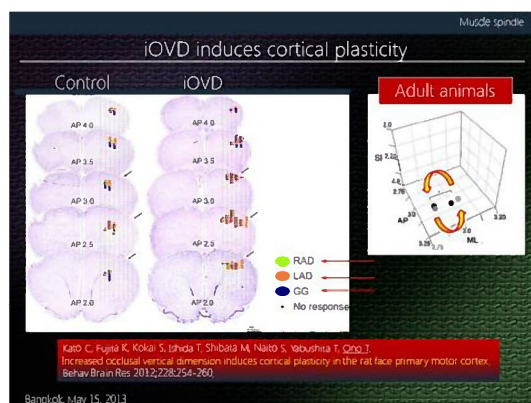
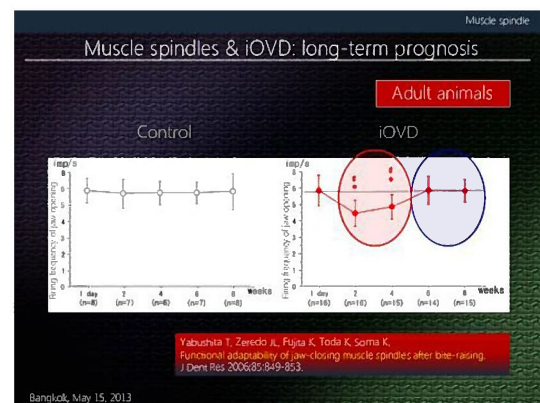
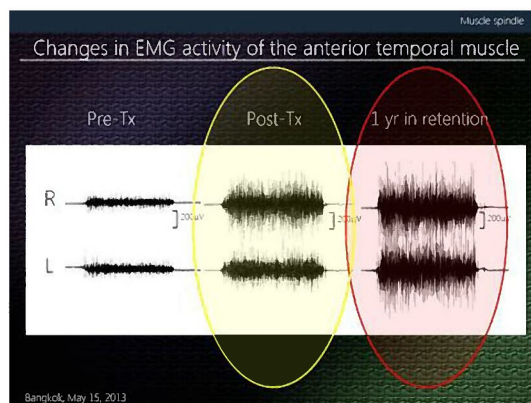
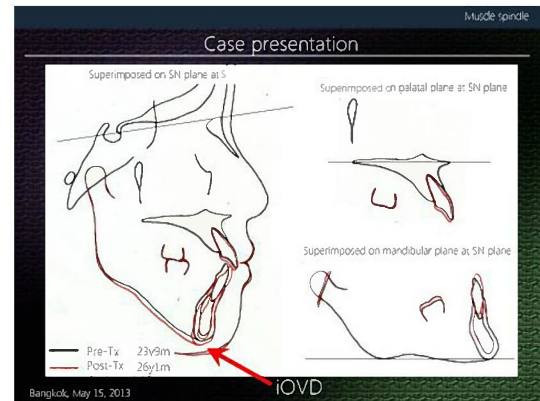
A

B

- ✓ Twenty Wistar rats
- ✓ Control and **iOVD** subgroups
- ✓ Stretch responses of spindle endings were recorded from the masseteric nerve filaments
- ✓ Recordings at 5, 10 and 15 days of **iOVD** (2mm in molar region with a resin built-up

Bangkok, May 15, 2013

[illegible]



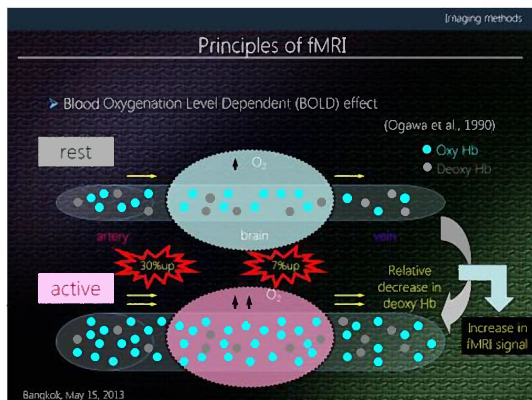
Muscle spindle

Vertical dimensional control & plasticity

- ✓ An increase in occlusal vertical dimension (iOVD) reduces masseter muscle spindle sensitivity
- ✓ Spindle function eventually recovers on the long-term basis
- ✓ The peripheral as well as central plasticity may occur following changes in occlusal vertical dimension
- ✓ Such concomitant plastic changes may provide a basis for physiological adaptation to orthodontic treatment

➡ Adult animals/humans

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Methods

Speech

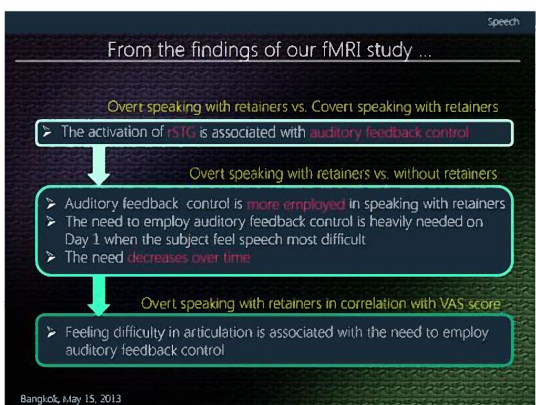
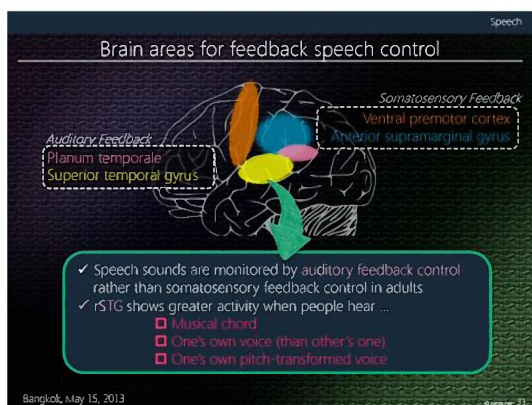
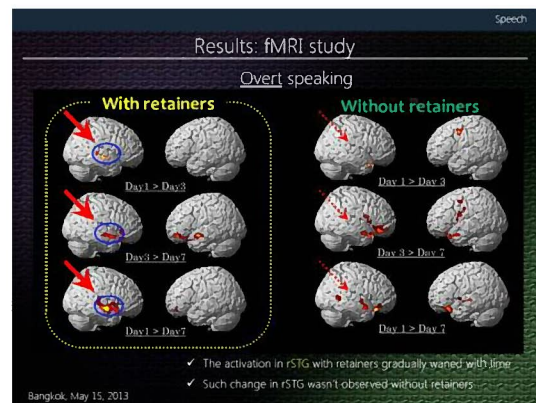
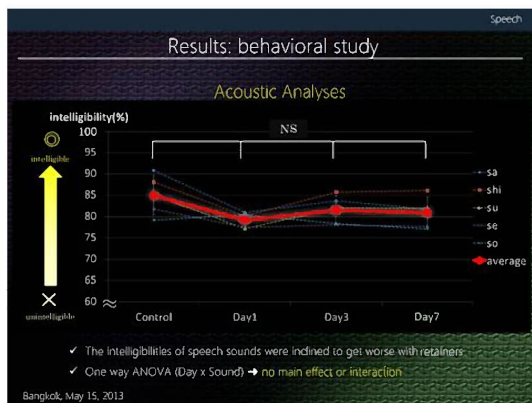
Participants & retainers

- 9 adult native Japanese speakers
- 1.5mm-thick clear plastic sheets (BIOSTAR® Rocky Mountain Korea Co., Tokyo, Japan)

Experimental design

- Time schedule: Wearing retainers for a week, three experiments in the next week: Days 1, 3 and 7
- Stimuli: Japanese "sa" column (hiragana)
- Condition: With/Without retainers
- Experiments:
 - Behavioral study:** Self-evaluation of difficulty in articulation (VAS) Acoustic analysis of speech sounds
 - fMRI study:** Kaneshima T, Usui N, Wada J, Inukita S, Ohmori H, Shimazaki K, Hideshima M, Masuura H, Igarashi Y, Kurabayashi T, Taira M, Ono J. The time course change of brain activation pattern during pronunciation with orthodontic retainer: an fMRI study. *Neuroimage* [submitted]

Bangkok, May 15, 2013



Mastication

What is the preferred chewing side?

Mastication is not performed equally on both sides of the dentition; instead, unilateral chewing occurs in about 70% of consecutive chewing cycles (Mioche et al., 2002)

↓

preferred chewing side: PCS

↑

Are only peripheral factors involved in determining the PCS?

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Mastication

PCS & tongue motor control

Shinagawa H, Odo J, Ishiwata Y, Honda E, Sasaki T, Tani M, Iniki A, Kuroda T. Hemispheric dominance of tongue control depends on the chewing-side preference. J Dent Res. 82:278-83:2003.

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Mastication

PCS-dependent short-term cortical plasticity

Shinagawa H, Odo J, Honda E, Sasaki T, Tani M, Iniki A, Kuroda T, Ohyama K. Chewing-side preference is involved in differential cortical activation patterns during tongue movements after bilateral gum-chewing: a functional magnetic resonance imaging study. J Dent Res. 83:762-6:2004.

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Mastication

Mastication (PCS) & plasticity

- ✓ Preferred chewing side (PCS) is not only the peripheral matter but also the manifestation of the central nervous system
- ✓ The masticatory exercise can induce a short-term change in the PCS-dependent cortical activity
- ✓ Further studies to investigate whether the PCS-dependent plasticity would last long may provide a key to prevent relapse of functionally-derived asymmetrical cases

➔ Adult humans

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Q2 What is the relationship between malocclusion and orofacial function ?

↓

A2. Malocclusion is accompanied by orofacial dysfunction

= Orofacial function "plastically" adapts to wrong environment

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TMJ mechanoreception

Animal model for TMJ resorption

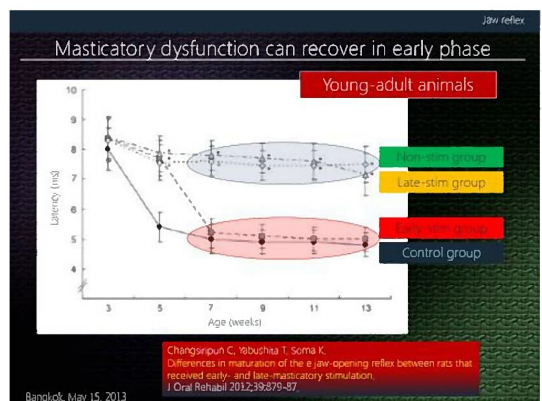
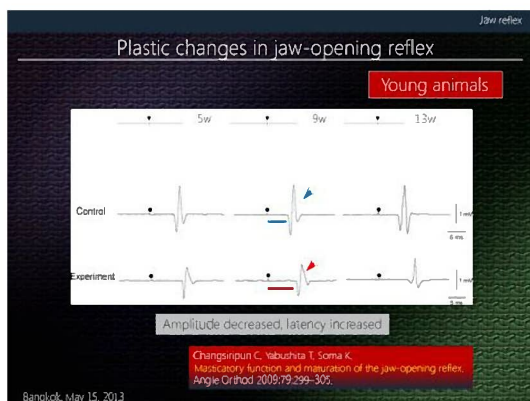
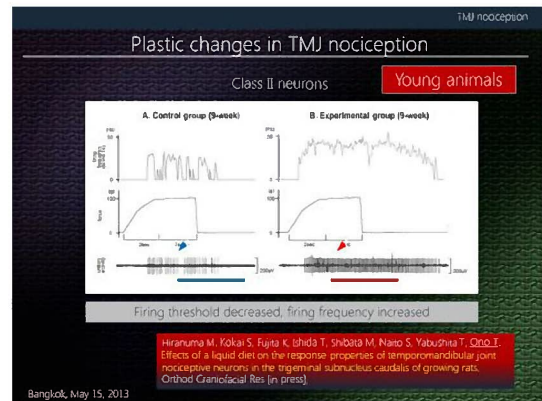
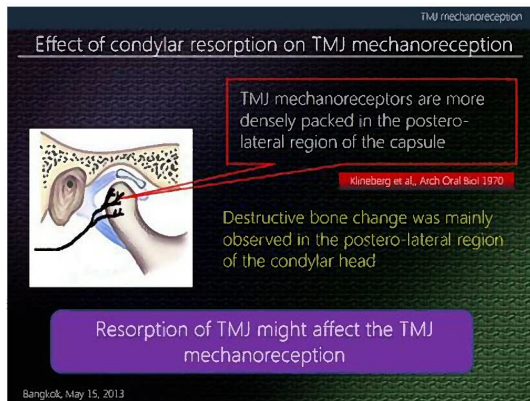
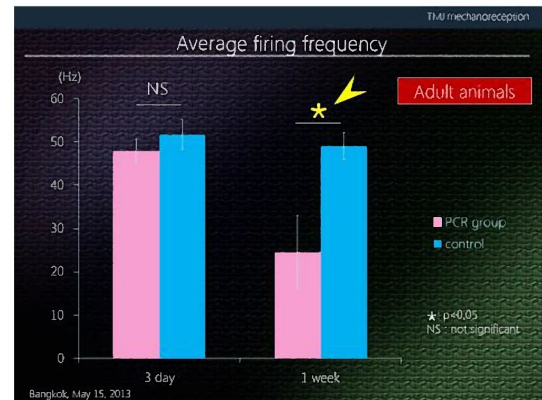
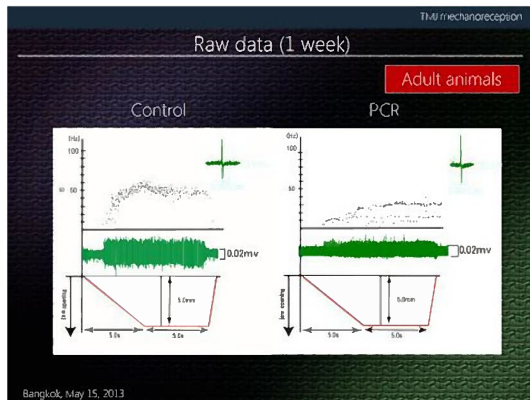
A compressive force was loaded on the condyle of the TMJ in the PCR group to induce resorption

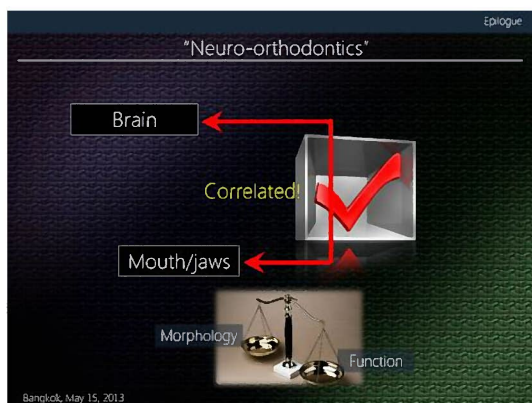
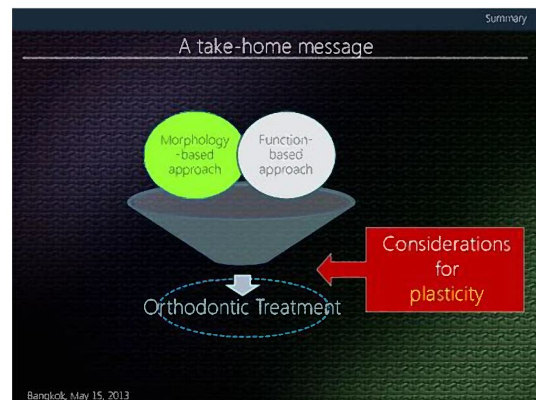
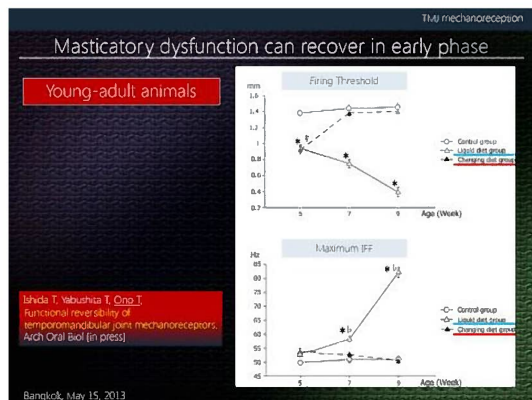
Teramoto et al., J Bone Miner Metab 2003

control PCR

right left right left

Bangkok, May 15, 2013





4. 写真



