ABSTRACT OF THESIS

By: Ammar Kassab  
Major: Human Morphology

Thesis title: The effect of sympathetic neural supply on the eruption rate of Rats’ mandibular incisors.

Background: Tooth eruption is defined as the movement of a tooth from its site of development within the alveolar process to its functional position in the oral cavity. The control of eruption mechanism is multifactorial, where the nervous system plays important role in the control of different contributors to this process.

Aims: (1) to investigate the effect of neurotomy on the eruption rate of rats’ incisors, (2) and to evaluate the role of the sympathetic nervous system, in particular, in the eruption rate, (3) to explore the differences in eruption rate between intact and shortened incisors without altering the neural supply.

Material and methods: Forty nine (49) adult female Sprague-Dawley rats divided into seven groups; group 1: (n=8) had guanethidine treatment (30 mg/kg/day; for one week) to block the sympathetic transmission at effector level; group 2: (n=8) received hexamethonium treatment (10 mg/kg/day; for one week) to produce sympathetic block at ganglionic level; group 3: (n=7) subjected to chemical ablation of capsaicin sensitive primary afferents, and followed by daily treatment with guanethidine (30 mg/kg/day; for one week); group 4: (n=7) had the left inferior alveolar nerve (IAN) cut; group 5: (n=5) served as a sham for axotomy group; group 6: (n=7) had their left mandibular incisor cut out of occlusion by 2-3 mm; group 7: (n=7) served as a control group. Two landmarks were used to measure eruption rate: the first landmark was a groove placed on the distal aspect of the incisor, while the second landmark was a tattoo placed at the attached gingiva at the distal margin of the tooth. Measurements were registered every 48hrs for a period of 144hrs. Statistical analysis of results was performed (ANOVA) and the significance was tested by post hoc Bonferroni’s multiple range test.

Results: The temporal evolution of the eruption of intact incisors elicited an initial fast ascension, followed by a phase of deceleration and decline at the end of the observation period. The eruption was significantly reduced in rats treated with guanethidine in 1\textsuperscript{st} time segment (0.87 ± 0.06 mm vs. 1.18±0.15 mm in control, P<0.05) and at total observation period (2.57 ± 0.06 mm vs. 3.00 ± 0.16 mm; P< 0.01). The rate of eruption was attenuated in hexamethonium treated rats but measurements were not statistically significant. IAN section significantly attenuated eruption rate in 2\textsuperscript{nd} (0.44 ± 0.13 mm, p<0.001), 3\textsuperscript{rd} (0.47 ± 0.11 mm, p<0.001), and total time segments (1.8 ± 0.15 mm, p<0.001). Guanethidine treatment in rats with ablated CSPA fibers reduced eruption rate during the first (0.79 ± 0.07 mm; p < 0.05), second (0.66± 0.7mm; P< 0.001), and total (2.24 ± 0.08 mm; p<0.001) time segments. The rate of eruption of shortened incisors significantly increased at the 1\textsuperscript{st} (1.67±0.2 mm; p<0.01) and 2\textsuperscript{nd} (1.66±0.2 mm, p<0.05) time segments then presented a compensatory deceleration until the tooth reached the incisal plane (0.37±0.17 mm, p<0.01).
**Conclusion**: the nervous system plays a key role in the control of the eruption process of rats’ mandibular incisors. Sympathetic supply appears to constitute a major component in this control.