

Rehabilitation of Deglutition by Cortical or Subcortical Pathway

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Abstract

The re-education of orofacial functions is recognized to be necessary by all practitioners when conducting orthodontic treatment, but neuroanatomy and physiology understanding are critical to obtain reproducible and controllable results. The simple wearing of a device, irrespective of the number of hours during which it is carried, is too random.

Keywords: *Cortical; Subcortical; Suction-Swallowing; Froggymouth*

The suction-swallowing, a physiological mode of swallowing saliva in young children, is a praxis developed in utero in the brainstem.

It will remain physiological as long as the milk teeth have not formed and mastication is not installed.

But around the age of 4 years old, a new swallowing program naturally takes place in 60% of children: toothed subject-type swallowing.

By the muscular forces, it generates it will promote optimal growth of the maxillary bones.

Two main causes may lead to the suction-swallowing mode being maintained:

- The child has never had the opportunity to discover this new operating mode
- The child has discovered it, but the limbic system, necessary step for the engramming of a new program, has not retained it, generally for psychological reasons (immaturity, thumb sucking, pacifier, bottle, soft food).

The therapist will have to put in place a strategy to allow this engramming.

By cortical means, the child becomes aware of the gestures that he usually performs, then of the gestures he must perform, with repetition allowing automation.

Eric Kandel, Nobel Prize for Medicine in 2000 for his work on memory, showed that in this case there was an increase in the neurotransmitters at the level of the synapses. We are in the scope of short-term memory but with a lot of repetition it can be transformed into long-term memory by a dialogue between the synapse and its nucleus, converting the CPEB proteins into prions.

When this work is done naturally, at the age of 4, by the subcortical route, new synapses are formed that will create a new circuit. It is for this reason that we must intervene as soon as possible.

Froggy-mouth is a device that, worn 15 minutes a day for a few weeks in front of a television screen (reward recognized by the limbic system), will force the child to discover a new mode of deglutition in a subcortical way.

Indeed, being unable to close the lips, it will be impossible for the child to swallow in suction, hence prompting an immediate reaction in the brain stem to find a new program of swallowing.

But this is only the first step, necessary but not sufficient to switch to automation.

The child will then have two programs to swallow his saliva and just like on a computer when two programs are available it is the activation of one or the other icon that will trigger its execution.

The icon of sucking swallowing is triggered by the activity of the facial nerve: “my lips are contracted, my teeth do not touch”.



Figure 1: The lips are joined by contraction of the orbicularis and chin musculature, the archaic program will be called.

The icon of toothed subject-type swallowing: “my lips are relaxed, my molars are in occlusion” is activated by the trigeminal nerve that will allow not only molar occlusion but also the protection of the tongue from being bitten due to the richness of trigeminal nerve endings of its epithelial covering.



Figure 2: The teeth are occluded with the lips relaxed, here is the icon of the new program.

The therapist should therefore monitor the resting posture to obtain relaxation of the perioral musculature and dental occlusion at the time of swallowing.

Control by the trigeminal nerve, which is mobilized during this stage, will replace the control by the facial nerve and will inhibit it. The trigeminal, which also controls the respiration centers in the pontic tegmentum by its sensory nucleus, will favor a restoration of nasal breathing, allowing the tongue to adopt a high posture of its posterior part (lingual dome).

“This double functional necessity for the tongue to be in a posterior and occlusal position, too often forgotten by the re-educators of the oro-facial functions is probably one of the causes of the frequent failures of re-education” (Delaire, 2015).

This new operating mode, analyzed and accepted by the limbic system, will thus be able to automate itself in the procedural memory.

Supervision of the labial posture can be transferred to parents who will control the position of the lips 4 or 5 times a day, validating or correcting the motor sequence; these two actions - reward or correction - are distinct because they stimulate different cortico-cortical loops. The success will be all the faster that the child will be close to the age range where this occurs naturally.

The prerequisite to this type of rehabilitation is the establishment of a comfortable anatomical environment, one that is compatible with the new motor sequences. The practitioner will thus be the prescriber and will decide when this therapeutic must be put in place [1-5].

Conflict of Interest

No Conflict of Interest.

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