

## Facial Nerve and a Dismissed Intermedius Pair?

### ¿Nervio Facial y un Par Intermedio Descartado?

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**The question posed:** Is it possible that classical anatomists have forgotten an important cranial pair in the XII pair classification?

**Factual analysis:** The VII nerve is known as a mixed sensory-motor pair but there are some reasons to look it as another pure motor pair like III, IV, VI, XI and XII.

The VII nerve as a motor pair needs to be sensorially enriched by various communicating branches from different mixed nerves that donate this component to it. Gray's Anatomy states that the sensory part of the facial nerve is not fully proven although this part is endorsed to the nervus intermedius emerging in a close triad beside the VII and VIII pairs. In fact, the nervus intermedius could not be "a sensory part of" another cranial pair due to them being a special (taste), secretomotor (parasympathetic fibers to lacrimal and salivatory glands) and a sensory component; coming respectively from the brainstem solitary nucleus (medulla), superior salivatory nucleus (pons) and V's sensory nucleus (medulla-pons) (Preston & Shapiro, 2013). With this in mind, clearly a sensory function for the nervus intermedius is not the only mistake. The VII's servant sensory function is another mistake as well.

German anatomist Heinrich Wrisberg (1739-1808), in 1777, described the nervus intermedius nerve as a lateral root of the VII nerve. Subsequently, Samuel Soemmerring, a student of Wrisberg, decided to combine them and call them with his eponym (Flamm, 1967). It is not difficult to imagine that size drives such a decision. Certainly, the nervus intermedius is a modest nerve in size, but not in function or in the distribution widely arranged in a broad craniofacial area. Robust cranial nerves as IX and X pairs could be compared equitably to the intermedius. VII and the intermedius both converge, as an apparent single structure into the osseous petrous zone in the middle cranial fossa. In this intimate osseous zone, the intermedius

is broadly distributed in two secretomotor nerves from the geniculate ganglion: the large superficial petrosal nerves to sphenopalatine ganglia and the small superficial petrosal nerves to otic ganglia (summing IX's tympanic plexus). This course ends first with the chorda tympani nerve carrying both special sensory components from the tongue to solitarius nucleus and a secretomotor component to Jacobson's Plexus and for submandibular ganglia (Tubbs *et al.*, 2009). Finally, some sensorial extra mastoid areas (digastric, styloid, and auricular) (Preston & Shapiro, 2013). If it is a matter of serving, the intermedius also does so with IX (Jacobson plexus) and X (Arnold's nerve) and V (Chorda Tympani, V3-lingual and V2-Sphenopalatine ganglia) nerves. It also has amazingly weird connections with the VIII nerve (Diamond *et al.*, 2011; Hwang *et al.*, 2015) through Scarpa ganglia (dizziness' reports) and a cochlear part with reported hearing impairment complication after intermedius sectioning (Rowed, 1990). It must be recognized that traveling closely to another nerve does not make it putative for this one. Consequently, there are other examples of intimate trajectories that occur starting with VII and VIII nerves (not related at all), or others like C1 and XII nerves or between XI (recurrent laryngeal nerve) with X nerves.

As above mentioned, the VII nerve's sensorial and thermo-algesic afferents start in the communicating branches (V, Intermedius, IX, X, C2, C3) that donate it to the VII nerve. All of the communication sensory dermatomes of the VII nerve's converge towards the V nerve's subnucleus caudalis-SC5 in the most surprisingly cervical zone of the brain stem which corresponds to spinal trigeminal nucleus. Consequently, the VII nerve is neither a stereceptive and interoceptive autonomous nor sovereign: It all depends on intermedius nerve (pair) and on several other general sensory communicating branches with thermal and algesic functions (Kwak *et al.*, 2004; Diamond *et al.*, 2011; Hwang *et al.*, 2015; Tansatit *et al.*, 2015).

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Finally, it is interesting to note the difference between Bell's palsy and Ramsey-Hunt palsy (Intermedius neuralgia) because this explanation offers some clinical tips relevant to this matter. The first is apparently caused by herpes simplex and the last by Herpes Zoster. This last usually prefers somatic-sensory and visceral-sensory nerves (intercostal neuritis and in trigeminal varicella), with painful blisters by deafferentation of these sensitive and sympathetic nerves (Causalgia and Complex regional pain syndrome). The dermatome involved in the VII nerve's paralysis of the Ramsey-Hunt should involve the entire "theoretical" sensory peripheral facial nerve branches, based on the premise that the VII nerve is a mixed sensory-motor nerve. Interestingly, the sensory territory impairment is only expressed up to external auditory meatus (the intermedius dermatome) and produces vesicular eruptions only in this zone, with tenderness in the external meatus (Hitzelberger sign). ¿Why does the neuritis not follow the entire VII nerve peripheral paths if it supposedly carries a sensory part of an alleged mixed cranial pair?

Rest only asks if the contemporary anatomists would tolerate a disruptive thirteen cranial pairs classification running down pairs eight through twelve to get the thirteen or maybe the "Intermedius Pair" would be recognized as a true cranial one. If so, the latter would deserve to be named the "Seven and a Half Pair".

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