Parasympathetic Pathways for Nose, Palate, Sinuses and Lacrimal Gland. The Pterygoplatine Fossa

PARASYMPATHETIC PATHWAY TO NOSE, PALATE & SINUSES & LACRIMAL GLAND VIA PTERYGOPALATINE GANGLION
The facial nerve (VII) is associated with parasympathetic fibres for secretory functions in the nose, palate sinuses & lacrimal gland. It enters the middle ear via the internal auditory meatus. It passes through the geniculate ganglion and the cavity of the middle ear before exiting the skull via the stylomastoid foramen. It supplies the muscles of facial expression.

The parasympathetics arise in the superior salivary nucleus and travel with VII (actually in the nervus intermedius, a nerve closely associated with the facial nerve which also carries taste & a small amount of general sensation).
These preganglionic parasympathetics reach the geniculate ganglion and pass right through it without synapsing. They then exit alone through the roof of the middle ear as the greater petrosal nerve.

This greater petrosal nerve is now in the middle cranial fossa, under the dura, and runs towards the top of foramen lacerum.
The greater petrosal nerve, carrying preganglionic parasympathetic fibres, passes across the superior aspect of foramen lacerum then dips into it to reach the pterygoid canal in its anterior wall. Here it enters the pterygopalatine ganglion.

Just before it enters the pterygoid canal it picks up the deep petrosal nerve, a sympathetic nerve from the plexus on the internal carotid artery. These sympathetic fibres pass straight through the parasympathetic ganglion and supply vasoconstriction only.
The preganglionic parasympathetic fibres synapse in the pterygopalatine ganglion.

The branches of the postganglionic parasympathetic fibres that emerge from the pterygopalatine ganglion are the greater and lesser palatine, nasopalatine, pharyngeal and lacrimal. Others are to sinuses, teeth and orbit.
The maxillary branch of the trigeminal enters the fossa via foramen rotundum and branches carry the parasympathetic AND the sympathetic to the palate and nose.

Postganglionic parasympathetic Branch of Vb (maxillary - sensory)
Sympathetics (vasoconstriction)

Postganglionic parasympathetics reach the lacrimal gland by joining the zygomaticotemporal nerve and then, in the orbit, they join the lacrimal branch of Va to be carried to the gland.
Taste from the palate, in the greater & lesser palatine nerves only, returns in the greater petrosal nerve and its cell bodies are in the geniculate ganglion in the middle ear. There is no taste in the nose or nasopharynx.