Quick Review: Fossa of Rosenmüller

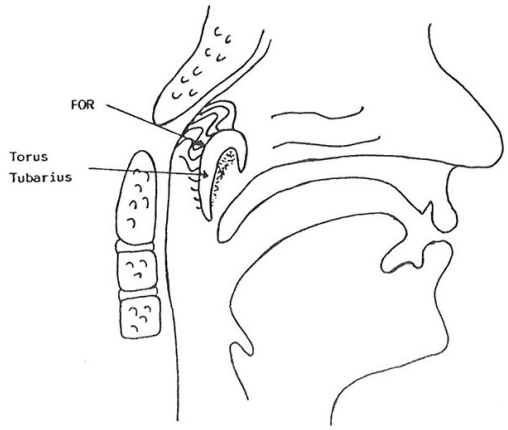
The nasopharynx is a fibromuscular sling suspended from the skull base. The human nasopharynx is mainly derived from the primitive pharynx. It represents the nasal portion of the pharynx behind the nasal cavity and above the free border of the soft palate.

The nasopharynx communicates with the nasal cavities through posterior nasal apertures. The choanal orifices along with the posterior edge of the nasal septum form the anterior boundary of the nasopharynx. The superior surface of the soft palate constitutes its floor and velopharyngeal isthum provides communication between nasopharynx and oropharynx. The body of sphenoid, basiocciput and first and second cervical vertebrae combine to form roof of the nasopharynx.

The part of nasopharynx proximal to the tubal orifice is innervated by the maxillary division of the trigeminal (V) nerve, and that posterior to the tubal orifice by the glossopharyngeal (IX) nerve.

Functional studies with contrast and cinefluorography reveal structural differences between the two components. Contractility is observed only in the posterior portion of nasopharynx.

The key feature of the lateral wall of nasopharynx is the pharyngeal orifice of the Eustachian tube. Located in the middle of the wall, it is about 1.5 cm equidistant from the roof, posterior wall, choana and the floor. The tubal elevation (torus tubarius), formed by the elastic cartilage of the tube, is particularly prominent in its upper and posterior lip. Behind the posterior margin of the torus, between it and the posterior wall, lies the lateral pharyngeal recess or *the fossa of Rosenmüller.*



Saggital section of the postnasal space
(L E Loh et al 1991)

The superior constrictor muscle does not reach the base of skull hence a lateral gap (sinus of Morgagni) is created. Fossa of Rosenmüller is a herniation of the nasopharyngeal mucosa through this deficiency between skull base and superior most fibers of the superior constrictor muscle. Through this gap bridged only by the pharyngobasilar fascia, the eustachian tube enters the nasopharynx with its two muscles, one on each side. Along the inferior border of the two muscles the Fossa of Rosenmüller is separated from the parapharyngeal space by mucosa and pharyngobasilar fascia.

The borders of the Fossa of Rosenmüller are:

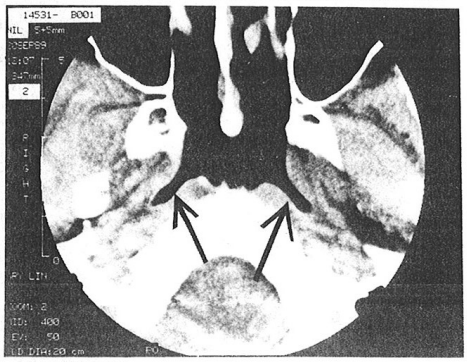
- Anterior: The eustachian tube, the levator palatini.
- Anterolaterally: Tensor veli palatini muscle
- Posteriorly: The retropharyngeal space,
- Inferiorly: The upper edge of the superior constrictor muscle
- Laterally: The tensor veli palatini muscle and parapharyngeal space.
- The superior border is the base of the skull with the foramen lacerum medially, the petrous apex and carotid canal

posteriorly, and the foramina ovale and spinosum anterolaterally.

These anatomic relationships provide explanations for the symptoms commonly found in patients with disorders of the nasopharynx and the pathways for direct extension of the disease.

Anatomical relations of the fossa of Rosenmüller (FOR) are:

- **Anteriorly**: Eustachian tube and levator palatini.
- **Posteriorly**: Pharyngeal wall mucosa overlying the pharyngobasilar fascia and retropharyngeal space.
- **Medially**: Nasopharyngeal cavity.
- **Superiorly**: Foramen lacerum and floor of carotid canal.
- **Posterolateral (apex)**: Carotid canal opening and petrous apex posteriorly, foramen ovale and spinosum laterally.
- **Laterally**: Tensor palatine and the mandibular nerve, and the prestyloid compartment of the parapharyngeal space. The fossa forms the medial border of the most superior part of the parapharyngeal space.



CT scan of FOR with patent orifice
(L E Loh et al 1991)

L E Loh et al (1991) attempted to study the anatomy of FOR using CT scan in 23 patients (comprising 46 fossae of 17 males and 6 females) in the age group of 18-66 years. Their findings are tabulated below:

1	Range of depth	1.7 to 18.8 mm
2	Range of width	1.6 to 7.4 mm
3	No. of FOR> 10 mm in depth	22 (48%)
4	No. of FOR> 10 mm in depth	40 (87%)
5	No. of FOR with depth > width	36 (78%)
6	No. of FOR with width > depth	10 (22%)
7	Angle between saggital plane and long axis of FOR	45 degrees
9	No. of FOR with depth > 10mm and orifice width <5mm	23 (50%)

Their study reported that the FOR is deeper than perceived and that it has a relatively narrow orifice. The FOR points laterally with its long axis making an average angle of 45 degrees with the Saggital plane. There is little variation between the left and right FOR in any patient; the difference in depth varies between 2 and 3 mm and difference in width of orifice within 1 mm.

FOR is far too deep and narrow for clinical inspection be it with a postnasal mirror or nasopharyngoscope. 50% of patients have a depth of more than 10 mm and orifice narrower than 5 mm. In these cases, the FOR, in particular the floor of FOR, constitutes a blind spot of the postnasal space. Perhaps in these cases the postnasal space can never be declared normal based solely on clinical inspection. . (L E Loh et al 1991)

Lymphatic drainage

Lymphoid tissue is abundant in the nasopharynx. Three main groups of submucosal collecting pathways drain the pharynx, the superior, middle, and

inferior pathways. The superior pathway provides the primary drainage of the nasopharynx along with a small contribution by the middle pathway. It drains the oropharynx, soft palate, eustachian tube and fossa of Rosenmüller, tympanic cavity, and nasal fossae.

The superior pathway is divided into median and lateral groups.

- The median group drains the roof and posterior border of the nasopharynx into the lateral retropharyngeal node.

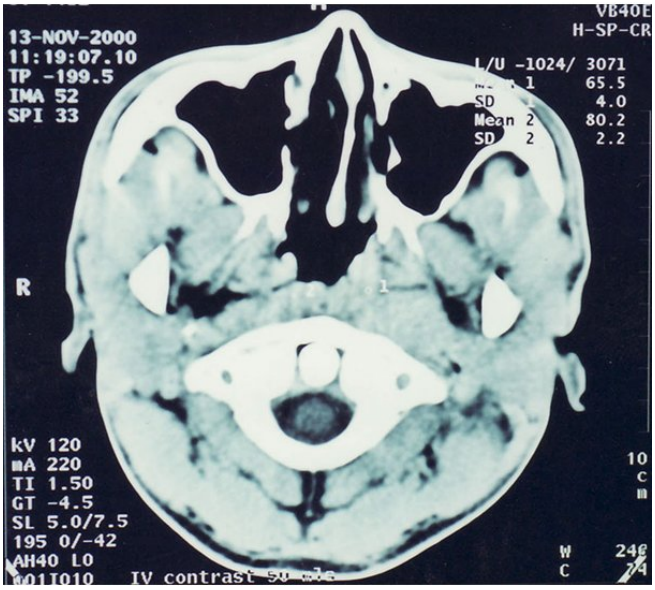
- The lateral group drains the lateral nasopharynx, including the fossa of Rosenmüller, and flows into the lateral half of the upper internal jugular chain or into the lateral retropharyngeal node. The lateral group is often a single node or several confluent nodes, termed the node of Rouviere. Occasionally, the node is absent on 1 side and usually non palpable. (Simon Lo et al 2009)

Nasopharyngeal carcinoma (NPC) arises most often posterosuperiorly in the postnasal space in the region of the Fossa of Rosenmuller. NPC may be entirely submucosal in site and in its early stages when it has not infiltrated through the pharyngobasilar fascia.

This malignancy is a squamous cell carcinoma with varying degrees of differentiation arising from the epithelial lining of the nasopharynx. (Sham JS, 1990)

Clinical examination, including endoscopic examination of the nasopharynx can provide valuable information on mucosal involvement and local tumor extension. It however cannot determine deep extension of the tumor such as skull base erosion and intracranial spread. (John Hoe, 1989)

CT has been the most reliable and well-established imaging technique for staging and assessing the extent of nasopharyngeal carcinoma (NPC), although MR imaging is now replacing CT as the examination of choice in the nasophanynx. NPC has a tendency for submucosal spread, and diagnosis of the disease is usually not difficult on CT scans. The typical finding is asymmetry of the fossa of Rosenmuller manifested as blunting or obliteration, often with associated thickening of the deglutitional muscle layer caused by tumor infiltration. As NPC characteristically results in deep infiltration, there is often obliteration or displacement of the paraphanyngeal space. (John Hoe, 1989)



CT scan of the nasopharynx and paranasal sinus demonstrates an asymmetry of the fossa of Rosenmuller with obliteration of the left parapharyngeal space
(http://www.ispub.com/ostia/index.php?xmlFilePath=journals/ijhns/vol1n1/nerve.xml)

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