

# FOSSA OF ROSENMULLER AND NASOPHARYNGEAL CARCINOMA

U. PRASAD,

## INTRODUCTION

NASOPHARYNX is an area behind the nasal cavities between the base of skull above and soft palate below. In shape it is almost cuboidal and measures between 3 — 4 cm in height, breadth and antero-posterior dimensions. Due to its small size and difficult anatomical location it has, since long, been known to the clinicians as an obscure area and has been termed a "blind spot" (Cantril and Buschke, 1946), a hidden cavity (Davis, 1948) and an "unknown region" (Hickley, 1951).

Nasopharynx is bounded anteriorly by the posterior nasal apertures with the posterior edge of the nasal septum in the middle. The floor is formed by the dorsum of the soft palate, while the basisphenoid forms its roof. The posterior wall which is continuous with the roof is constituted by basiocciput and upper two cervical vertebrae. A prominent landmark along its lateral wall is the pharyngeal opening of the Eustachian tube (Fig. 1), which measures about 8 x 5 mm, and is roughly triangular in shape with apex pointing upwards. Along its superior and posterior margins there is a prominence called torus tubarius, formed by the medial end of the cartilaginous part of the tube. Behind this prominence lies a Fossa, or the lateral recess, first of all, described in 1808 by a German Anatomist, Johann Christian Rosenmuller (1771 — 1828). This Fossa of Rosenmuller has been said to be the site of predilection for the development of nasopharyngeal carcinoma (NPC) (Prasad, 1972, 1978; Oreskovic *et al.*, 1968). The gross pathological lesions in NPC are proliferative (exophytic) when the tumour bulges in the nasopharynx, and infiltrative, in which case the tumour grows submucosally without producing ulceration (Whiteleather, 1945) in early stages.

The purpose of this paper is to establish that all the infiltrative types of NPC originate from the fossa of Rosenmuller. I shall put forward the anatomical, clinical and radiological evidences to prove this hypothesis.

## ANATOMICAL CONSIDERATION

The Fossa of Rosenmuller is a cone-shaped lateral extension of the nasopharynx, which is contracted dorsoventrally. This recess is hardly noticeable at birth, however with the growth of the person it increases more and more in depth, averaging about 10 mm when fully formed, probably in order to facilitate the movement of the Eustachian tube. The apex of this cone lies very close to the anterior margin of the lower opening of the carotid canal, while the base which opens into the nasopharyngeal space proper is related superiorly to the foramen lacerum (Fig. 2). This foramen is occupied, in the recent state, by fibrocartilage and no large structure either enters or leaves the skull through it. Thus the internal carotid artery and the sympathetic plexus of nerves which traverse forward and medially from the lower opening of the carotid canal to the cranial cavity are separated from the roof of the Fossa of Rosenmuller by thin bone which forms the floor of the carotid canal and the fibrocartilage which cover the foramen lacerum. This piece of bone is developed by a process of secondary fusion which is often incomplete. As such it is more convenient for the neoplastic process to enter the cranial cavity through the weak floor of the carotid canal and progress on to the cavernous sinus unhindered than to enter the foramen lacerum through its floor where the fibrocartilage is likely to offer tremendous resistance. However once the cavernous sinus is invaded, the maxillary, abducent, trochlear and oculomotor nerves are affected in that order (Fig. 2).

The anterior wall of the Fossa of Rosenmuller is related to thin mucosa covering the cartilaginous part of the Eustachian tube (Fig. 3)

Department of E.N.T., Faculty of Medicine,  
University of Malaya, Kuala Lumpur.

U. PRASAD, M.B., B.S. (Bihar), F.R.C.S.Ed, F.I.C.S.,  
Associate Professor and Head

superiorly and the fascia covering the levator palati muscle inferiorly. Again, the cartilage of the tube offers resistance to the spread of tumour to its lumen, as such it is very rare for the tumour to enter the middle ear and present as polyp in the external auditory meatus, however, it does compress the tube and cause conductive deafness. Deafness also occurs due to the involvement of the levator palati muscle which is responsible for the opening and closing of the tube. The fascial space surrounding the levator palati muscle is penetrated rather easily and thereby this muscle is infiltrated. This subsequently leads to the fixation of the soft palate.

The mandibular nerve, which is separated from the Fossa by the Eustachian tube and tensor palati, is fairly well protected (Fig. 4) and is affected only late, when the tumour invades the prestyloid compartment of the parapharyngeal space via the apex of the Fossa of Rosenmuller.

Laterally there is parapharyngeal space which can be divided into the following three compartments, by the styloid process, the muscles attached to it and the various fascial expansions (Fig. 5).

1. Retropharyngeal
2. Retrostyloid
3. Prestyloid

1. The retropharyngeal compartment contains the lymph node of Rouviere which is of importance, since this is most frequently and fairly early involved in nasopharyngeal carcinoma (NPC). This compartment separates the nasopharynx from the prevertebral muscles and upper two cervical vertebrae.

2. The retrostyloid compartment, which contain the internal carotid artery, internal jugular vein, the last 4 cranial nerves, the sympathetic trunk and few lymph nodes, is entered, either by way of direct spread from the lateral wall of the Fossa or indirectly after the node of Rouviere has been affected.

3. The prestyloid compartment, however is affected, only when the disease is fairly well advanced. In that case the structures affected are the mandibular nerve, the parotid gland and pterygoid muscles and rarely the facial nerve. As

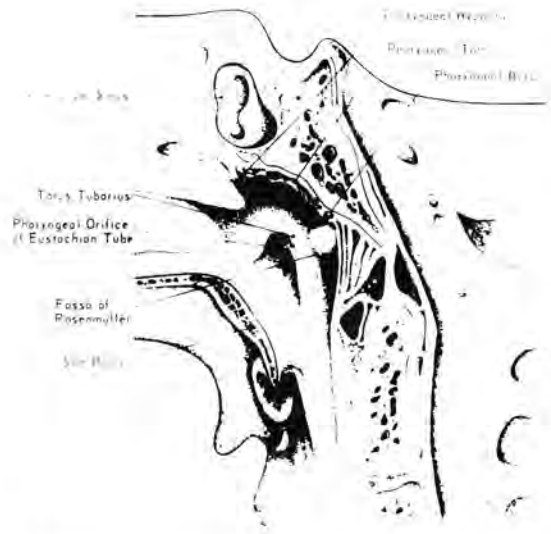


Fig. 1. Section to show the normal boundaries of the nasopharynx.

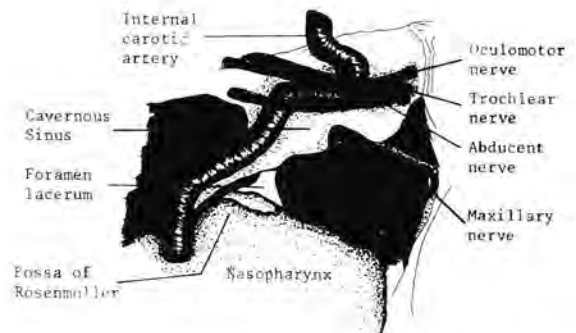


Fig. 2. Coronal section of Cavernous Sinus and lateral wall of nasopharynx.

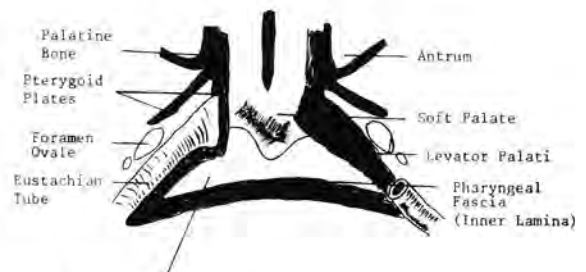


Fig. 3. The Fossa of Rosenmuller seen from above.

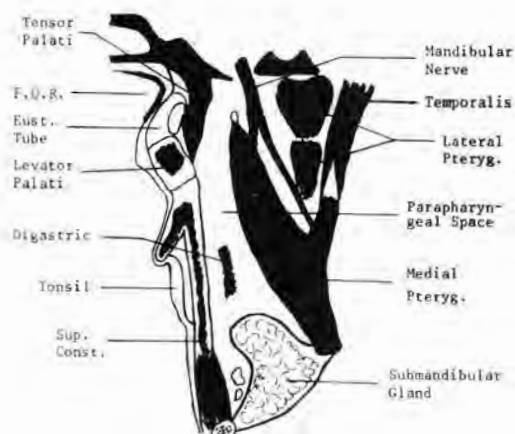


Fig. 4. Coronal section through the prestyloid part of the Parapharyngeal space.

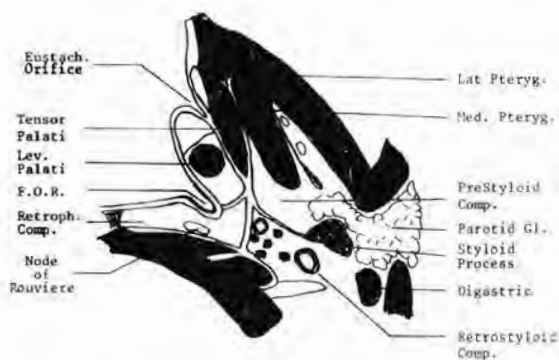


Fig. 5. Horizontal section through the parapharyngeal space.

the disease spread below in this compartment it pushes the tonsil and the lateral pharyngeal wall medially and may extend inferiorly to infiltrate the submandibular salivary gland which forms the floor of this compartment (Fig. 4).

The lymphatics from the Fossa of Rosenmuller first drain into the node of Rouviere and subsequently to the upper deep cervical lymph node situated below the tip of the mastoid process, deep to the upper attachment of the sternomastoid muscle.

### CLINICAL CONSIDERATION

Out of first 200 cases of NPC diagnosed at the ENT clinic of the University Hospital, Kuala

Lumpur, it was possible to collect 60 cases where the tumour was localised to the region of the Fossa of Rosenmuller. It was interesting however to observe that, in 24 cases among these, either there was just fullness of this Fossa (18 cases) so that one could just differentiate between the depth of Fossa on one side as compared to the other side or no obvious lesion could be seen (6 cases) on posterior rhinoscopy. In all these 24 cases the mucosa was intact and histopathological examination of tissue taken from the Fossa through direct nasopharyngoscopy, revealed the diagnosis of NPC in each case.

On reviewing the clinical features of these 24 cases (Fig. 6) it was found that at the time of their first presentation to our clinic, 15 had mass of node in the neck, 14 had otological symptoms in the form of deafness and/or tinnitus, 9 had cranial nerve involvement, 5 had rhinological symptom of epistaxis and/or nasal obstruction and 3 even had distant bony metastasis.

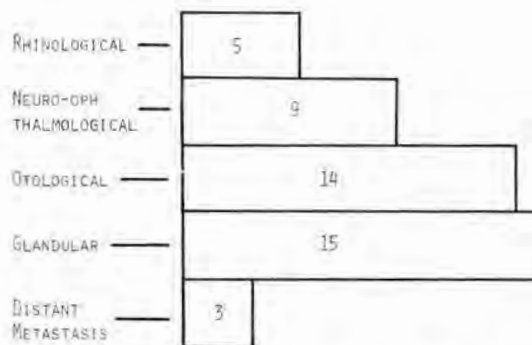


Fig. 6. Symptomatology in 24 cases of NPC with fullness of Fossa of Rosenmuller.

### RADIOLOGICAL CONSIDERATION

Routine X-ray examination of the nasopharynx, in nasopharyngeal carcinoma, reveal either thickness of the precervical fascia or soft tissue mass occupying the nasopharyngeal space or bony erosion. Out of these 24 cases, no abnormality could be detected in 17. In 7 cases there was only thickening of the precervical fascia and neither soft tissue mass nor evidence of bony erosion could be seen.

## DISCUSSION

Since Whiteleather's (1945) observation that initially nasopharyngeal carcinoma may grow sub-mucosally without causing ulceration, such infiltrative lesions have been reported time and again, however so far, there has been no mention of the behaviour of these tumours which are so very limited in their appearance in the nasopharynx, yet have spread far beyond the site of origin to the extent of producing distant metastasis. It seems obvious that these tumours arise in the Fossa of Rosenmuller and undergo such pattern of spread whereby instead of proliferating and producing tumour mass in the nasopharyngeal space, at least in the earlier stage of the disease, take other different routes of spread inwardly. The mucous membrane covering the tumour mass remain intact.

Extension anteriorly results in otological symptoms due to pressure over the Eustachian tube or infiltration of the levator palati muscle, as was the case in 14 of them. Superiorly the spread lead to involvement of the cranial nerves from 3rd to 6th (7 cases) and laterally those of 9th to 12th (2 cases). Largest number of cases (15) had cervical node involvement at the time of first presentation. Definitely these nodes were affected secondarily from the node of Rouviere which is very conveniently placed in the retropharyngeal compartment and drains lymphatics from the Fossa of Rosenmuller. Once these nodes are infiltrated distant metastasis is not highly unlikely. Radiological finding of thickening of the precervical fascia in those 7 cases further supports that these tumours had grown sub-mucosally and produced thickness of the posterior nasopharyngeal wall instead of giving shadow of soft tissue mass occupying the nasopharyngeal space. In the rest of the case, routine radiological examination of the

nasopharynx did not reveal any tumour, although clinically there were evidences of growth extending from the Fossa of Rosenmuller inwardly.

## CONCLUSION

The anatomical consideration and the clinical and radiological evidences in histopathologically confirmed cases of nasopharyngeal carcinoma with suspected or very minimal lesion observed clinically and radiologically, suggest that the site of origin of, if not all, at least the infiltrative type of nasopharyngeal carcinoma, is the Fossa of Rosenmuller. As such I shall like to suggest that in all suspected cases of NPC, biopsy should be obtained from the Fossa and carefully studied for N.P.C.

## ACKNOWLEDGEMENT

My sincere thanks to Encik Mazna and the Department of Medical Illustration for the photographs and to my departmental secretary, Miss A.M. Tan for typing the manuscript.

## REFERENCES

- Cantril, S.T. and Buschke, F. (1966). Malignant tumours of the nasopharynx. *West. J. Surg.*, **54**, 494 — 496.
- Davis, E.D.D. (1948). Diagnosis and treatment of tumours of nasopharynx. *J. Laryng. & Otol.*, **62**, 192 — 205.
- Hickley, H.L. (1951). Nasopharyngeal malignant tumour. *Arch. Otolaryng.*, **53**, 53 — 67.
- Oreskovic, M., Petric, K. and Padovan, S. (1968). The otoneurophthalmologic diagnosis in tumours of the nasopharynx and of the apex of the petrous pyramid. *J. Laryng. & Otol.*, **82**, 575 — 601.
- Prasad, U. (1972). Cancer of the nasopharynx, a clinical analysis with anatomico-pathological orientation. *J.R. Coll. Surg. Edinb.*, **17**, 108 — 117.
- Prasad, U. (1978). Nasopharyngeal carcinoma, etiological aspects and electron-microscopic observations. *J.R. Coll. Surg. Edinb.*, **23**, 199 — 207.
- Whiteleather, J.E. (1945). Transitional epithelial cell carcinoma of the nasopharynx. *Am. J. Roentg.*, **54**, 357 — 369.