TUMORS OF THE NASAL AND PARANASAL CAVITIES

CHARLES F. GESCHICKTER, M.D.¹

(From the Surgical Pathological Laboratory, Department of Surgery, Johns Hopkins Hospital and University)

EMBRYOLOGY AND CLASSIFICATION

The lining membrane of the nasal cavity and sinuses is formed from the invaginating ectoderm of the olfactory plates at the end of the fourth week of embryonic life. It is continuous with the mucous membrane of the nasopharynx, which is entodermal in origin but of similar histologic structure. At first these olfactory plates are in contact with the cerebral vessels, but later the meninges and ethmoid bone separate them from the brain. Outgrowths of the nasal lining in the third month form the middle meatus, and further extensions at the posterior end form the pockets for the maxillary sinus. From the anterior portion four furrows develop, two representing buds for the frontal sinuses and the remainder the air cells of the ethmoid. The lining membrane differentiates to form ciliated columnar epithelium resembling the respiratory epithelium of the pulmonary tract. From the undifferentiated cells of the basal layers the mucous glands of Bowman are derived. The submucous tissue of this region is particularly rich in mucous glands and in blood vessels. Portions of the olfactory ectoderm in the upper ethmoidal region are neuro-epithelial in character and form connections with the olfactory bulb. Gangliomas may rarely form from these cells.

The sinuses are rudimentary at birth, but reach adult size between adolescence and the twenty-fifth year. The majority of carcinomas of the nose arise in the region of the middle turbinate at the embryonic site of the outpouching of the sinuses, and are epidermal in type. In the nasopharynx, and more rarely in the nose and antrum, malignant epidermal cells from the mucous membrane are interspersed with lymphoid tissue, producing a variety of lympho-epithelioma. The post-embryonic extensions of the epithelial membrane within the maxillary sinuses provide a source for epidermal carcinomas of the antrum. From the undifferentiated epithelium of the basal layers destined to form glandular appendages cystic basal-cell cancer and adenocarcinoma arise. It is usually impossible at the time of their clinical recognition to determine whether malignant epithelial tumors of this region have had their primary site within the nose or antrum. Intranasal carcinomas extend to the maxillary sinus, and antral tumors invade the nasal cavity relatively early. The largest number of cancers are both antral and intranasal at the

¹ Aided by a grant from The Anna Fuller Fund.
time of clinical observation, and may be referred to as maxilloethmoidal tumors. Such carcinomas comprise from 1 to 2 per cent of cancer throughout the body. These tumors obstruct respiration, erode the surrounding skeletal structures, and usually produce death by extension. Clinical recognition is usually late, and prior to the introduction of radium therapy permanent cures were exceedingly rare.

Probably because slowly growing tumors of this region remain asymptomatic, epithelial tumors of benign character are seldom reported. So-called hard papillomas, adenomas and cystadenomas, and rarely aberrant salivary tumors are among the benign epithelial growths of the nasal and paranasal cavities. Osteomas, angiomas, plasmocytomas and a variety of benign and malignant connective-tissue tumors occur, but with less frequency than epithelial tumors.

The classification and incidence of the 211 tumors in the present series, selected by microscopic study from over 2,000 specimens removed surgically in the Department of Laryngology and Otology of the Johns Hopkins Hospital, are as follows:

<table>
<thead>
<tr>
<th>Tumor Type</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benign Epithelial Tumors</strong></td>
<td>19 cases</td>
</tr>
<tr>
<td>Epidermal papilloma</td>
<td>10 cases</td>
</tr>
<tr>
<td>Appendage-cell tumors</td>
<td></td>
</tr>
<tr>
<td>Aberrant salivary tumors</td>
<td>3 cases</td>
</tr>
<tr>
<td>Cystadenoma</td>
<td>6 cases</td>
</tr>
<tr>
<td><strong>Malignant Epithelial Tumors</strong></td>
<td>139 cases</td>
</tr>
<tr>
<td>Epidermal cancer</td>
<td></td>
</tr>
<tr>
<td>Keratinizing and non-keratinizing squamous-cell cancer</td>
<td>73 cases</td>
</tr>
<tr>
<td>Lymphohodermal cancer (lympho-epithelioma)</td>
<td>36 cases</td>
</tr>
<tr>
<td>Appendage-cell carcinoma</td>
<td></td>
</tr>
<tr>
<td>Cystic basal-cell cancer</td>
<td>15 cases</td>
</tr>
<tr>
<td>Adenocarcinoma (including Schneiderian cancer)</td>
<td>15 cases</td>
</tr>
<tr>
<td><strong>Benign Connective-tissue Tumors (exclusive of 76 osteomas)</strong></td>
<td>37 cases</td>
</tr>
<tr>
<td>Angioma</td>
<td>25 cases</td>
</tr>
<tr>
<td>Plasmocytoma</td>
<td>6 cases</td>
</tr>
<tr>
<td>Fibroma</td>
<td>6 cases</td>
</tr>
<tr>
<td><strong>Sarcomas</strong></td>
<td>16 cases</td>
</tr>
<tr>
<td>Lymphosarcoma</td>
<td>7 cases</td>
</tr>
<tr>
<td>Melanosarcoma</td>
<td>2 cases</td>
</tr>
<tr>
<td>Rhabdomyosarcoma</td>
<td>2 cases</td>
</tr>
<tr>
<td>Myeloma</td>
<td>2 cases</td>
</tr>
<tr>
<td>Fibrosarcoma</td>
<td>3 cases</td>
</tr>
</tbody>
</table>

Inflammatory Growths or Nasal Polyps: Among the non-neoplastic conditions in this series, the majority were nasal polyps. These are sometimes classed as fibro-epithelial tumors or as soft papillomas of the nose.

Crowe believes that 95 per cent of nasal polyps are inflammatory. They occur usually above the inferior turbinate in the ethmoidal region, are often multiple, and may recur after removal. A smaller number occur in the antrum, and rarely they are found in the frontal sinus or in the nasopharynx. The characteristic growth is pedunculated and may show a tendency to ulceration and hemorrhage. The variations in histologic structure are of interest in that any type of benign tumor of
the nose may be simulated (Figs. 1 and 2). The epithelium, which is usually ciliated, may be thickened and thrown into papillary folds and transformed into transitional or squamous epithelium resembling benign epithelial papilloma. The loose, edematous connective tissue which forms the bulk of the polyp may be highly cellular, as in true

fibromas. Dilated venules, which are present in all cases and are often accompanied by hemorrhage, may be conspicuous and suggestive of hemangioma. Infiltration by wandering cells of various types is marked; when plasma cells are conspicuous, plasmocytoma may be mimicked. More rarely cystic dilatation may be present in the mucous glands, leading to a histologic diagnosis of cystadenoma.
The more moderate increases in the epithelial covering, in the submucous fibrous tissue, in vessels, and in the plasma-cell infiltration are not inconsistent with the diagnosis of benign inflammatory nasal polyp. It is doubtful if such lesions undergo neoplastic or malignant change. More often these polypoid conditions are the result rather than the source of malignancy. They occur as secondary manifestations in carcinoma of the nose or sinuses, the vascular obstruction caused by the malignant new growth giving rise to polypoid masses.

Impairment of the venous circulation in the mucous membrane, resulting from an osteitis in the ethmoid bone through which the vessels pass, is apparently the most common etiologic factor in the formation of these growths. The resultant congestion leads to a localized distention which eventuates in a pedunculated tumor. Local removal suffices to cure, but a thorough examination must be made to rule out multiple tumors or a neoplastic cause of vascular obstruction.

**Epidermal Tumors**

*Benign Epidermal Papillomas (Hard Papillomas)*

Epithelial papillomas of the nose and sinuses must be distinguished from papillary overgrowths of the lining epithelium which complicate many of the benign inflammatory polyps. True papillomas are rare tumors. Ten cases are recorded in the present series. Mossböck was able to collect only 70 cases from the literature, to which he added one of his own. These benign growths are firm in character and are composed of transitional epithelium which may become keratinized (Fig. 3). Reduplicated layers of columnar epithelium are found in a smaller number of cases. Adults are usually affected and males more often than females. Most of these growths appear in the nasal cavity, in the region of the septum or lower turbinate and in the vestibule. Occasionally multiple growths of this type have been described. Papilloma has been reported in the antrum by Holmgren and in the frontal sinus by...
TUMORS OF THE NASAL AND PARANASAL CAVITIES

Herxheimer. The tumors grow slowly and the outstanding symptom is nasal obstruction. Excision, preferably with a cautery, should suffice for a cure, but the specimen should be checked microscopically to rule out malignant change. Recurrent growths have been reported. These usually retain a benign character, showing the epithelium clearly demarcated from the underlying fibrous tissue.

The dividing line between papillomas and inflammatory nasal polyps on the one hand and between papillomas and papillary carcinoma on the other hand is not distinct. Ewing believes that the inflammatory overgrowths may pass imperceptibly into papillomas and thence into carcinoma. Recently Reuys, in a study of 12 cases, has tried to show a relation between nasal polyp, papilloma, and papillary carcinoma of the nose. In the present series the patients with benign papilloma who have been followed after excision have remained well, in one case over a period of sixteen years. No relation to the inflammatory polyp has been proved. However, a small group of carcinomas of the nose and antrum show a definite papillary structure, indicating a probable origin in hard papillomas.

**Epidermal Carcinomas**

Epidermal carcinomas of the maxillo-ethmoidal region may be divided into two major groups according to their clinical and pathological features. The largest group comprises squamous-cell or transitional-cell cancer. There were 73 cases of this type in the present series, 50 involving the antrum predominantly and 23 confined to the intranasal cavities. These tumors produce large local growths which invade the adjoining structures and involve the regional lymph nodes, but rarely
give rise to distant metastases. The other group is composed of lymphodermal cancers, the so-called lympho-epitheliomas, in which the malignant transitional cells are intermingled with lymphoid tissue. There were 49 cases of this type in the present series, 20 in the nasopharynx, 16 in the nose, and 3 in the sinuses. This type of tumor usually forms a small local growth in the nasopharynx. The primary le-

![Fig. 5](image)

**Fig. 5. Roentgenogram Showing Clouding of the Left Antrum Produced by Epidermal Carcinoma**

The small insert is a lateral view showing destruction of the bony wall of the antrum. Path. No. 48056.

sion often remains asymptomatic, the outstanding clinical feature being enlargement of the cervical lymph nodes produced by metastasis.

*Squamous or Transitional-cell Cancers*: These epidermal cancers of the maxillo-ethmoidal region are slowly growing tumors which usually erode the bone and invade surrounding structures before they are clinically detected. They are rare under the age of forty and become progressively more frequent in the fifth, sixth, and seventh decades. In the present series 20 of the antral tumors presented in the region of the palate and 15 in the cheek or upper jaw, while 7 showed a bulging
FIG. 6. FATAL KERATINIZING EPIDERMAL CARCINOMA OF THE MAXILLO-ETHMOIDAL REGION

The tumor invaded the antrum and ethmoid. The recurrent tumor involved the hard palate, metastasized to the right subparotid lymph nodes, and extended intracranially. Path. No. 43838.

FIG. 7. NON-KERATINIZING EPIDERMAL CARCINOMA ARISING IN THE RIGHT NASAL CAVITY

The tumor extended into the nasopharynx and intracranially. Path. No. 39340.
in the orbit. In the majority the outstanding symptoms were related to an intranasal tumor. The tumors growing in the nasal passages produce obstruction, interference with the voice and sense of smell, and epistaxis. Blocking of the naso-lacrimal duct may cause lacrimation. Antral tumors cause swelling of the jaw, trigeminal neuralgia, and fungation or bleeding in the region of the hard palate, nose, or orbit. Loosening of the upper molar teeth may be a late manifestation, and exophthalmos may occur. Nasal polyps of the benign inflammatory type produced by vascular obstruction may be the first manifestation of a more deep-seated malignant growth. In the roentgenogram clouding of the antrum or of the nasal cavities, with deflection of the septum or bulging of the bony walls of the antrum, may be seen. Osseous destruction and decalcification are late signs (Figs. 4 and 5).

Fig. 8. Case of Lympho-epithelioma Primary in the Nasopharynx

The only clinical findings were a narrowing of the nasopharyngeal cavity and the large cervical masses. Path. No. 39818.

Öhngren divides carcinomas of the antrum clinically into two groups: those superior and posterior to a plane passing from the angle of the jaws to the inner canthus of the eye, and those inferior and anterior to this plane. Tumors in the first group rapidly encroach upon the meninges and important vessels, rendering the chance of successful treatment minimal. Some of these tumors, however, grow laterally, invading the orbit and the pterygomaxillary fossa, and remain accessible to therapy. The tumors in the anterior-inferior portion of the antrum encroach upon the hard palate, loosen the teeth, and invade the nose, but from the standpoint of treatment remain relatively accessible. Regardless of location, the presence or absence of metastases is the most important factor in curability. The lymphatic drainage of the nose and antrum passes posteriorly and medially into the retropharyngeal spaces. The lateral retropharyngeal lymph nodes receive the early metastases. From here secondary deposits pass to the deep jugular
chain of nodes at the bifurcation of the carotid. Palpation of the retropharyngeal nodes shows that the majority of cancers in this region metastasize relatively early. If palpation is restricted to the nodes at the bifurcation of the carotid, the false impression is obtained that metastasis occurs late. In a large number of the cases in the present series death resulted from intracranial extension.

The commonest histologic variety is the so-called transitional-cell cancer arranged in islands or folds. Papillary epidermal carcinoma showing an origin in benign papilloma may occur (Figs. 6 and 7). Squamous-cell carcinoma with epithelial pearls accounts for about one-sixth of the cases.

Cures of carcinoma of the nose and sinuses by means of surgery with or without thermal cauterization are exceedingly rare. Among

![Image](image.jpg)

**Fig. 9. Lympho-epithelioma of the Antrum, Patient Well Seven Years After Cauterization and Radium Therapy**

The photomicrograph shows the small epithelial cells intermingled with lymphocytes, suggesting a diagnosis of round-cell sarcoma (the old classification for these growths). Path. No. 40630.

the earlier cases recorded in this series only one was cured by a combination of these methods. Electrocoagulation combined with irradiation has improved the percentage of permanent cures in recent years. Önggren has reported 16 per cent of patients living beyond the five-year period in a series of 116 cases of epidermal and basal-cell cancers of the antrum treated by electrocoagulation and irradiation. New and Cabot report a marked increase in the curability of their cases of the upper jaw and antrum since the introduction of this method of treatment. Of a series of 91 patients with primarily malignant tumors of the antrum, 75 were traced and 40 per cent were living after five years.

Lympho-epithelioma (Lymphodermal Carcinoma or Schmincke Tumor): Lympho-epithelioma is most common in the nasopharynx. It is
also observed in the nose and antrum. Similar tumors are found in
the tonsil, the posterior third of the tongue, the pharynx, and larynx.
The local growth remains small, but metastasis occurs early. The tu-
mor is most frequent in the fossa of Rosenmüller, near the entrance to
the eustachian tube. Ewing credits the first description of this tumor
to Regaud, who distinguished it from other epidermal cancers because
of its marked radiosensitivity. In the German literature the original
description is credited to Schmincke. The age distribution is variable,
cases being reported from fourteen to seventy, with young adults pre-
dominating. Many cases were undoubtedly included in the older litera-
ture under the diagnosis of round-cell sarcoma.

**Fig. 10. Lympho-epithelioma of the Nasopharynx**

Metastasis to the cervical lymph nodes occurred before the primary growth was discovered.
Path. No. 17557.

In the present series there were 36 cases, 18 in the nasopharynx, 16
in the nose, and 2 in the antrum. The majority of the patients were
young adults. Metastases were present in the cervical lymph nodes in
most of the nasopharyngeal cases at the time the true nature of the dis-
case was recognized. Although the tumors are radiosensitive, perma-
nent cures are rare. One patient in the present series is living seven
years after removal of a nasopharyngeal growth. Irradiation was
given postoperatively to the tumor site and to the cervical lymph nodes
in the posterior triangle. A second patient, with lympho-epithelioma
of the antrum, is living seven years since cauterization of the growth
and postoperative application of radium to the antral cavity (Figs. 8
and 9).

The following case presents many typical features:
A colored girl, aged nineteen, was first seen because of headache, pain in the right side of the face, and a sore throat. The tonsils were removed, but the sore throat continued and was associated with a slight cough. Two months later the patient noticed a lump in the right jaw, which was painful and tender. A second lump appeared on the left side. Difficulty of breathing through the right nostril then developed, followed by a mucous discharge. A second examination showed tender and sensitive lymph nodes on both sides of the neck, and a polypoid mass in the right nasal cavity apparently springing from the ethmoidal and sphenoidal regions. The polyp was removed and the cervical lymph nodes were resected under the diagnosis of Hodgkin's disease. Pathological examination showed the polypoid mass to be inflammatory. The character of the lymph nodes was uncertain. The microscopic differentiation between inflammatory endothelial hyperplasia and possible metastatic carcinoma could not be made. Following the operation radium was administered to the cervical region. The patient next complained of deafness in the right ear and hoarseness. A bloody discharge appeared from the right nostril. The lymph nodes behind the angle of the right jaw enlarged. One year after the first examination a mass was discovered in the nasopharynx which was removed and proved microscopically to be a lympho-epithelioma (Fig. 10). The mass recurred promptly, and the patient died six weeks later. Autopsy was not obtained.

**APPENDAGE-CELL TUMORS**

**Benign Basal-cell Tumors, Aberrant Salivary Types:** Tumors derived from the appendages of the mucous membranes of the nasal and paranasal cavities are basal-cell or adenomatous in type. The benign basal-cell lesions resemble histologically the mixed salivary tumors. They are firm, encapsulated, slowly growing tumors of a tough fibrous consistency. The symptoms produced are those of obstruction or compression and extend over a period of from five to ten years. The growths show a tendency to recur after excision. These tumors are rarely primary in the nose or accessory sinuses. More often they are found secondarily invading the antrum from the region of the hard palate, which is the more common site. Only 3 such cases are recorded.
in the present series. One of these, a growth 1.5 cm. in diameter, occurred within the nasal vestibule in a male of sixty-three, who had first noticed a mass seven years previously (Fig. 11). A similar but recurrent tumor invading the antrum and originating in the region of the middle meatus was removed from a boy of eighteen, who had noticed difficulty in breathing for the past ten years. In the third case a tumor present on the hard palate for eighteen years, in a patient of fifty-one, recurred after excision and invaded the antrum (Figs. 12A and B).

Öhngren has reported 13 tumors of the mixed salivary type primarily or secondarily involving the antrum. Denker records and illustrates a tumor of this type removed from the nasal septum, and

Aubry records a similar growth in a woman of forty-seven, which was removed from the left ethmoidal region.

Histologically these tumors are composed of cords or strands of basal cells embedded in rich amounts of hyalinized fibrous tissue. Occasionally the stroma shows mucoid degeneration and the epithelial cells are arranged in acinar structure. The number of reported cases of this type from the region of the nose and sinuses cannot be determined since these tumors were formerly regarded as endotheliomas or cylindromas and are often discussed as sarcoma or carcinoma.

*Cystic Basal-cell Cancer*: The malignant basal-cell lesions of the nose and accessory sinuses are adenocystic in type and resemble in histologic character the malignant tumors of the salivary glands. Fifteen tumors belonging to this group are recorded in the present series.
Nine of these primarily or secondarily involved the sinuses. Six of the
growths were predominantly intranasal (3 with antral extension); 3
were located in the nasopharynx. With one exception these tumors
occurred in adults.

Like other malignant tumors of this region, these growths obstruct
the nasal passages, produce clouding of the antrum and expansion of
the bony walls, and bulge downward in the region of the hard palate, or
laterally and superiorly into the region of the orbit. They are accom-
panied by the formation of nasal polyps, and in three instances in this
series there were repeated operations for benign polypoid tumors be-
fore the malignant nature of the condition was suspected. Although

![Figure 12B. Aberrant Salivary Tumor: Photomicrograph of Specimen Shown in Fig. 12A](image)

Spies, Ewing and Öhngren have emphasized the fact that cystic basal-
cell carcinoma of the nasal and paranasal mucous membranes metas-
tasizes to distant organs, in the present series repeated local recur-
rence or invasion of contiguous structures was more often the cause of
fatality than metastasis. In one case of widely metastasizing carcino-
oma of the nasal vestibule the original tumor was reported as cystic
basal-cell cancer, but the metastases were epidermal in type. Such
mixed tumors probably account for some of the so-called metastasizing
cystic basal-cell cancers. These tumors approach the lympho-epitheli-
omas in radiosensitivity.

The following history is typical of the cystic basal-cell carcinomas
in the present series and illustrates the tendency to local recurrence.

A white male, aged fifty-four, had noticed discharge from the left nostril for several
years. Six months ago a swelling appeared in the region of the hard palate and two
teeth in this region were extracted. The patient came under observation because of pain in this region which had been present only one week. Examination showed a swelling of the mucous membrane over the hard palate and x-rays showed cloudiness of the left antrum. At the first operation, in 1915, the antrum was opened and multiple polypoid growths were removed. These showed a typical adenocystic structure (Fig. 13). In 1916, similar polypoid tumors were removed from the left naris and sphenoid sinus. In 1917, there were three operations for the removal of tumors in the hard palate and nose, followed in 1918 by three more excisions for recurrent tumors of the nose and antrum. In 1919, there was bulging of the left eye, followed by destruction of this organ. In 1920, the patient died. The tumor had filled the orbit, escaped externally from the nose, and crowded into the nasopharynx. Death was due to intracranial extension. There was no evidence of metastasis.

*Adenomas and Cystadenomas:* Benign adenomas of the nasal mucous membranes and the accessory sinuses are the rarest of the epithelial growths in this region. They are usually found in the upper
and posterior portion of the nasal fossa and occasionally the larger growths extend into the accessory sinuses. The region of the tuberculum septi is cited by Eckert-Möbius as a favorite location. The present series includes 3 intranasal tumors of this type, 2 involving the antrum, and one in the frontal sinus. With one exception these 6 cases were in young adults, who complained of headache, neuralgia, nasal obstruction or nasal discharge. Eckert-Möbius described 3 cases and collected 24 from the literature. His cases were polypoid growths which grew slowly and produced symptoms of nasal obstruction. Histologically, two of them were cystadenomas lined by cylindrical epithelium. The third contained ciliated epithelium and was located in the frontal sinus. Grevillius reported two cases, both in the nasal cavity, with nasal hemorrhages and extension into the maxillary sinus. These tumors give no peculiar symptoms other than those due to encroachment upon normal structures. Usually they have been present for several years before clinical recognition. The histological structure is tubo-alveolar with an epithelial lining varying from cuboidal to cylindrical. Many of the glandular spaces are dilated to form small cysts lined by low cuboidal cells. The diagnosis depends upon microscopic examination. Some of these growths approach in appearance the glandular hyperplasia seen in cases of rhinitis and sinusitis. On the other hand, some are difficult to distinguish from adenocarcinoma (Fig. 14).

*Mucoid Cysts and Cholesteatomas:* Mucoid cysts occur in the nasal vestibule of adults, and according to Laszlo only 60 cases have been reported to date in the literature. The tumors produce a rounded fluctuant swelling on the floor of the nose which contains a thick, honey-like...
FIG. 15. CHOLESTEATOMA OR CYST OF THE FRONTAL SINUS. PATH. NO. 47788

FIG. 16. LOW-POWER AND HIGH-POWER PHOTOMICROGRAPHS OF ADENOCARCINOMA OCCURRING IN THE NASAL VESTIBULE AND INVADING THE ANTRUM. PATH. NO. 35176

652
fluid within an epithelial-lined sac. Histologically the lining membrane consists of stratified columnar epithelium. The majority of growths have been reported in women. Laszlo gives the various theories of their origin. One of these, proposed by Schaeffer, relates the growths to remnants of the nasopalatine canal which connects the nasal and oral cavities in fetal life. Römer relates the cysts to the epithelial débris of Malassez, and groups them with the dentigerous cysts of the jaws.

Cholesteatomas are cystic tumors lined by stratified epithelium resembling epidermoid cysts of the skin. They are more often intracranial in origin. They have not been described in the nose, but Eckert-

---

**Fig. 17. Low-power and high-power photomicrographs of adenocarcinoma removed from the antrum**

The patient had a tumor excised from the region of the hard palate thirteen years previously. Case of J. W. Lindsay, Washington, D. C. Path. No. 53900.

Möbius has collected 18 of these growths in the region of the frontal sinus and 9 in the antrum and ethmoid. He believes that those in the frontal sinus are related to the cholesteatomas found in the brain. The growths are observed in adults and rarely produce symptoms other than gradually increasing swelling (Fig. 15).

**Adenocarcinoma:** Adenocarcinoma is one of the rare forms of cancer of the nose and sinuses. Its origin can be traced to the mucous glands or to benign adenoma of the nose. There were 15 cases in the present series. All but two of these gave a history indicating an intra-nasal origin (Fig. 16). In one of the two exceptions the largest mass was in the antrum. The other appeared in the antrum following the removal of a tumor in the region of the hard palate thirteen years previously (Fig. 17). A small group of adenocarcinomas form polypoid masses and have a structure of cylindrical epithelium arranged in coils. This has been traced by some authors to the Schneiderian membrane, whence the term Schneiderian carcinoma, employed
by Ewing. One of the cases of this type in the present series occurred in a male of forty years, who had had repeated nasal hemorrhages over a period of four years. The tumor recurred repeatedly and terminated fatally despite three operations elsewhere and two excisions in this clinic. In another case the tumor invaded the ethmoid, antrum and frontal sinus and fungated in the region of the right molars, in the roof of the mouth (Fig. 18). In the majority of adenocarcinomas the glandular structure is accompanied by mucous secretion, and in one case in this series typical mucoid carcinoma was found. These tumors apparently grow more slowly than epidermal carcinoma but are more radioresistant. All the cases followed in the present series proved fatal. Denker, in his review of the literature of adenocarcinoma, cites three cases of Meyer in which adenocarcinoma in the region of the ethmoid was associated with the formation of bone and cartilage.
Benign and Malignant Connective-tissue Tumors

Benign connective-tissue tumors in the intranasal and accessory cavities, including osteomas, angiomas, plasmocytomas and fibromas, are more common than benign epithelial tumors. Marschik and Sendziak in their reviews of malignant tumors in this region find sarcoma more frequent than carcinoma. Sendziak records 450 sarcomas to 337 carcinomas. If the osteomas and ossifying fibromas arising from the underlying skeletal structures are excluded, benign connective-tissue tumors are not common in this region. Benign angiomas were most frequent in the present series (25 cases), the majority of these being observed in the region of the nose. Sarcomas were less common than carcinomas, in the ratio of 16 to 121. The preponderance of sarcoma in the literature over carcinomas is unquestionably due to the previous inclusion by older authors of lympho-epithelioma under the diagnosis of round-cell sarcoma, of benign mixed salivary tumors under the diagnosis of endothelioma, of basal-cell carcinomas under the diagnosis of cylindroma, and of ossifying and cellular fibromas under the diagnosis of spindle-cell sarcoma.

Osteomas: Osteomas of the eburnated type, composed of spicules of adult bone, and spongy osteomas in which ossifying fibrous tissue predominates are relatively common in the bones of the face and in the frontal bones of the skull. A detailed discussion of these tumors is presented elsewhere in connection with tumors of the jaw and of the

---

**Fig. 19. Roentgenogram of Large Osteoma Obstructing the Nasal Cavity and Invading the Ethmoidal and Antral Sinuses**

Case of Dr. Max Cutler, Chicago. Path. No. 55212.
skull. They occur in young individuals and present most commonly in the frontal sinus. Eckert-Möbius reports 113 out of 276 osteomas in the frontal sinus, 53 in the ethmoid, 13 in the antrum, and 7 in the sphenoidal sinus. Of 70 osteomas in the region of the jaws recorded in this laboratory, 50 cases were in the region of the upper jaws and, of these, 20 were primarily antral or intranasal (Fig. 19). Osteomas of

the skull and frontal sinuses were less frequent in the present series, but the majority of these growths from the cranial region were in the frontal bone or frontal sinus (Echlin). These tumors grow slowly and rarely produce symptoms other than those caused by pressure or obstruction. In 50 per cent of the cases, however, fatal complications may eventuate, and for this reason surgical removal is indicated at the time of clinical recognition. In the more cellular fibrous growths irradiation may be tried.

Angiomas: These benign tumors were formerly classed with bleeding polyps of the septum, and it is difficult to separate the cases recorded in the literature from inflammatory polyps and granulomas. In the present series there were 25 cases, the greater number occurring intranasally, a smaller number in the nasopharynx, and one in the antrum. The growths are characterized by red, soft polypoid tumors. The clinical symptoms are profuse bleeding and nasal obstruction. The common site of origin is the septum or lower turbinate. Histologically the growths are capillary or cavernous (Fig. 20). One lymphangioma is recorded in the present series. The growths are best treated by electrocoagulation or irradiation.

Benign and Malignant Plasmocytes: Tumors of the upper respiratory passages composed of plasma cells of both benign and malignant character have been described. Mattick and Thibaudeau have reported one case and collected 20 cases from the literature. The symptoms of nasal obstruction and epistaxis observed are shared by other intranasal growths. Histologically, plasma cells in great numbers crowd together with little intervening tissue. Some of these tu-
TUMORS OF THE NASAL AND PARANASAL CAVITIES

Mors have been described as granulomas. The majority of cases in our own series are undoubtedly inflammatory in type, merging imperceptibly with cases in which eosinophils and plasma cells predominate in otherwise typical granulation tissue. However, 6 of the tumors of this group have been separated as apparently benign neoplasms and 2 as sarcomas. The malignant cases showed areas of tumor giant cells

![Image 1](image1)

**Fig. 21. Benign Plasma-cell Tumor of the Nose. Path. No. 25644**

![Image 2](image2)

**Fig. 22. Malignant Plasma-cell Tumor of the Nose**

Case of Dr. S. W. Budd, Richmond, Va. Path. No. 54390.

and plasma cells varying in size and shape, such as are found in multiple myeloma, but the skeleton was not involved. The cases in the present series have been reported by Koehler (Figs. 21 and 22).

*Fibromas and So-called Spindle-cell Sarcoma:* Fibrous tumors of the nasal cavity and sinuses are rarely found to be true fibromas or fibrosarcomas upon histologic examination. The majority are fibrous
inflammatory polyps, fibroed angiomas, or ossifying fibromas. The fibromas recorded in the literature (Sargnon) often respond to irradiation, which is not typical of true fibromas or fibrosarcoma. Six fibromas were recorded in the present series and 3 fibrosarcomas. The growths occurred in young individuals and were found in the nose and nasopharynx. It is impossible to rule out the possibility of nerve sheath tumor in two of these cases.

The nasopharyngeal fibroma or basal fibroid presents many characteristic features. The tumor originates at the base of the skull or from the fibrocartilages of the upper cervical vertebrae. It is composed of embryonic connective tissue with numerous vascular spaces and may be mistaken for sarcoma. It occurs usually in boys, between ten and twenty years of age, giving rise to symptoms of hemorrhage and obstruction. While not malignant, the tumor invades the surrounding structures including the orbit, sinuses, and temporal fossa. Irradiation is the treatment of choice, implantation of radon and external irradiation being combined. The tumors often become arrested or decrease in size after the age of twenty-five.

Other Forms of Sarcoma and Rare Tumors: Lymphosarcoma, melanosarcoma, and rhabdomyosarcoma have been reported in the literature in the nose and nasopharynx (Denker). Öhngren reports similar tumors in the antrum. In the present series there were 7 lymphosarcomas, 2 melanosarcomas and 2 myosarcomas, one of the rhabdomyoma type. These were rapidly growing tumors which terminated fatally (Figs. 23 and 24). The majority of lymphosarcomas occur in the nasopharynx. They may, however, occur in the nose or

Fig. 23. Lymphosarcoma of the Nasopharynx. Path. No. 15407
in the sinuses when the lesion is associated with a generalized lympho-sarcoma.

Among the rare tumors in this region are ganglioneuromas and teratomas. Eckert-Möbius discusses 5 teratomas collected from the literature. Two of these occurred at the root of the nose, one each in the frontal and sphenoidal sinus, and the other involved the upper jaw and extended diffusely into the accessory nasal cavities. Smith described a teratoma of the antral cavity of a newborn infant. He could not find a similar case in the literature.

Ganglioneuromas in the region of the Schneiderian membrane have been occasionally described in the literature. Stout records a case, and Eckert-Möbius refers to tumors of this type under the term glioma of the nose.

BIBLIOGRAPHY

AUBRY AND KLOTZ: Tumeur mixte de l'ethmoïde, Arch. internat. de laryng. 9: 977, 1930.
EWING, J.: Lectures on Tumor Pathology, Cornell University Medical School, Class of 1934, pp. 3 and 4.
HOLMGREN, G.: Papillom im antrum Highmori, Hygiene (Stockholm) 87: 482, 1925.
KOELKE, H. P.: Benign and malignant plasmacytomas, to be published in Arch. Surg.