DISSERTATION ON

“ROLE OF ENDOSCOPY IN THE MANAGEMENT OF BENIGN AND MALIGNANT SINONASAL TUMORS”

Dissertation submitted in partial fulfillment

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UPGRADED INSTITUTE OF OTORHINOLARYNGOLOGY,
MADRAS MEDICAL COLLEGE, CHENNAI.

APRIL 2018
CERTIFICATE

This is to certify that this dissertation “ROLE OF ENDOSCOPY IN THE MANAGEMENT OF BENIGN AND MALIGNANT SINONASAL TUMORS” submitted by Dr. VIVEK. B, appearing for M.S ENT Branch IV Degree examination in April 2018 is a bonafide record of work done by him under my direct guidance and supervision in partial fulfillment of the regulations of the Tamilnadu Dr.M.G.R Medical University, Chennai. I forward this to the Tamilnadu Dr.M.G.R Medical University, Chennai, Tamilnadu, India.

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DECLARATION

I solemnly declare that the dissertation entitled “ROLE OF ENDOSCOPY IN THE MANAGEMENT OF BENIGN AND MALIGNANT SINONASAL TUMORS” is done by me at Madras Medical College, Chennai-3 during August 2015 to August 2017 under the guidance and supervision of Prof. DR. G. SANKARANARAYANAN M.S, DLO. MNAMS, to be submitted to The Tamil Nadu Dr. M.G.R Medical University towards the partial fulfillment of requirements for the award of M.S DEGREE in OTORHINOLARYNGOLOGY BRANCH-IV

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I would be failing in my duty if I don’t place my sincere thanks to those patients who were the subjects of my study.
I thank all my colleagues and friends and juniors for their constant encouragement.

I am extremely thankful to my family members for their continuous support.

Above all I thank God Almighty for his immense blessings.
ABBREVIATIONS

SCC- Squamous Cell Carcinoma

CT- Computed Tomography

MRI- Magnetic Resonance Imaging

JNA- Juvenile Nasopharyngeal Angiofibroma
## INDEX

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CONTENTS</th>
<th>PAGE NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>AIMS OF THE STUDY</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>REVIEW OF LITERATURE</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>EMBRYOLOGY AND ANATOMY</td>
<td>13</td>
</tr>
<tr>
<td>5.</td>
<td>MATERIALS AND METHODS</td>
<td>48</td>
</tr>
<tr>
<td>6.</td>
<td>RESULTS AND ANALYSIS</td>
<td>65</td>
</tr>
<tr>
<td>7.</td>
<td>OBSERVATION AND DISCUSSION</td>
<td>80</td>
</tr>
<tr>
<td>8.</td>
<td>CONCLUSION</td>
<td>89</td>
</tr>
<tr>
<td>9.</td>
<td>BIBLIOGRAPHY</td>
<td>90</td>
</tr>
<tr>
<td>10.</td>
<td>ANNEXURE</td>
<td>95</td>
</tr>
</tbody>
</table>

I. PROFORMA  
II. MASTERCHART  
III. CONSENT FORM  
IV. ETHICAL COMMITTEE CERTIFICATE  
V. PLAGIARISM CERTIFICATE
INTRODUCTION

Sinonasal malignancies are a diverse group of tumours, some of which are unique to the nose. These tumours are uncommon and account for less than 1 percent of all neoplasms. They produce little in the way of symptoms at the outset when most are mistaken for rhinosinusitis. Paranasal sinus malignancies comprise less than 5% of all head and neck cancers. The maxillary sinus remains the most common site of paranasal sinus malignancies (50% to 70%), followed by the nasal cavity (15% to 30%) and ethmoid sinus (10% to 20%).

The average delay between the first symptom and diagnosis is six months. By this time, erosion of bone and infiltration of sensory nerves has usually produced severe pain and sometimes a facial sensory deficit. Further extension of the tumour into the orbit, brain and infratemporal fossa has profound implications for treatment and the likely outcome. Surgery and chemoradiotherapy remain the mainstays of treatment.

The introduction of endoscopic endonasal surgery in the 1980s, underpinned by access to CT and then MRI, revolutionized our approach to the diagnosis and management of virtually all rhinological conditions. Beginning with inflammatory and infective conditions, it was rapidly extended to the interfaces with the orbit and skull base, encouraging cross-specialty interaction.
It was thus a natural progression to the resection of benign sino nasal tumors and then, albeit with some trepidation, to malignant tumors.

This study is undertaken to assess the role of endoscopy in the management of Benign and Malignant Sinonasal tumors and the outcomes.
AIMS AND OBJECTIVES

1. To study the role of endoscopy in management of benign and malignant sinonasal tumors.

2. To evaluate the advantages and disadvantages of endoscopy in management of benign and malignant sinonasal tumors.
David M. Poetker, M.D., Robert J. Toohill, M.D., Todd A. Loehrl, M.D., and Timothy L. Smith, From the Department of Otolaryngology and Communication Sciences, Medical College of Wisconsin, Milwaukee, Wisconsin, in their study “Endoscopic Management of Sinonasal Tumors: A Preliminary Report“, comprising of forty patients which included 24 patients with benign tumor and 16 patients with malignant tumor, underwent surgical resection by trans-nasal endoscopic technique and were followed up with a mean average period of 17 months for benign tumors and 50 months for malignant tumors, reported a recurrence rate of 4.2% for benign tumors and 31.3% for benign tumors. They included all histological types of both benign and malignant sinonasal tumors which were surgically resectable by endoscopic techniques. Epithelial-derived malignancies arising from the nasal cavity and paranasal sinuses were staged using American Joint Committee on Cancer guidelines. Esthesioneuroblastomas were staged using the Kadish staging system. Patient survival and disease-free survival were measured from the date of surgery to the date of death, disease recurrence, or the last follow-up visit available. There were a total of 24 patients with benign histology with a mean age of 50.7 years. The most common benign pathology was Inverted Papilloma followed by juvenile nasopharyngeal angiofibroma. There was one case each of
the following: angiofibroma, osteoma, pleomorphic adenoma. There were a total of 16 patients with malignant pathologies, with a mean age of 57.3 years. There were five patients with squamous-cell carcinoma (SCC), five with esthesioneuroblastoma, and two with adenocarcinoma. The remaining histologies included hemangiopericytoma, chondrosarcoma, adenoid cystic carcinoma, and malignant melanoma, each representing one case. All the patients underwent endoscopic resection for both benign and malignant tumors. A total of 11 of the 16 patients with malignant tumors received adjuvant therapy during the initial management of their tumors. Four of the five patients with squamous cell carcinoma received External Beam Radiotherapy and/or chemotherapy. Four of the five patients with esthesioneuroblastoma received External Beam Radiotherapy, two of these patients received chemotherapy as well. The remaining three patients receiving adjuvant therapies included a patient with chondrosarcoma, a patient with adenoid cystic carcinoma, and a patient with malignant melanoma, all of whom received postoperative External Beam Radiotherapy. All patients were examined using nasal endoscopic examination and Imaging modalities in the follow up period. The benign group had an overall recurrence rate of 1 of 24 or 4.2%, with a mean follow-up of 17.5 months. The only recurrence came in a patient with Inverted Pailloma. Thus, the recurrence rate for Inverted Papilloma was 1 of 17 or 5.9%, with a mean follow-up of 22.2 months. There were a total of five local recurrences in the malignant tumor group, three patients with Squamous Cell Carcinoma and two patients
with esthesioneuroblastoma. Survival for the entire malignant group was 87.5%, with a mean follow up of 51.5 months. They concluded that the recurrence rates, survival rates for both benign and malignant sinonasal tumors were acceptable when compared to other external surgical approaches though their study required a more continuous surveillance of their patients. The morbidity of external surgical approaches were minimized by endoscopic resection of these tumors and also patients had a better quality of life owing to better cosmetic results and a lesser duration of hospital stay.

Scott D. London, M.D., Rodney J. Schlosser, M.D., and Charles W. Gross, M.D. From the Department of Otolaryngology, Head and Neck Surgery University of Virginia Health Sciences Center, Charlottesville, Virginia in their paper “Endoscopic Management of Benign Sinonasal Tumors” comprising of thirty eight patients with benign sinonasal tumors were managed with endoscopic techniques reported a recurrence rate of 16.7%(3 cases) in their mean follow up period of 4 years. All patients had preoperative coronal computed tomography (CT) scans performed. Magnetic resonance imaging (MRI) was performed in cases in which the extent of disease was unclear to differentiate between retained secretions and tumor and to determine the extent of mucosal involvement. All patients underwent nasal endoscopy with biopsy to determine pathology. Endoscopic resection were performed under general anesthesia. Generally, the procedures were started by debulking any large tumor
mass not involving nasal or sinus mucosa. This allowed excellent exposure to determine the exact site of origin of tumor mucosal attachment, thereby preventing any breach of tumor margin. When complete removal was indicated, the exact mucosal site of origin was identified and the involved mucosa was incised and elevated using a sickle knife and freer elevator. Normal-appearing mucosa that lined sinuses adjacent to the site of origin was preserved. Inverted papilloma was the most common benign tumor observed in this study. Patients ages ranged from 11 to 65 years old (median, 37 years old). Follow up period ranged from 6 months to 96 months. Two of 18 (11%) patients required endoscopic management for recurrent tumor. Both patients had ossifying fibroma—one in the sphenoid and one along the posterior ethmoid and orbital apex, one patient with fibrous dysplasia of the sphenoid had recurrence. One patient had CSF leak while undergoing Modified Lothrop Procedure for Frontal Sinus Osteoma. Other than that no other complications were observed in any other cases. follow-up consists of frequent postoperative visits until the operative cavity has stabilized, and then future surveillance of endoscopy every 6 months coupled with annual CT scans. With a recurrence rate of 16.7% and a complication rate of 5.8% endoscopic resection of benign sinonasal tumors and endoscopic surveillance in the outpatient setting has allowed a less radical surgical approach while resulting in decreased morbidity and better tumor control.
Tomasz Gotlib, Ewa Osuch-Wójcikiewicz, Marta Held-Ziółkowska, Magdalena Kuźnińska, Kazimierz Niemczyk, Department of Otolaryngology, Medical University of Warsaw, Poland in their paper “Endoscopic transnasal management of sinonasal malignancies” comprising of eleven patients who underwent endoscopic transnasal surgical excision of the tumors, reported a recurrence rate of 8% (one patient) over a mean follow up period of 13.5 months. The histopathology was as follows: malignant melanoma in 3 patients, squamous cell carcinoma in 2, adenocarcinoma in 2, poorly differentiated carcinoma in 1, hemangiopericytoma in 1, adenoid cystic carcinoma in 1 and fibrosarcoma in 1. The data on tumor type, operative technique, perioperative complications and postoperative course were analyzed. Four patients underwent subsequent radiotherapy. In 1 patient selective neck dissection was performed due to metastasis of malignant melanoma. The mean observation period was 13.5 months (range: 4–20 months). One patient with hemangiopericytoma developed intraoperative CSF leak and closure was done at the time of surgery itself. Follow-up visits with debridement of crusts under endoscopic control were carried out every 7–14 days for at least 1 month, and then at least once in 3 months. Follow-up imaging was performed with computed tomography or magnetic resonance. They concluded that in selected cases endoscopic surgery of sinonasal malignancies is similarly effective as external approach surgery.
Peter John Wormald, MD; Eng Ooi, MBBS; C. Andrew van Hasselt, FCS (SA); Salil Nair, FRCS, From the Department of Surgery (P.J.W., E.O., S.N.), Adelaide and Flinders Universities, South Australia, Australia; and the Department of Surgery (C.A.V.H.), Chinese University of Hong Kong, Hong Kong, Republic of China in their study” Endoscopic Removal of Sinonasal Inverted Papilloma Including Endoscopic Medial Maxillectomy” comprising of 17 patients who underwent exclusive endoscopic excision of the inverted papilloma were followed up for a period ranging from 8 to 98 months, reported a recurrence rate of 6%(1 patient) and one patient had malignanat transformation. There were 13 male and 4 female patients in the present study confirming the male predominance. Ages ranged from 41 to 78 years with a median age of 54 years. Patients were assessed for recurrence as outpatients using nasal endoscopy. There were no complications recorded as a result of surgery. The most common presenting symptom was nasal obstruction (50%), followed by nasal discharge (20.8%), epistaxis (16.6%), frontal sinusitis (4.2%), and maxillary sinusitis (4.2%); one patient was asymptomatic (4.2%). The most common sites of involvement were the lateral nasal wall (42%), maxillary sinus (26%), ethmoid sinus (3.8%), sphenoid sinus (14.4%), septum (7.4%), and frontal sinus (7.4%). All patients were followed up for a period ranging from 8 to 98 months. They concluded that advances in endoscope, image technology, and powered instruments have enabled most inverted papillomas to be safely
resected by experienced endoscopic sinus surgeons. Results achieved endoscopically are comparable to those employing an external approach.

Other Important Studies

E. Serrano, A. Coste*, J. Percodani, S. Herve´ *, L. Brugel, From the Department of Otorhinolaryngology Head and Neck Surgery, Rangueil Hospital, Toulouse, and the District and Henri Mondor Hospitals*, Cre´teil, France in their paper” Endoscopic sinus surgery for sinonasal haemangiopericytomas” comprising of 5 cases of hemangiopericytoma treated by exclusive endoscopic approach and were followed up for a period of 4.5 years showed a recurrence rate of 20% and concluded that Endoscopic Excision for Hemangiopericytoma is a viable surgical modality which has outcomes compared with that of more morbid external approach procedures.

In a comprehensive study by Lawson et al. various aspects of inverted papilloma management, such as treatment concepts (aggressive vs conservative) and surgical approaches (traditional vs endoscopic) were compared in 160 patients, with an average follow-up period of 5.2 years. This is the largest series of inverted papilloma cases to date. They suggest that conservative approaches, especially endoscopic removal, can be performed on select lesions with a recurrence rate (12%) comparable to those of more aggressive techniques (18%).
Kaza and Casiano reported 51 cases of inverted papilloma removed endoscopically over a 10-year period. They reported seven recurrences (14%), with a mean follow-up of 30 months (range 6 to 99 months). Four of these recurrent cases were managed definitively in the office setting, with just topical anesthesia. The other three cases were managed in the operating room through a more extensive endoscopic approach under general anesthesia. All of these have remained free of disease after further follow-up.

Llorente et al. reported on 27 patients who underwent endoscopic resection of inverted papillomas over a 7-year period, with mean follow-up of 5 years. There were no surgical complications, but 2 patients (7%) had recurrence after 2 years of follow up.

Roger et al. reported on 20 cases with JNA. Their mean follow-up was 22 months. No recurrences occurred in this series, but there were small asymptomatic remnants in two patients.

Matthew and Smith reported a case of septal chondrosarcoma, which was successfully removed endoscopically. They found no clinical evidence of recurrence 27 months after surgery.
Erkan AN, Tarhan E, Yılmazer C, Çağıcı A, Cakmak O in their paper ”Endoscopic removal of sinonasal tumors” comprising of 20 patients who underwent endoscopic tumor resection with diagnosis of sinonasal tumor had one case of recurrence in their follow up period ranging from 6 months to 6 years and concluded that Low recurrence rates in their series showed that endoscopic resection of nasal-paranasal sinus tumors in selected cases, may be an appropriate method of surgical technique.

Taha Z. Shipchandler MD, Pete S. Batra MD, Martin J. Citardi MD, William E Bolger MD, Donald C. Lanza MD, in their study “Outcomes for Endoscopic Resection of Sinonasal Squamous Cell Carcinoma” comprising of eleven patients who underwent endoscopic resection of the tumors demonstrated a recurrence rate of 9% in a follow up period ranging from 6 to 88 months, concluded that Endoscopic resection in combination with multimodality therapy is an effective method for curative resection of sinonasal Squamous Cell Carcinoma
EMBRYOLOGY OF THE NOSE AND PARANASAL SINUSES

The nose and paranasal sinuses development is usually dealt along with development of the face. Between 4th - 8th weeks of intrauterine life, a few undifferentiated swellings at the head end of the fetus grow and remodel to finally form the facial structures. By the end of 4th week five facial swellings appear around the stomodeum or primitive mouth. an unpaired central process called the frontonasal process, two lateral pairs - maxillary and mandibular processes. The ectoderm overlying the forebrain proliferates downwards to form the frontonasal process. On this process, a pair of ectodermal thickening appear in the 5th intrauterine week. These are the nasal placodes, the center of which invaginates in the 6th week to form the nasal pit. On either sides of the nasal pits are the medial and lateral nasal processes.

FIG-1
The paired processes—maxillary and mandibular—are subdivisions of the first pharyngeal arches. Around the 6th and 7th week, the maxillary process increases in size and eventually grows medially. They initially fuse with lateral nasal process and later with the medial nasal process, thus separating the nasal pits from stomatodeum.

The medial nasal processes migrate towards each other and fuse in the midline to form the intermaxillary process. It forms the central bridge of nose and central part of upper lip which is also known as philtrum. Behind this intermaxillary process, the nasal pits coalesce and form a single cavity, which is separated initially from the stomodeum by a thin oronasal membrane. During the 7th week this membrane ruptures to form primitive choana. This connects the primitive nasal cavity to the developing mouth.

The lateral nasal process forms the alae on either sides. It also grows backwards forming the lateral nasal wall on which multiple anteroposterior elevations occur. These finally reduce to three or four and form the turbinates overhanging their corresponding meati.

The nasolacrimal groove or the naso optic groove is formed at the point of fusion of the lateral nasal process with the maxillary processes on either side. By the 7th week, it invaginates into the mesenchyme forming the nasolacrimal duct. The canalization completes after birth.
Thin medial extensions from the medial aspect of the maxillary process form the palatine shelves. These shelves initially grow downwards but later rotate upwards eventually coming to lie in a horizontal position. These fuse in the midline with each other and also anteriorly with the primary palate, thus forming the secondary palate. The developing nasal septum also grown downwards to fuse with this secondary palate, thus dividing the nasal cavity into two separate passages. Behind this is the definitive choana.

<table>
<thead>
<tr>
<th>Processes</th>
<th>Structures formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontonasal</td>
<td>Forehead, bridge of nose, medial and lateral nasal prominences</td>
</tr>
<tr>
<td>Maxillary</td>
<td>Cheeks, lateral portion of upper lip</td>
</tr>
<tr>
<td>Medial nasal</td>
<td>Philtrum of upper lip, crest and tip of nose, septum</td>
</tr>
<tr>
<td>Lateral nasal</td>
<td>Alae of nose, lateral nasal wall</td>
</tr>
<tr>
<td>Mandibular</td>
<td>Lower lip and jaw</td>
</tr>
</tbody>
</table>

FIG-2

FIG-3
In the lateral nasal wall, ridges appear around the 8th week. They all have an anterior ascending and posterior descending rami. These eventually develop into the turbinates.

- Maxilloturbinal (the inferior most) - inferior turbinate
- Nasoturbinal or Superior portion of first ethmoturbinal - Agger nasi cell
- Second ethmoturbinal - Middle turbinate
- Third ethmoturbinal - Superior turbinate

The inferior turbinate develops to form a separate bone whereas the other structures as a part of the ethmoid bone. Between these ridges are the primary furrows, which later deepen to form meatus.
At birth, the cranial vault volume is seven times the facial skeleton volume. But the ratio decreases steadily due to growth of the paranasal sinuses and teeth. The invaginations from the nasal cavity extend into the bones around it, thus forming the paranasal sinuses.

**FIG-5**

**ETHMOIDAL SINUS DEVELOPMENT**

The first sinus to develop is the ethmoid sinus. Bulla around 11 to 12 weeks; anterior ethmoid cells by 14 to 16 weeks; posterior ethmoids by 17 to 18 weeks. The most mature sinus at the time of birth is the ethmoid sinus. The total number of cells are completely developed but their size increases with most rapid increase from 1 to 4 years. They reach their adult dimensions by 12 years of age. The can also expand beyond their boundaries to pneumatise the surrounding structures forming Haller cell; Onodi cell; suprabullar cell; frontal bullar cell etc. The ethmoidal air cells pneumatize into surrounding structures as well –
- Frontal sinus and frontal recess cells- into frontal bone anterosuperiorly
- Supraorbital cell - superiorly
- Haller cell - roof of maxilla/ floor of orbit
- Onodi cell - posteriorly
- Agger nasi - anteriorly

**MAXILLARY SINUS DEVELOPMENT**

Around 17 to 18 weeks, an air space protruding towards the maxilla appears. Grows larger with reabsorption of the cartilagenous capsule during the second and third trimesters. At birth it measure around 3mm height, 4mm wide, 10mm long. At 4 years it expands upto the level of infraorbital nerve laterally. Around 8 years it reaches the middle of inferior turbinate inferiorly. By 12 years laterally it reaches the zygomatic recess, inferiorly floor of nasal cavity and medially upto the nasolacrimal duct. Hypoplasia of the maxilla can occur due to several factors like early childhood trauma, failure of eruption of permanent dentition or cystic fibrosis etc.

**SPHENOID SINUS DEVELOPMENT**

Sphenoid sinus development begins during the third or fourth month of intrauterine life. It starts as an invagination from the nasal cavity posteriorly called the cartilagenous cupolar recess. Initially the pneumatization is from the
posterior ethmoids via the Bone of Bertini. After birth, around 1 year of age, the pneumatization expands into the sphenoid bone. Around 3 months to 5 years sphenoid sinus grows most rapidly. By the age of 12 years it attains its adult dimensions. But it may expand up to the third or fourth decade. The degree of sphenoid pneumatization is described with respect to the sella in the sagittal plane - conchal, presellar and sellar (most common). The greater the pneumatization of the sphenoid sinus the greater the vulnerability of the neurovascular structures during surgery.

**FRONTAL SINUS DEVELOPMENT**

Frontal sinuses are the last to start developing and the last to finish development. There are several hypothesis of the frontal sinus development. One or several frontal furrows or pits from the anterior ethmoidal cells extend into the frontal sinus. There are several variations in the frontal sinus pneumatization and frontal recess orientation with respect to these cells. Usually it isn't visible at birth. Only in 12% it can be visualized at birth. Hence the development is mostly postnatal. Present at the age of 4 - dimensions -11 to 19 mm width, 6 to 9 mm height and 4 to 8 mm in width. Attains tetrahedral shape by 12 years of age. It continues to expand well into early adulthood.
OSTEOLOGY

The lateral nasal wall is formed by 8 bones - maxilla, frontal, ethmoid, sphenoid, inferior turbinate, lacrimal, palatine and the nasal bones.

MAXILLA BONE

The maxillary bone develops from five ossification centers – Alveolar, Zygomatic, palatine, floor of the orbit and frontal process. At adult dimensions the maxillary volume is about 15 square cm. Base forms the lateral wall of the nose which serves as the framework for the same. The medial surface of the maxilla has a large defect which is covered by

- Lacrimal bone anteriorly,
- Uncinate process anteroinferiorly,
- Inferior turbinate inferiorly and
perpendicular plate of palatine bone posteriorly

The region not covered by these areas are covered with a double layer of mucosa forming the fontanels - anterior and posterior fontanels. These may be deficient to form the accessory ostium. The normal ostium lies deep behind the uncinate process junction. There are 2 crests in the medial surface - the ethmoidal crest and the conchal crest. The frontonasal process extends superiorly to articulate with the frontal and the nasal bones. The groove immediately below this process forms the nasolacrimal groove. It is closed by the lacrimal bone. Maxillary tuberosity occurs at the junction of the medial and the posterior walls of maxilla. It is closed by the perpendicular plate of palatine bone thus forming a canal for the greater palatine nerves and vessels. The roof of the maxillary sinus is the orbit including the infraorbital nerve and vessels. The posterolateral wall is related to the pterygopalatine fossa and the infratemporal fossa; the maxillary artery; vidian nerve etc. The anterolateral
wall along with the zygomatic process (apex of maxilla) form the frame work of the cheek. Inferiorly the maxilla is related to the alveolar processes for the teeth.

**ETHMOID BONE**

The ethmoidal bone ossification is from three centers – one for the perpendicular plate and one for each labyrinth. Ethmoid is a single bone with several structures – crista gali, cribiform plate and the Perpendicular plate in the midline, the ethmoidal labyrinth, middle, superior and supreme turbinates, uncinate etc laterally. The cribiform plate is a sieve like structure for the olfactory neurons to pass through. It separates the nasal cavity from the anterior cranial fossa. It has a medial and lateral lamella connected at a junction which is the weakest part of the nasal cavity 0.05mm in diameter. It is also related to the anterior ethmoidal artery. The lateral lamella laterally articulates with the fovea ethmoidalis, the part of frontal bone covering the ethmoid bone. Keros
classified the depth of the olfactory fossa depending on the length of the lateral lamella

FIG-8 SHOWING KEROS CLASSIFICATION

Type 1 - 1 to 3mm

Type 2 - 4 to 7 mm (most common)

Type 3 - 8 to 17 mm

Projecting upward from the middle line of this plate is a thick, smooth, triangular process, the crista gali, so called from its resemblance to a cock’s comb, for the attachment of the falx cerebri. Its two small projecting alae are received into corresponding depressions in the frontal bone and complete the foramen cecum. On either side of the crista gali, it supports the olfactory bulb and is perforated by foramina for the passage of the olfactory nerves. The foramina in the middle of the groove are small and transmit the nerves to the roof of the nasal cavity; those at the medial and lateral parts of the groove are
larger—the former transmit the nerves to the upper part of the nasal septum, the latter those to the superior nasal concha.

The ethmoidal labyrinth is a complex maze like structure with blind ending alleys and interconnected pathways. It consists of both the anterior and posterior ethmoidal air cells. It is actually on all sides but covered by other structures - lamina papyraceae laterally, turbinates especially the middle turbinate medially, fovea ethmoidalis superiorly, anterior wall of sphenoid sinus posteriorly. The lamina papyraceae is a very thin sheet of bone which separates the nasal cavity from the orbit and its contents.

The ethmoid bone can be removed in toto only from infant cadaver and not in adults.

**FRONTAL BONE**

The frontal bone consists of two ossification centers one in each supraciliary ridge. They ossify in membrane. Frontal bone consists of an outer and an inner
table which is separated by the frontal sinus. Posteriorly it is related to the frontal lobe. Inferiorly the roof of the orbit. Inferomedially is the hiatus which is partially covered by the cribriform plate. It is also related to the anterior ethmoidal air cells. Anteromedially the frontal bone extends inferiorly as the frontal spine which articulates with both the nasal bones and the frontal process of maxilla, thus forming a part of the lateral nasal wall.

**SPHENOID BONE**

The presellar portion of the sphenoid bone along with the lesser wings develop from six separate ossification centers The sellar and post sellar part along with the greater wing of sphenoid and pterygoid process ossify from eight centers. The nasal cavity is closed posteriorly by the sphenoid bone thus separating it from anterior and middle cranial fossa. It consists of a body, greater wing, lesser wing and pterygoid plates. The body consists of the two sphenoid sinuses which can be variably pneumatized based on which the dominance of the sphenoid
sinus is determined. A triangular process is present in the midline of the body of the sphenoid called the rostrum of sphenoid (which helps in forming a part of the nasal septum). The body of the sphenoid is related to several important structures. Superiorly the pituitary gland and the optic chiasm. Superolaterally the optic nerve. Laterally the internal carotid arteries and the cavernous sinus. Inferolaterally the vidian nerve. Recess called the carotico-optic recess is found in between the internal carotid artery and the optic nerve which may be deep when the anterior clinoidal process is well pneumatized.

FIG-11

Lateral to the body of the sphenoid, the greater and lesser wings are present. In between these two is a retort shaped opening called the superior orbital fissure which transmits the lacrimal nerve, frontal nerve, trochlear nerve, occulomotor nerve both superior and inferior divisions, nasociliary nerve and abduscens
nerve. Between the two roots of the lesser wing of sphenoid is the optic canal which transmits the optic nerve and the ophthalmic artery.

On either side of the junction of body of sphenoid with the greater wing is the pterygoid process. It splits inferiorly into two forming the medial pterygoid plate and the lateral pterygoid plate. The medial pterygoid plate contributes in forming the lateral wall of the choana. Anterior to the pterygoid process lies the pterygopalatine fossa. The pterygoid process is related to two foramina - the foramen rotundum superolaterally (transmitting the maxillary nerve) and the vidian canal inferomedially (transmitting the vidian nerve).

**INFERIOR TURBINATE**

The inferior turbinate is an independent scroll like bone running anterior to posterior parallel to the floor of the nasal cavity. Superiorly it is attached anteriorly to the maxilla and posteriorly top the palatine bone. It has three processes. Anterosuperiorly the lacrimal process which articulates with the
lacrima1 bone. Just behind that the ethmoidal process which articulates with the uncinate process. Superiorly maxillary process which attaches to the maxillary bone and closes the maxillary hiatus partially.

**LACRIMAL BONE**

![Image](image13.png)

**FIG-13**

The smallest and the most fragile bone in the skull. Forms the postero-medial wall of the lacrimal fossa which contains the lacrimal sac. Articulates with the frontonasal process anteriorly; uncinate process posteriorly; frontal bone superiorly; inferior turbinate inferiorly. It may be pneumatized along the medial wall.
PALATINE BONE

FIG-14

L shaped bone forming the floor of the nasal cavity anteriorly and a part of the lateral nasal wall posteriorly. It is made up of two plates – the horizontal plate and the vertical plate. Horizontal plate forms the floor of the nasal cavity along with the horizontal portion of the maxilla. The posterior border forms the posterior free border of the hard palate. The Perpendicular plate has a medial and lateral surface. The medial surface is related to the nasal cavity. It consists of two crests. The conchal crest – lower – to which the inferior turbinate gets attached. The ethmoidal crest – upper – to which the middle turbinate gets attached. This forms a landmark for sphenopalatine foramen which lies just posteriorly. The lateral surface forms the medial wall for the pterygopalatine fossa superiorly. Inferiorly articulates with the maxillary tuberosity to form a
canal through which the greater palatine nerves and vessels pass through. It also has three processes – two superiorly and one inferiorly. Anterosuperiorly, the orbital process which forms the floor of the orbit and lies just posterior to the inferior orbital fissure. Posterosuperiorly, the sphenoidal process which articulates with the body of sphenoid bone. Between these two processes a deep notch is formed. This is called the sphenopalatine notch. Superiorly it is closed by the body of the sphenoid to form the sphenopalatine foramen. The third inferior process, the pyramidal process, articulates posterolaterally with the notch in between the two pterygoid plates. It lies at the junction of the horizontal plate with the perpendicular plate.

**NASAL BONES**

These are two rectangular bones forming the bridge of the nose. In different individuals their size varies. They have four borders and two surfaces. Frontal
bone articulates with the superior border. Upper lateral cartilage is related to the inferior border. Frontonasal process articulates with the lateral border. The medial border of the nasal bones on either side unite to form a vertical crest. It also contributes to a part of the nasal septum. The nasalis and procerus muscles cover the external convex surface. The concave internal surface has a groove for the anterior ethmoidal artery.

ANATOMY OF THE NOSE AND PARANASAL SINUSES

EXTERNAL NOSE

The external nose is made up of root, bridge, dorsum, supratip, tip, alae and columella. There are a few muscles only of almost vestigial importance. These are procerus, corrugator, levator labii superioris, nasalis and depressor nasi. They are all supplied by the facial nerve. The pyriform aperture is bounded superiorly by the nasal bones and infero-laterally by the maxilla. The external lateral nose also consists of two cartilages – the upper lateral cartilage and lower lateral cartilage. These are hyaline cartilages. Hence may get ossified. There is a groove between the upper lateral cartilages and lower lateral cartilages called the limen nasi where the intercartilagenous incisions are made. The lower lateral cartilages have a medial crura and a lateral crura connected at the tip. Facial artery branches; ophthalmic artery – dorsal branch; maxillary artery – infraorbital branch supply the external nose. The supraorbital and supratrochlear venous branches join together to form the angular vein which later forms the
facial vein. Nerve supply is by the infratrochlear branch of the ophthalmic nerve and the infraorbital branch of the maxillary nerve. Lymphatics drain to the submental and submandibular lymph nodes.

**NASAL SEPTUM**

Nasal septum consists of three parts – membranous part; cartilagenous part and bony part. Quadrangular cartilage forms the cartilagenous part. It is 3-4mm thick in the centre but increases anteroinferiorly. The bony part is formed by contributions from several bones. The major portion – perpendicular plate of ethmoid anterosuperiorly and vomer posteroinferiorly. The minor portions are formed from contributions of crest of maxilla, crest of palatine bone, rostrum of sphenoid, anterior nasal spine of frontal bone, anterior nasal spine of maxilla and nasal bones. Both external and internal carotid arteries supply the nose. Sphenopalatine and greater palatine arteries - branches of maxillary artery;
superior labial artery a branch of facial artery are all from the external carotid. Anterior and posterior ethmoidal arteries are branches of the internal carotid arteries. These form Kiesselbachs plexus at the Littles area which is a common source of epistaxis. Nerve supply is from trigeminal nerve maxillary division; nasopalatine nerve; Anterior and posterior superior alveolar nerves. Olfactory nerves are present in the superior portion of the septum and lateral wall. The lymphatic drainage is to the submandibular glands.

LATERAL NASAL WALL

INFERIOR MEATUS

The inferior meatus is the largest meatus which extends almost entire length of nasal cavity. It lies inferior to the inferior turbinate in the lateral wall. The highest point is at the anterior and middle third junction (around 2cm). Just anterior to this point the nasolacrimal duct opens. Its opening is covered by Hasners valva which isn’t a true valve but small folds of mucosa forming valve like structure.

INFERIOR TURBINATE

Unlike the other turbinates, the inferior turbinate is a separate bone. Articulates with lacrimal, ethmoid and palatine bones covering the nasolacrimal duct completely. It has a submucosal cavernous plexus with large sinusoids which
are under autonomic control. These contribute to nasal resistance. It is lined by respiratory epithelium with large number of goblet cells.

**MIDDLE MEATUS**

The part of the lateral nasal wall which lies lateral to the middle turbinate is the middle meatus. The frontal sinus, anterior ethmoidal sinus and the maxillary sinus drains into the middle meatus. The hiatus semilunaris is a 2 dimensional pathway which leads into the 3 dimensional structure the ethmoidal infundibulum. Its boundaries are maxillary process of inferior turbinate inferiorly; perpendicular plate of the palatine bone posteriorly; lacrimal bone and uncinate process anteriorly; bulla ethmoidalis superiorly.

**FIG-17**

The bulla ethmoidalis, uncinate process along with the infundibulum with the sinuses draining into it form the osteomeatal complex.
The uncinate process is a boomerang shaped structure. It consists of a vertical and horizontal limb with an intermediate connecting part. Inferiorly the uncinate is attached to the inferior turbinate. Anteriorly it is attached to the lacrimal bone. Posterosuperior border is free. Superiorly the attachment of the uncinate process may vary. It may be attached to the lamina papyraceae laterally (80%) or the skull base superiorly or the middle turbinate medially. The attachment of the uncinate process superiorly determines the drainage of the frontal sinus.

The frontal recess is a funnel/hour-glass shaped drainage pathway for the frontal sinus. It is situated at the floor of the frontal sinus. It is bound anteriorly by the posterior wall of the agger nasi posteriorly by the anterior wall of the bulla ethmoidalis medially by the middle turbinate laterally by the lamina papyraceae. When the uncinate process is attached to the lamina papyraceae laterally, the frontal sinus drains medial to it. When the uncinate is attached to the skull base or the middle turbinate the frontal recess opens medial to it.
MIDDLE TURBINATE

The middle turbinate is not a straight structure but is convoluted and lies in three different planes. Initially, the middle turbinate lies in the sagittal plane being attached to the skull base – cribriform plate at the junction of both the lamellae. The middle part of the middle turbinate lies in the coronal plane being attached laterally to the lateral wall of the nose – lamina papyraceae. It is also called the basal lamella or the ground lamella. It separates the anterior from the posterior ethmoidal air cells. The posterior one third of the middle turbinate lies in the horizontal plane attaching laterally to the perpendicular plate of the palatine bone and the lamina papyraceae.
SUPERIOR MEATUS

The superior meatus lies lateral to the superior turbinate. The posterior ethmoidal complex drains into the superior turbinate. The sphenoid sinus opens into the sphenoethmoidal recess medial to the superior turbinate.

PTERYGOPALATINE FOSSA

Boundaries

- Anterior: superomedial part of the infratemporal surface of maxilla
- Posterior: root of the pterygoid process and adjoining anterior surface of the greater wing of sphenoid bone
• Medial: perpendicular plate of the palatine bone and its orbital and sphenoidal processes

• Lateral: pterygomaxillary fissure

<table>
<thead>
<tr>
<th>Direction</th>
<th>Passage</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posteriorly</td>
<td>foramen rotundum</td>
<td>middle cranial fossa</td>
</tr>
<tr>
<td></td>
<td>pterygoid canal (Vidian)</td>
<td>middle cranial fossa, foramen lacerum</td>
</tr>
<tr>
<td></td>
<td>palatovaginal canal (pharyngeal)</td>
<td>nasal cavity/nasopharynx</td>
</tr>
<tr>
<td>Anteriorly</td>
<td>inferior orbital fissure</td>
<td>orbit</td>
</tr>
<tr>
<td>Medially</td>
<td>sphenopalatine foramen</td>
<td>nasal cavity</td>
</tr>
<tr>
<td>Laterally</td>
<td>pterygomaxillary fissure</td>
<td>infratemporal fossa</td>
</tr>
<tr>
<td>Inferiorly</td>
<td>greater palatine canal (pterygopalatine)</td>
<td>oral cavity, lesser palatine canals</td>
</tr>
</tbody>
</table>

• Inferior: pyramidal process of the palatine bone.

Contents

• Maxillary nerve and its branches

• Maxillary artery and its branches

• Pterygopalatine ganglion

• Lymph node

• Fat
The infratemporal fossa is a wedge shaped cavity located deep to the zygomatic arch and masseter muscle.

**Boundaries**

- **Anteriorly** - Infratemporal surface of the maxilla
• Posteriorly - Carotid space

• Superiorly - Greater wing of the sphenoid and by the under surface of the squamous part of temporal bone, containing the foramen ovale and the foramen spinosum

• Inferiorly - Medial pterygoid muscle attaching to the mandible

• Medially - Lateral pterygoid plate

• Laterally - Ramus of mandible laterally

FIG-22

Contents

• Muscles – Lower part of temporalis; masseter; medial and lateral pterygoid muscles

• Vessels – Internal maxillary vessels originating from the external carotid and its branches including middle meningeal artery; inferior alveolar
artery; deep temporal artery and buccal artery. Pterygoid venous plexus and retromandibular vein

- Nerves - Mandibular nerve, inferior alveolar nerve, lingual nerve, buccal nerve, chorda tympani nerve, and otic ganglion

**Communication to nearby spaces**

- Cranial cavity (through foramen ovale and spinosum).
- Temporal fossa (deep to zygomatic arch).
- Pterygopalatine fossa (through pterygomaxillary fissure).
- Orbit (through inferior orbital fissure).
- Parapharyngeal space.
BLOOD SUPPLY OF THE NOSE

<table>
<thead>
<tr>
<th>Sr no.</th>
<th>Artery</th>
<th>Branch of Artery</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anterior ethmoid</td>
<td>Ophthalmic artery (ICA)</td>
<td>Ethmoid and Frontal sinuses, roof of the nose, upper part of lateral wall and septum</td>
</tr>
<tr>
<td>2.</td>
<td>Posterior ethmoid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Sphenopalatine</td>
<td>Maxillary artery (ECA)</td>
<td>Supplies the mucous membrane, superior and middle meatus, conchae and septum</td>
</tr>
</tbody>
</table>
| 4.     | Greater palatine   | Maxillary artery (ECA) | • Posterior part of the lateral nasal wall as it descends in the greater palatine canal  
             |                    | • Anterior inferior end of septum as it re-enters the nose through the incisive canal |
| 5.     | Superior labial    | Facial artery (ECA) | Region of the vestibule of the nose                                     |
| 6.     | Infraorbital       | Maxillary artery (ECA) | Mucous membrane of the maxillary sinus                                  |
| 7.     | Posterior superior alveolar | Maxillary artery (ECA) | Mucous membrane of the maxillary sinus                                  |
| 8.     | Anterior superior alveolar | Maxillary artery (ECA) | Mucous membrane of the maxillary sinus                                  |
| 9.     | Pharyngeal branch  | Maxillary artery (ECA) | Sphenoid sinus                                                          |
| 10.    | Twigs from the internal carotid artery | — | Sphenoid sinus                                                          |
ANTERIOR ETHMOIDAL ARTERY

During its course, the anterior ethmoidal artery crosses three cavities (the orbit, ethmoidal labyrinth and anterior cranial fossa of skull. It is a branch of the ophthalmic artery, given off in the orbit and enters the nasal cavity through the anterior ethmoidal foramen present at the frontoethmoidal suture line. It passes within a bony mesentry (orbitocranial canal) along the roof of nasal cavity connecting the anterior ethmoidal artery to the skull base with a space of about 5 mm between the two. In CT scan, the exit of the artery from the orbit is evident as the Kennedy’s nipple, a bony projection at the junction of medial rectus and superior oblique muscle. It enters the olfactory fossa through the lateral lamella of cribriform plate and runs forward in a groove called the ethmoidal sulcus, giving off the anterior meningeal artery. It again enters the nasal cavity through the cribroethmoidal foramen and the lamina cribrosa.

The relationship of the anterior ethmoidal artery to the roof of the ethmoid is highly variable and is at risk during endoscopic sinus surgeries. Identification of this artery is important in identifying frontal sinus outflow tract and superior limits of skull base and in avoiding the risk of bleeding and orbital hematoma.
**POSTERIOR ETHMOIDAL ARTERY**

The posterior ethmoid artery is a branch of the ophthalmic artery in the orbit and it passes between the frontal bone and the lamina papyracea through the fissure to enter the nasal cavity 6 mm in front of the optic foramen. It lies high in the roof of the ethmoid and is usually not easily seen. Later it passes anteromedially at the level of the cribiform plate enter into the cranial cavity traversing the cribiform plate anteriorly for a short distance and re-enters the nasal cavity and supply the upper and posterior part of the nasal septum.

**SPHENOPALATINE ARTERY**

The sphenopalatine artery is one of the terminal branches of the maxillary artery in the pterygopalatine fossa. It enters the nasal cavity passing medially through the sphenopalatine foramen entering above the posterior end of the middle turbinate. It supplies the nasal conchae and meatii via its lateral nasal branches. Its medial branch crosses sphenoid anteriorly to supply the septum. Keisselbach’s plexus in the Little’s area is formed by the branches of sphenopalatine artery, greater palatine artery, anterior ethmoidal artery and superior labial branch of the facial artery. This is responsible for anterior epistaxis.
NERVE SUPPLY OF THE NOSE
The septum and lateral nasal wall is lined predominantly by respiratory epithelium with a small portion of olfactory epithelium next to the cribriform plate. The respiratory epithelium comprises of both non ciliated and ciliated pseudostratified columnar cells, basal pleuripotent cells and goblet cells. Each cell has 300-400 cilia. In the submucosa seromucinous glands are present. These are more important in the production of mucus as they are more abundant in number in the septum compared to the goblet cells which are in high concentration in the sinuses. With a sharp demarcation the respiratory epithelium is defined from the olfactory epithelium. The olfactory epithelium lies in the upper part of the septum and lateral nasal wall next to the cribriform plate. It comprises of receptor cells, supporting cells with their microvilli and
basal stem cells. The sensory endings end in a characteristic knob like vesicle from which the olfactory fibers unite with the axonal bundle. Bowman's gland provide secretions for the olfactory epithelium.

There are areas of squamous metaplasia in the lateral nasal wall corresponding to the areas of maximal exposure to airflow.
MATERIALS AND METHODOLOGY

MATERIALS

Study place : Rajiv Gandhi Government General Hospital, Chennai-600003

Collaborating Department : Upgraded Institute of OtoRhinolaryngology

Study Design : Prospective and Retrospective

Study Period : August 2015 to August 2017

Ethical Committee Clearance : Obtained
INCLUSION CRITERIA:

1. Age between 10 and 70yrs

2. Both sexes (male and female)

3. Histopathologically proven benign or malignant sinonasal tumors.

EXCLUSION CRITERIA:

1. Age below 10yrs and above 70yrs

2. Patients with co morbid illness who cannot undergo surgery.

INVESTIGATION:

1. CT scan of the paranasal sinuses

2. MRI of the paranasal sinuses

3. Diagnostic Nasal Endoscopy

4. Biopsy
DATA COLLECTION : Clinical

BENEFIT TO THE COMMUNITY :

- Awareness of various treatment modalities
- Reduction in morbidity of surgical intervention
- Reduction in required hospital stay.

ONFLICT OF INTEREST : NIL

FINANCIAL SUPPORT : NIL

PRINCIPAL INVESTIGATOR : Dr. B. Vivek MS ENT Post Graduate
METHODOLOGY

The study was conducted in Rajiv Gandhi Government General Hospital and Madras Medical College in the Upgraded Institute Of Otorhinolaryngology.

The study group comprises of patients who presented to us with a sinonasal mass lesion. Detailed history and clinical examination as per the proforma were performed.

Each patient was subjected to Diagnostic nasal endoscopy, Biopsy, Computed Tomography and Magnetic Resonance Imaging of the para nasal Sinuses. All the patients of benign and malignant sinonasal tumors underwent surgical excision or debulking after obtaining anesthetic clearance for surgery. The patients were followed up for a period ranging from 3 months to 24 months.

BENIGN TUMORS:

Patients in this study group consisted of benign sinonasal tumors. A total of 24 patients had presented to us with benign sinonasal tumors. There were a total of 14 patients who had presented with Inverted papilloma, 12 patients with Juvenile Nasopharyngeal Angiofibroma, and 2 patients with capillary hemangioma. All the patients with Inverted papilloma were staged according to Krause Staging and all patients with Juvenile Nasopharyngeal Angiofibroma were staged by Radkowski's Staging. All the 24 patients underwent excision of the tumor by transnasal endoscopic method. All these patients were watched for
any intra operative complications like CSF leak etc,. These patients were followed up after surgery for a period ranging from 3 months to 24 months and watched for residual or recurrence of the tumor.

**MALIGNANT TUMORS:**

Patients in this study group consisted of those who presented with malignant sinonasal tumors. There were a total of 11 patients who had presented with malignant sinonasal tumors. Of which 3 patients had squamous cell carcinoma (2 in the maxillary sinus and one in frontal sinus), 3 patients had ethesioneuroblastoma, 2 patients had Sinonasal Undifferentiated carcinoma, one patient had nasal chondrosarcoma, one patient had hemangiopericytoma and one patient presented with adenoid cystic carcinoma. All these patients had been staged by TNM staging (Esthesioneuroblastoma alone was staged by Kadish staging). All the patients underwent endoscopic debulking or excision of the tumors by transnasal route. One patient with hemangiopericytoma developed intra operative CSF leak during endoscopic excision. The leak was managed by endoscopic CSF leak repair using 5 layered closure. Of the Squamous cell carcinoma patients 2 patients underwent adjuvant treatment with post operative chemotherapy and Radiotherapy and the other squamous cell carcinoma patient underwent post operative radiotherapy for palliation. Patients with esthesioneuroblastoma, sinonasal undifferentiated carcinoma and also adenoid cystic carcinoma also underwent adjuvant treatment with post operative
chemotherapy and radiotherapy. All the 11 patients were followed up for a period ranging from 3 months to 24 months and observed for recurrence of the disease. All patients were followed by nasal endoscopic examination weekly for the 1st one month, then every month for the next 3 months and then 3 monthly there after. Radiological evaluation was also done during the follow up period either with a CT scan of the paranasal sinuses or Magnetic Resonance Imaging of the paranasal sinuses after 6 months.

CASE STUDY 1:

A 20 years male presented to our OPD with complaints of right sided nasal obstruction for 3 months duration, insidious in onset, gradual and progressive in nature. Complaints of protrusion of the right eye for 2 months. History of diplopia of right eye for 2 months. Bleeding from right nostril on and off for 2 months. History of right sided frontal headache present. History of decreased sense of smell on the right side. History of hyponasal voice present. The physical examination revealed a reddish polypoidal mass occupying the right nasal cavity which bleeds on touch. Right eye proptosis was present. The globe was pushed upwards and outwards. Extra ocular movements were normal. MRI of the paranasal sinuses done which showed a 4.8x3.5x4.4 cm heterogeneously enhancing mass epicentering in the right nasal cavity and ethmoid sinuses causing erosion of the nasal turbinates, medial maxillary wall, medial orbital wall and extending into the maxillary sinus and medial extraconal space of the
orbit. The lesion closely abuts the medial rectus muscle and retrobulbar optic nerve. Post obstructive sinusitis seen in the right maxilla and frontal sinuses. Contrast enhanced MRA doesn’t reveal any prominent arterial feeders or enlarged draining veins. HPE report came as esthesioneuroblastoma

Pre op MRI of the Patient.

After anaesthetic work up patient was planned for endoscopic excision of the tumor. Under GA with patient in supine position with head end elevation 15 degrees using 0 degree Hopkin’s rod endoscope right nasal cavity mass visualised. The mass was seen occupying the right nasal cavity, middle meatus, maxillary antrum, anterior and posterior ethmoids and extending to the medial wall of the orbit. Surgical excision of the mass done. Minimum irregular tissue near the optic nerve not removed. Mass sent for HPE and immunohistochemistry
Figure-25 showing Intra op pictures of the same.

FIG-26  A  B

Figures showing Histopathological Picture(A) and Immunohistochemistry(B).
Post op adjuvant chemo radiotherapy was given. And patient was followed for 2 years. Post op Nasal endoscopic examination was done regulary and post operative magnetic resonance imaging taken at 1 year follow up. Follow up examinations showed no recurrence of the tumor. The patient is disease free now.

FIG-27 SHOWING POST OP DNE

Figure showing post operative nasal endoscopic examination at 2 years. There was no recurrence of disease.
FIG-28 showing Post operative MRI of the patient after 1 year showing no evidence of recurrence of tumor.

CASE STUDY 2:

A 55 years old male presented to our OPD with complaints of left sided nasal obstruction for 3 months duration, insidious in onset, gradual and progressive in nature. Complaints of watery nasal discharge from the left nasal cavity for 3 months. History of epistaxis from the left nostril for 3 months. History of decreased sense of smell on the left side. History of hyponasal voice. The physical examination revealed a pale granular mass occupying the left nasal cavity obscuring the view of inferior turbinate which bleeds on touch. Extra
ocular movements were normal. Diagnostic nasal endoscopy done and biopsy taken from the mass. CECT showed an intensely enhancing mass lesion with epicentre in the ethmoid sinus of the left side approximately measuring 3.9x 4.2 cm. The lesion is causing erosion of the adjacent bones with extension into the orbit, anterior aspect of sphenoid sinus and left maxillary sinus. Inferiorly the lesion is extending into the nasal cavity. There is destruction of intervening bones noted.

![Figure-29 showing pre op CT of the patient.](image)

After anaesthetic work up patient was planned for endoscopic excision of the tumor. Under GA with patient in supine position with head end elevation 15 degrees using 0 degree Hopkin’s rod endoscope left nasal cavity mass visualised. The mass was seen occupying the left nasal cavity, middle meatus, maxillary antrum, anterior and posterior ethmoids and sphenoid sinus. Using Blakesly forceps mass removed in pieces. The inferior and middle turbinates were found to be destroyed and were removed. The posterior half of the septum
was found to be destroyed and was removed. Using RF cautery bleeding points cauterised and complete hemostasis secured. Nasal cavity pack was kept. Mass sent for HPE and immunohistochemistry. Patient was given IV antibiotics, fluids and analgesics. Post op period uneventful.

Figure-30 showing intra op pictures.
The patient underwent adjuvant treatment with post operative chemotherapy and radiotherapy. The patient was followed regularly by nasal endoscopic examination and CT scan of the para nasal sinuses. After 18 months of follow up patient showed no evidence of recurrence.
Fig-33 showing Post op CT scan of the patient after 1 year showing no evidence of recurrence.

**CASE STUDY 3:**

A 13 Year old Patient presented with complaints of bleeding from nose one episode which occurred spontaneously and stopped by itself, moderate amount, not associated with trauma. History of progressive nasal obstruction, hyponasal voice, snoring was present for 4 months. There were no other symptoms. Patient was evaluated at Thiruvanamalai GH for the above aid complaints and a DNE was done. A provisional diagnosis of juvenile nasopharyngeal angiofibroma was made and the patient was referred to higher centre for further management.
On examination anterior rhinoscopy revealed a smooth pinkish globular mass seen medial to the middle turbinate.

Posterior rhinoscopy revealed a smooth pinkish globular mass seen occupying the entire nasopharynx. Posterior end of septum, Eustachian tube orifices could not be visualised.

CT angiogram of the patient showed a 4.2x 2.3x 2.2 cm well defined soft tissue density polypoidal lesion in posterior aspect of left nasal cavity in the region of right sphenopalatine foramen without erosion of adjacent bones.
After obtaining anesthetic fitness patient was taken up for endoscopic excision of the tumor under GA.

![FIG-35 Showing intra op pics](image)

Post operative period was uneventful. Patient was followed for a period of 18 months by routine nasal endoscopic examination. After 18 months of follow up patient showed no evidence of recurrence.
Figure-36 showing post op nasal endoscopic examination at 18 months showing no evidence of recurrence tumor.
RESULTS AND ANALYSIS

AGE WISE DISTRIBUTION

<table>
<thead>
<tr>
<th>AGE (IN YEARS)</th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 TO 20</td>
<td>11</td>
<td>31%</td>
</tr>
<tr>
<td>21 TO 30</td>
<td>4</td>
<td>11%</td>
</tr>
<tr>
<td>31 TO 40</td>
<td>5</td>
<td>14%</td>
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<tr>
<td>41 TO 50</td>
<td>5</td>
<td>14%</td>
</tr>
<tr>
<td>51 TO 60</td>
<td>8</td>
<td>23%</td>
</tr>
<tr>
<td>61 TO 70</td>
<td>2</td>
<td>7%</td>
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</tbody>
</table>

35

The most common age group affected in this study was 10 to 20 years age group including both benign and malignant sinonasal tumors combined.
AGE WISE DISTRIBUTION IN BENIGN TUMOR PATIENTS

<table>
<thead>
<tr>
<th>AGE</th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20 YEARS</td>
<td>9</td>
<td>38%</td>
</tr>
<tr>
<td>21-30 YEARS</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>31-40 YEARS</td>
<td>4</td>
<td>17%</td>
</tr>
<tr>
<td>41-50 YEARS</td>
<td>4</td>
<td>17%</td>
</tr>
<tr>
<td>51-60 YEARS</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>61-70 YEARS</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td></td>
</tr>
</tbody>
</table>

The most common age group affected in benign tumors was 10 to 20 years.
<table>
<thead>
<tr>
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<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20 YEARS</td>
<td>2</td>
<td>18%</td>
</tr>
<tr>
<td>21-30 YEARS</td>
<td>1</td>
<td>9%</td>
</tr>
<tr>
<td>31-40 YEARS</td>
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<tr>
<td>41-50 YEARS</td>
<td>2</td>
<td>18%</td>
</tr>
<tr>
<td>51-60 YEARS</td>
<td>4</td>
<td>36%</td>
</tr>
<tr>
<td>61-70 YEARS</td>
<td>1</td>
<td>9%</td>
</tr>
</tbody>
</table>

The most common age group affected in malignant tumors was 51 to 60 years.
SEX DISTRIBUTION

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<th>SEX</th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
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<td>MALE</td>
<td>25</td>
<td>71%</td>
</tr>
<tr>
<td>FEMALE</td>
<td>10</td>
<td>29%</td>
</tr>
</tbody>
</table>

Males were more commonly affected including both benign and malignant tumor combined contributing to 71%.
SEX DISTRIBUTION IN BENIGN TUMOR PATIENTS

<table>
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<th>SEX</th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
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<tbody>
<tr>
<td>MALE</td>
<td>20</td>
<td>83%</td>
</tr>
<tr>
<td>FEMALE</td>
<td>4</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>100%</td>
</tr>
</tbody>
</table>

In the benign tumor patients males were more commonly affected contributing to around 83% of the patients.
SEX DISTRIBUTION IN MALIGNANT TUMOR PATIENTS

<table>
<thead>
<tr>
<th>SEX</th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MALE</td>
<td>5</td>
<td>45%</td>
</tr>
<tr>
<td>FEMALE</td>
<td>6</td>
<td>55%</td>
</tr>
</tbody>
</table>

In our study malignant tumors of the nose and para nasal sinuses occurred more commonly in females accounting to around 55% of patients.
NUMBER OF BENIGN AND MALIGNANT TUMORS

<table>
<thead>
<tr>
<th></th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BENIGN</td>
<td>24</td>
<td>69%</td>
</tr>
<tr>
<td>MALIGNANT</td>
<td>11</td>
<td>31%</td>
</tr>
</tbody>
</table>

There were a total of 24 cases of benign sinonasal tumors contributing to 69% of cases and 11 malignant tumors contributing to 31% of cases.
MODES OF PRESENTATION

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal Obstruction</td>
<td>32</td>
<td>91%</td>
</tr>
<tr>
<td>Nasal Discharge</td>
<td>8</td>
<td>29%</td>
</tr>
<tr>
<td>Epistaxis</td>
<td>19</td>
<td>54%</td>
</tr>
<tr>
<td>Hyposmia</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>Watering of Eye</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Blurring of Vision</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Headache</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Diplopia</td>
<td>3</td>
<td>9%</td>
</tr>
</tbody>
</table>

The most common presenting symptom was nasal obstruction occurring almost in 91% of patients followed next by epistaxis which accounted for 54%. Hyposmia occurred in 25% of patients, watering of eyes, blurring of vision and headache occurred in 3% of patients and diplopia in 9% of patients.
# BENIGN TUMORS

<table>
<thead>
<tr>
<th></th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVERTED PAPILLOMA</td>
<td>12</td>
<td>50%</td>
</tr>
<tr>
<td>JUVENILE NASOPHARYNGEAL ANGIOFIBROMA</td>
<td>10</td>
<td>42%</td>
</tr>
<tr>
<td>CAPILLARY HEMANGIOMA</td>
<td>2</td>
<td>8%</td>
</tr>
</tbody>
</table>

Of all the benign tumors inverted papiloma was more common accounting for almost 50% of cases followed next by juvenile nasopharyngeal angiofibroma contributing to 42% of cases and capillary hemangioma which occurred in 8%.
**MALIGNANT TUMORS**

<table>
<thead>
<tr>
<th></th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCC</td>
<td>3</td>
<td>27%</td>
</tr>
<tr>
<td>ESTHESIONEUROBLASTOMA</td>
<td>3</td>
<td>27%</td>
</tr>
<tr>
<td>ADENOID CYSTIC CA</td>
<td>1</td>
<td>9%</td>
</tr>
<tr>
<td>HEMANGIOPERICYTOMA</td>
<td>1</td>
<td>9%</td>
</tr>
<tr>
<td>CHONDROSARCOMA</td>
<td>1</td>
<td>9%</td>
</tr>
<tr>
<td>SNUC</td>
<td>2</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Of all the malignant tumors squamous cell carcinoma and sthesioneuroblastoma occurred more commonly contributing to 27% cases respectively. Sinonasal undifferentiated carcinoma occurred in 18% and adenoid cystic carcinoma, hemangiopericytoma and chondrosarcoma occurred in 9% respectively.
Of all the patients who underwent endoscopic excision of the tumor, only one patient with hemangiopericytoma developed intra operative CSF leak (3%) and endoscopic CSF leak repair was done on table. There were no other complications in any patients.
CORELATION BETWEEN RADIOLOGICAL TUMOR EXTENT AND INTRA OP ENDOSCOPIC FINDING

<table>
<thead>
<tr>
<th></th>
<th>NUMBER OF PATIENTS</th>
<th>PERCENTAGE</th>
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</thead>
<tbody>
<tr>
<td>SIMILAR</td>
<td>29</td>
<td>83%</td>
</tr>
<tr>
<td>NOT SIMILAR</td>
<td>6</td>
<td>17%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>35</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

All the patients underwent pre operative radiological investigation either computed tomography or magnetic resonance imaging, in 6 patients the radiological tumor extent and the extent visualised during surgery using endoscope did not correlate. In those 6 patients the radiological imaging had upstaged the tumor which was not so when visualised during surgery.
RECURRENT IN BENIGN TUMORS

<table>
<thead>
<tr>
<th>Tumor</th>
<th>Number of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverted Papilloma</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>JNA</td>
<td>NIL</td>
<td>0%</td>
</tr>
<tr>
<td>Capillary Hemangioma</td>
<td>NIL</td>
<td>0%</td>
</tr>
</tbody>
</table>

The recurrence rate in those patients with benign tumors who underwent endoscopic excision was 4%, seen only in one patient who had recurrence of inverted papilloma. He was managed by endoscopic excision of the recurrent lesion again.
The recurrence rate in those patients with malignant tumors who underwent endoscopic excision was 9%, seen only in one patient who had squamous cell carcinoma of the maxilla. The patient had recurrence within 3 months of the endoscopic excision and was managed with palliative chemoradiotherapy.
The overall survival rate for all the patients with malignant tumors who underwent endoscopic excision was 100% and disease free survival rate was 91%, as one patient of squamous cell carcinoma who had recurrence is living with disease.
OBSERVATION AND DISCUSSION

There were a total of 35 patients who were included in this study. Out of the 35 patients, 24 had benign sinonasal tumors and 11 presented with malignant sinonasal tumors. Of the 24 benign tumors, 12 patients had inverted papilloma, 10 patients had juvenile nasopharyngeal angiofibroma as 2 patients had capillary hemangioma. Of the 12 inverted papilloma patients, 5 patients had Krause stage II tumors, 3 had Krause stage 1 tumor, 3 had Krause stage III tumor and one patient had Krause stage IV tumor. Of the 12 inverted papilloma patients one patient had recurrence within 3 months if the first surgery. He underwent endoscopic excision of the same lesion again and is currently on follow up. There was no evidence of recurrence of tumor further. One patient of the 12 inverted papilloma had malignant transformation to squamous cell carcinoma and is currently on palliative chemotherapy and radiotherapy and is currently living with disease. One patient died of a cause unrelated to the disease. The remaining patients are under regular follow up and showed no evidence of any recurrence. Of the 10 juvenile nasopharyngeal angiofibroma patients 5 patients had presented with Radkowski stage IIb tumor,2 patients with stage IIIA, one patient with IIIb,one of with Ia,and one patient with Ib. All patients are under regular follow up and showed no evidence of any recurrence of tumor.2 patients had presented with capillary hemangioma and underwent endoscopic excision and are under regular follow up and showed no evidence of recurrence of tumor.
Of the 11 malignant tumors 3 patients had presented with squamous cell carcinoma, 3 patients had esthesioneuroblastoma, 2 patients had sinonasal undifferentiated carcinoma, one patient had hemangiopericytoma, one patient had nasal chondrosarcoma, one patient had adenoid cystic carcinoma. All the patients underwent endoscopic excision of the tumors. In the 3 squamous cell carcinoma patients one patient developed recurrence within 3 months of surgery and underwent palliative chemotherapy and radiotherapy for the same and is currently living with disease. The remaining patients except those with nasal chondrosarcoma and hemangiopericytoma, all underwent adjuvant treatment with post operative chemotherapy and radiotherapy. All patients were followed up regularly and showed no evidence of recurrence of the tumor and are disease free.

David M. Poetker, M.D., Robert J. Toohill, M.D., Todd A. Loehrl, M.D., and Timothy L. Smith In their study of Endoscopic Management of Sinonasal Tumors: A Preliminary Report, comprising of forty patients demonstrated a recurrence rate of 4.2% (1 patient) in benign tumors who underwent endoscopic excision and 31.3% for malignant tumors who underwent endoscopic excision. The mean follow up period for benign tumors were 17.5 months and for malignant tumors it was 50 months. The recurrence in benign tumor was in inverted papilloma. There were five recurrences in malignant tumor patients, 3 with squamous cell carcinoma and 2 with esthesioneuroblastoma. Of the
recurrences in malignant tumors T1 tumors had one recurrence, T2 tumors had 3 recurrences and T4 tumors had 1 recurrence. The disease free survival rate in malignant tumor patients who underwent endoscopic excision in their study was 87.5%. In our study the recurrence rate for patients with benign tumors who underwent endoscopic excision was 4.06% (one case of inverted papilloma) and for patients with malignant tumors who underwent endoscopic excision, the recurrence rate was 9%. There was one recurrence in squamous cell carcinoma T4 tumor. The disease free survival rate for the malignant tumor patients was 91%. In our study the follow up period ranged from 3 to 24 months with a mean follow up period of 13 months.

Scott D. London, M.D., Rodney J. Schlosser, M.D., and Charles W. Gross, M.D. From the Department of Otolaryngology, Head and Neck Surgery University of Virginia Health Sciences Center, Charlottesville, Virginia in their paper “Endoscopic Management of Benign Sinonasal Tumors” comprising of thirty eight patients with benign sinonasal tumors were managed with endoscopic techniques reported a recurrence rate of 16.7%(3 cases) of the recurrences 2 cases were of ossifying fibroma and one case of fibrous dysplasia. The mean follow up period was 24 months. The average time of recurrence was 5.5 months. In our study comprising of 24 benign tumors patients who underwent endoscopic excision of the tumors, the recurrence rate for benign tumors after endoscopic excision was 4.02%(one patient of inverted papilloma,
recurrence after 3 months) after a mean follow up period of 13 months. Though the mean follow up period is shorter, the early results are promising.

Tomasz Gotlib, Ewa Osuch-Wójeikiewicz, Marta Held-Ziółkowska, Magdalena Kuźmińska, Kazimierz Niemczyk, Department of Otolaryngology, Medical University of Warsaw, Poland in their paper “Endoscopic transnasal management of sinonasal malignancies” comprising of eleven patients, malignant melanoma in 3 patients, squamous cell carcinoma in 2, adenocarcinoma in 2, poorly differentiated carcinoma in 1, hemangiopericytoma in 1, adenoid cystic carcinoma in 1, and low grade fibrosarcoma in 1, who underwent endoscopic transnasal surgical excision of the tumors, reported a recurrence rate of 8% (one patient) over a mean follow up period of 13.5 months, the recurrence being that of hemangiopericytoma. In our study comprising of 11 patients with malignant sinonasal tumors, who underwent endoscopic excision, the mean follow up period of 13 months the recurrence rate was 9%. The disease free survival rate in their study was 92% whereas the disease free survival rate in our study was 91%. Thus our study proves that outcomes following transanasal endoscopic excision of malignant sinonasal tumors are comparable to that of other external approach procedures.

Peter John Wormald, MD; Eng Ooi, MBBS; C. Andrew van Hasselt, FCS (SA); Salil Nair, FRCS, From the Department of Surgery (P.J.W., E.O., S.N.), Adelaide and Flinders Universities, South Australia, Australia; and the
Department of Surgery (C.A.V.H.), Chinese University of Hong Kong, Hong Kong, Republic of China in their study “Endoscopic Removal of Sinonasal Inverted Papilloma Including Endoscopic Medial Maxillectomy” comprising of 17 patients who underwent exclusive endoscopic excision of the inverted papilloma, reported a recurrence rate of 6% (1 patient) and one patient had malignant transformation. The mean follow up period in their study was 40 months. In our study comprising of 12 patients of inverted papilloma who underwent endoscopic excision for the same, showed a recurrence rate of 4.02% (one patient) and malignant transformation in one patient after a mean follow up period of 13 months. Though our follow up period is small we could achieve comparable results.

E. Serrano, A. Coste*, J. Percodani, S. Hervé´*, L. Brugel, From the Department of Otorhinolaryngology Head and Neck Surgery, Rangueil Hospital, Toulouse, and the District and Henri Mondor Hospitals*, Cre´teil, France in their paper “Endoscopic sinus surgery for sinonasal haemangiopericytomas” comprising of 5 cases of hemangiopericytoma treated by exclusive endoscopic approach and showed a recurrence rate of 20%. In our study there was one case of hemangiopericytoma who underwent endoscopic excision of the tumor and was followed up for one year and showed no evidence of recurrence of the tumor. Though our sample size is small to comment on our outcomes, early results are promising.
In a comprehensive study by Lawson et al., various aspects of inverted papilloma management, such as treatment concepts (aggressive vs conservative) and surgical approaches (traditional vs endoscopic) were compared in 160 patients, with an average follow-up period of 5.2 years. This is the largest series of inverted papilloma cases to date. They suggest that conservative approaches, especially endoscopic removal, can be performed on select lesions with a recurrence rate (12%) comparable to those of more aggressive techniques (18%). Our study also demonstrated similar results with a recurrence rate of 4.02% for those patients who underwent endoscopic excision of inverted papilloma followed up over a period of 2 years.

Kaza and Casiano reported 51 cases of inverted papilloma removed endoscopically over a 10-year period. They reported seven recurrences (14%), with a mean follow-up of 30 months. In our study the inverted papilloma patients who underwent endoscopic excision were followed up for a mean follow up period of 13 months and showed a recurrence rate of 4.02%. Though the follow up period is short the early results are promising in our study.

Llorente et al. reported on 27 patients who underwent endoscopic resection of inverted papillomas. There were no surgical complications, but 2 patients (7%) had recurrence after 2 years of follow up. In our study there was recurrence in one patient with inverted papilloma who underwent endoscopic excision who was followed up for a period of up to 24 months. Our sample size is small
compared to their study, but outcomes of our study is almost similar hence endoscopic excision is a viable option for inverted papilloma excision.

Roger et al. reported on 20 cases with JNA. Their mean follow-up was 22 months. No recurrences occurred in this series, but there were small asymptomatic remnants in two patients. In our study there were 10 patients with juvenile nasopharyngeal angiofibroma who underwent endoscopic excision, of which 5 patients belonged to Radkowski staging IIb, 1 each in Ia, Ib, IIIb and 2 patients in IIIa, were followed up for mean follow up period of 13 months. No recurrence of tumor was seen.

Erkan AN et al in their paper “Endoscopic removal of sinonasal tumors” comprising of 20 patients who underwent endoscopic tumor resection with diagnosis of sinonasal tumor in which there were five osteomas, one fibrous dysplasia, one ossifying fibroma, seven inverted papillomas, one oncocytic papilloma, three angiofibromas, one schwannoma, and one esthesioneuroblastoma, had one case of recurrence (inverted papilloma) in their follow up period ranging from 6 months to 6 years and concluded that Low recurrence rates in their series showed that endoscopic resection of nasal-paranasal sinus tumors in selected cases, may be an appropriate method of surgical technique. Similar results were obtained in our study where a recurrence of one each in benign (inverted papilloma) and malignant tumors (Stage IV Squamous cell carcinoma) was seen following endoscopic
excision of the tumor. Thus from our study we can say that endoscopic excision for benign and malignant sinonasal tumors gives outcomes comparable to that of gold standard procedures.

Taha Z. Shipchandler MD, Pete S. Batra MD, Martin J. Citardi MD, William E. Bolger MD, Donald C. Lanza MD, in their study “Outcomes for Endoscopic Resection of Sinonasal Squamous Cell Carcinoma” comprising of eleven patients who underwent endoscopic resection of the tumors demonstrated a recurrence rate of 9% and concluded that, Endoscopic resection in combination with multimodality therapy is an effective method for curative resection of sinonasal Squamous Cell Carcinoma. In our study there were 3 patients with squamous cell carcinoma who underwent endoscopic excision of the tumor. Of which 2 patients had adjuvant chemotherapy and radiotherapy. There was recurrence in one case of squamous cell carcinoma following which she underwent palliative radiotherapy and is living with disease. Though the sample size is small and the follow up period is short to comment about the study, early results are promising.

Where the endoscopic approach for excision of sinonasal tumors scores over the other external approaches are that certain areas like the cribiform plate, ethmoidal region, infratemporal fossa, pterygopalatine fossa are easily reached with the help of angled endoscopes than by the external approaches. The endoscopes also offer the advantage of restricting the damage to normal
adjacent tissues when compared to that of external approach procedures. Also
the endoscopes offer superior magnification, better 3 dimensional viewing,
lower rate of complications, better acceptability by the patient, lesser duration
of hospital stay and lesser morbidity to the patient than external approach
procedures.
CONCLUSION

Though the sample size and period of study is small, in the hand of experienced and skilled surgeons, complete endoscopic removal is attainable in most cases, especially for the more common benign neoplasms, such as inverted papilloma and angiofibroma. With our experience we feel that endoscopic resection is achieving oncological cure. The combination of removal of tumors endoscopically and endoscopic surveillance in the outpatient setting has allowed a less radical surgical approach while resulting in decreased morbidity and better tumor control.
BIBLIOGRAPHY


ANNEXURES

PROFORMA

PROFORMA

CASE NUMBER:
NAME: AGE / SEX: IP NO.:
DATE OF ADMISSION:
DATE OF DISCHARGE:
OCCUPATION:
ADDRESS:
COMPLAINTS OF:
  1. NASAL OBSTRUCTION
  2. NASAL DISCHARGE
  3. EPISTAXIS
  4. HEADACHE
  5. POST NASAL DRIP
  6. HYPOSOMIA/ANOSMIA
  7. DIPLOPIA

PAST HISTORY:
  1. PREVIOUS SURGERY
  2. PAST HISTORY OF IRRADIATION:
FAMILY HISTORY
SIMILAR ILLNESS IN FAMILY MEMBERS

PERSONAL HISTORY
1. SMOKER
2. ALCOHOLIC
3. PAN CHEWER

EXAMINATION

NOSE
ANTERIOR RHINOSCOPY

POSTERIOR RHINOSCOPY

EXAMINATION OF EYES

CRANIAL NERVE EXAMINATION

<table>
<thead>
<tr>
<th>NERVE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Olfactory Nerve</td>
<td></td>
</tr>
<tr>
<td>Optic Nerve</td>
<td></td>
</tr>
<tr>
<td>Occulomotor, Trochlear and A</td>
<td></td>
</tr>
<tr>
<td>Abducen</td>
<td></td>
</tr>
<tr>
<td>Trigeminal Nerve</td>
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</tr>
<tr>
<td>Facial Nerve</td>
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<tr>
<td>Vestibulocochlear Nerve</td>
<td></td>
</tr>
<tr>
<td>Glossopharyngeal Nerve and V</td>
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</tr>
<tr>
<td>Vagus Nerve</td>
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</tr>
<tr>
<td>Spinal Accessory Nerve</td>
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</tr>
<tr>
<td>Hypoglossal Nerve</td>
<td></td>
</tr>
</tbody>
</table>

EXAMINATION OF NECK
EXAMINATION OF THROAT

EXAMINATION OF EAR
INVESTIGATIONS

DIAGNOSTIC NASAL ENDOSCOPY

RADIOLOGICAL EVALUATION

PRE OP BIOPSY

SURGERY:

COMPLICATIONS

ADJUVANT TREATMENT:

POST OP BIOPSY:

FOLLOW UP
PATIENT CONSENT FORM

Title of the Project: ROLE OF ENDOSCOPY IN MANAGEMENT OF BENIGN AND MALIGNANT SINONASAL TUMORS

Institution: Upgraded Institute of Otorhinolaryngology, Madras Medical College, Chennai – 600003.

Name: Date: 

Age: IP No.: 

Sex: Project Patient No.: 

The details of the study have been provided to me in writing and explained to me in my own language.

I confirm that I have understood the above study and had the opportunity to ask questions.

I understood that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without the medical care that will normally be provided by the hospital being affected.

I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

I have been given an information sheet giving details of the study.

I fully consent to participate in the above study.

__________________            ___
Name of the subject                     Signature                              Date

__________________              __________                      ___________
Name of the Investigator              Signature  

Date
INFORMATION SHEET

We are conducting a prospective cohort study on “ROLE OF ENDOSCOPY IN MANAGEMENT OF BENIGN AND MALIGNANT SINONASAL TUMORS” at the Upgraded Institute of Otorhinolaryngology, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai – 600003.

The outcomes of patients with benign and malignant sinonasal tumors who undergo endoscopic excision is evaluated.

At the time of announcing the results and suggestions, name and identity of the patients will be confidential.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of Investigator

Signature of Participant

Date:
To
Dr.B.Vivek
Post Graduate in M.S.ENT
Upgraded Institute of Otorhinolaryngology
Madras Medical College
Chennai 600 003

Dear Dr.B.Vivek,

The Institutional Ethics Committee has considered your request and approved your study titled "ROLE OF ENDOSCOPY IN THE MANAGEMENT OF BENIGN AND MALIGNANT SINONASAL TUMORS " - NO.02012017 (II)

The following members of Ethics Committee were present in the meeting hold on 31.01.2017 conducted at Madras Medical College, Chennai 3

1. Dr.C.Rajendran, MD.,
2. Dr.M.K.Muralidharan,MS.,M.Ch., Dean, MMC, Ch-3
3. Prof.Sudha Seshayyan, MD., Vice Principal,MMC,Ch-3
4. Prof.B.Vasanthy, MD., Prof.of Pharmacology.,MMC,Ch-3
5. Prof.S.Suresh, MS., Prof. of Surgery,MMC,Ch-3
6. Prof.N.Gopalakrishnan, MD., Director, Inst.of Nephrology,MMC,Ch:
7. Prof.S.Mayilvahanan, MD., Director, Inst. of Int.Med,MMC, Ch-3
8. Tmt.J.Rajakshmi, JAO,MMC, Ch-3
9. Tmt.Arnold Saulina, MA.,MSW.,

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary - Ethics Committee

[Signature]

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003
Urkund Analysis Result

Analysed Document: viv thesis final final compiled.doc (D31473707)
Submitted: 10/19/2017 7:38:00 PM
Submitted By: viv.cool18@gmail.com
Significance: 1 %

Sources included in the report:
Review 16.10.docx (D31372696)
THESIS-final draft.docx (D31047541)

Instances where selected sources appear:
4
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<th>PRE OP RADIOLOGICAL EXTENT OF THE TUMOR</th>
<th>PRE OP BIOPSY</th>
<th>INTRA OP EXTENT OF THE TUMOR</th>
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<tbody>
<tr>
<td>1</td>
<td>MAHALINGAM</td>
<td>55</td>
<td>M</td>
<td>11046</td>
<td>FARMER</td>
<td>LT NASAL OBSTRUCTION, HYPOSMIA</td>
<td>MALIGNANT</td>
<td>3.9X4.2 CM INTERSECTING ENHANCING LESION OF LT NASAL CAVITY CAUSING EROSION OF ADJACENT BONES WITH EXTENSION INTO ANTERIOR ASPECT OF ETHMOID AND SPHENOID AND LEFT MAXILLARY SINUS</td>
<td>UNDIFFERENTIATED CARCINOMA</td>
<td>TUMOR WAS SEEN INVOLVING THE ENTIRE LT NASAL CAVITY, ETHMOID, MAXILLA OF LEFT SIDE AND SPHENOID</td>
</tr>
<tr>
<td>2</td>
<td>MUMTAZ</td>
<td>48</td>
<td>F</td>
<td>107843</td>
<td>HOME MAKER</td>
<td>RT NASAL OBSTRUCTION</td>
<td>MALIGNANT</td>
<td>SOFT TISSUE DENSITY MASS SEEN IN RT NASAL CAVITY EXTENDING TO RT MAXILLARY SINUS WITH ADJACENT BONY EROSION</td>
<td>UNDIFFERENTIATED CARCINOMA</td>
<td>TUMOR SEEN IN THE RT NASAL CAVITY ATTACHED TO THE RT LATERAL WALL, NO BONY EROSION</td>
</tr>
<tr>
<td>3</td>
<td>RAMACHANDRA</td>
<td>20</td>
<td>M</td>
<td>74799</td>
<td>STUDENT</td>
<td>RT NASAL OBSTRUCTION, EPITAXIS, WATERING OF RT EYE</td>
<td>MALIGNANT</td>
<td>4.8X3.5X4.4 CM HETEROGENOUSLY ENHANCING MASS WITH EPICENTRE IN RT NASAL CAVITY AND ETHMOID SINUS CAUSING EROSION OF MEDIAL MAXILLARY WALL, MEDIAL ORBITAL WALL CLOSELY ABDUITS THE MEDIAL RECTUS MUSCLE</td>
<td>ESTHESIONEUROBLASTOMA</td>
<td>TUMOR SEEN IN RT NASAL CAVITY ERODING MEDIAL WALL OF MAXILLA, RT ETHMOIDS AND EXTENDING INTO THE ORBIT</td>
</tr>
<tr>
<td>4</td>
<td>KANCHANAMALA</td>
<td>50</td>
<td>F</td>
<td>97838</td>
<td>HOME MAKER</td>
<td>LT SIDE HEADACHE, DIPLOPIA LT EYE</td>
<td>MALIGNANT</td>
<td>3.3X3.1 CM SOFT TISSUE DENSITY LESION IN LT FRONTAL SINUS ERODING THE POST TABLE OF FRONTAL BONE EXTENDING INFERIORLY INTO LT ORBIT MEDIALY EXTENDING TO ETHMOID</td>
<td>SQUAMOUS CELL CARCINOMA</td>
<td>TUMOR SEEN INVOLVING THE LEFT FRONTAL SINUS ERODING POST TABLE JUST ABUTTING THE DURA, LT ethmoid sinus was also involved</td>
</tr>
<tr>
<td>5</td>
<td>MUTHU</td>
<td>61</td>
<td>M</td>
<td>22678</td>
<td>UNEMPLOYED</td>
<td>LT NASAL OBSTRUCTION, HYPOSMIA, EPITAXIS</td>
<td>MALIGNANT</td>
<td>3.8X3.4X1.4 HETEROGENOUSLY ENHANCING LESION IN LT MAXILLARY SINUS WITH ADJACENT AREAS OF BONY EROSION WITH BREACH OF ANTERIOR AND POSTERIOR WALL OF MAXILLARY SINUS AND LESION EXTENDS INTO ORBIT CAUSING MILD PROPTOSIS</td>
<td>INFLAMMATORY PATHOLOGY</td>
<td>TUMOR WAS SEEN EXTENDING INTO THE RIGHT NASAL CAVITY, WITH INVOLVEMENT OF MAXILLARY SINUS ENTIRELY ON RT SIDE, BONY EROSION SEEN IN POST WALL OF THE MAXILLARY SINUS</td>
</tr>
<tr>
<td>6</td>
<td>MADHUNIKA</td>
<td>18</td>
<td>F</td>
<td>7809</td>
<td>STUDENT</td>
<td>RT NASAL OBSTRUCTION, BLURRING OF VISION</td>
<td>MALIGNANT</td>
<td>3.3X3X1.4 CM HETEROGENOUSLY ENHANCING SOFT TISSUE LESION WITH HETEROGENOUS CONTRAST ENHANCEMENT CAUSING DESTRUCTION OF NASAL SEPTUM, LESION INVOLVES BOTH NASAL CAVITY AND EXTENDS TO BOTH MAXILLARY SINUS LATERALLY INTO EXTRACOONAL COMPARTMENT OF BOTH ORBITS CAUSING COMPRESSION OF BOTH MEDIAL RECTUS MUSCLE, LESION EXTENDS TO ANTERIOR CRANIAL FOSSA DURA EXTRADURALY</td>
<td>CHONDROSARCOMA</td>
<td>TUMOR WAS SEEN INVOLVING THE BOTH THE ETHMOID SINUS AND SPHENOID AND CAUSING COMPRESSION OF OPTIC CHIASMA, CRIBRIFORM PLATE EROSION SEEN, NO DURAL INVASION, PUS ASPIRATED FROM BOTH MAXILLARY SINUS</td>
</tr>
<tr>
<td>7</td>
<td>KUSMAVATHY</td>
<td>55</td>
<td>F</td>
<td>107142</td>
<td>HOUSE WIFE</td>
<td>LT NASAL OBSTRUCTION</td>
<td>MALIGNANT</td>
<td>WELL DEFINED SOFT TISSUE DENSITY LESION OCCUPYING LEFT NASAL CAVITY PUSHING SEPTUM TO RT PROBALLY ATTACHED TO SKULL BASE</td>
<td>TUMOR WAS SEEN IN LEFT NASAL CAVITY WITH EXTENSION INTO ETHMOIDS CAUSING EROSION OF CRIBRIFORM PLATE</td>
<td>TUMOR WAS SEEN INVOLVING THE BOTH THE ETHMOID SINUS AND SPHENOID</td>
</tr>
<tr>
<td>8</td>
<td>MARIMUTHU</td>
<td>40</td>
<td>M</td>
<td>52060</td>
<td>ELECTRICIAN</td>
<td>RT NASAL OBSTRUCTION, DIPLOPA, EPITAXIS</td>
<td>MALIGNANT</td>
<td>6.6X6X3.5 CM IN RT NASAL CAVITY ETHMOID REGION WITH EROSION OF BONY SEPTUM, CRIBRIFORM PLATE, FOVEA ETHMOIDALIS, ROOF OF SPHENOID SINUS ON BOTH SIDES, LESION SHOWS EROSION OF FLOOR OF ANTERIOR CRANIAL FOSSA, NO DURAL INVASION, SHOWS EROSION OF MEDIAL WALL OF RIGHT ORBIT ABUTTING MEDIAL RECTUS AND SUPERIOR OBLIQUE</td>
<td>SINONASAL UNDIFFERENTIATED CARCINOMA</td>
<td>TUMOR SEEN IN RT ETHMOID REGION WITH EROSION OF BONY NASAL SEPTUM, EROSION OF ROOF OF SPHENOID SINUS ON BOTH SIDES, CRIBRIFORM AREA NORMAL</td>
</tr>
<tr>
<td>9</td>
<td>LALITHA</td>
<td>57</td>
<td>F</td>
<td>1461</td>
<td>HOUSE WIFE</td>
<td>NASAL OBSTRUCTION BOTH SIDES, EPITAXIS</td>
<td>MALIGNANT</td>
<td>HOMOGENOUS SOFT TISSUE DENSITY LESION IN NASAL CAVITY ON LEFT SIDE INVOLVING LT MAXILLARY, ETHMOID SINUS AND ALSO EXTENDING TO RT NASAL CAVITY. THE LESION ALSO INVOLVES SPHENOID SINUS</td>
<td>CHORDOMA</td>
<td>TUMOR WAS SEEN ON BOTH NASAL CAVITY WITH EROSION OF POST PART OF SEPTUM. ALSO INVOLVED THE LEFT ETHMOID, LEFT MAXILLARY SINUS. SPHENOID SINUS WAS NORMAL</td>
</tr>
<tr>
<td>10</td>
<td>UNNAMALAI</td>
<td>60</td>
<td>F</td>
<td>26823</td>
<td>HOUSE WIFE</td>
<td>RT NASAL OBSTRUCTION, EPITAXIS,</td>
<td>MALIGNANT</td>
<td>SOFT TISSUE DENSITY LESION IN POSTERIOR PART OF RT NASAL CAVITY EXTENDING TOWARDS NASOPHARYNX NO EVIDENCE OF BONY EROSION</td>
<td>INVERTED PAPILLOMA</td>
<td>TUMOR SEEN IN RT NASAL CAVITY PUSHING THE MIDDLE TURBINATE MEDALLY, NO BONY EROSION,</td>
</tr>
</tbody>
</table>

**PATHOLOGY**

- Benign
- Malignant
- Sinonasal undifferentiated carcinoma
- Inverted papilloma
S. NO | NAME | AGE | SEX | IP NO | OCCUPATION | PRESENTING COMPLAINT | BENIGN/MALIGNANT | PRE OP RADIOLOGICAL EXTENT OF THE TUMOR | PRE OP BIOPSY | INTRA OP EXTENT OF THE TUMOR
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
11 | BALAJI | 23 | M | 29308/ | PRIVATE COMPANY EMPLOYEE | LT NASAL OBSTRUCTION, EPITAXIS | MALIGNANT | SOFT TISSUE DENSITY LESION IN LT NASAL CAVITY PUSHING SEPTUM TO RT MEDially, LT CRIBRIFORM PLATE IS ERODED. LESION INVOLVES LT ANTERIOR POSTERIOR ETHMOID AND SPHENOID | SINONASAL PAPILLOMA | TUMOR SEEN IN LEFT NASAL CAVITY, AND ETHMOIDS. SPHENOID SINUS WAS TUMOR FREE, CRIBRIFORM PLATE EROSION WAS SEEN. NO CSF LEAK
12 | SUNIL KUMAR | 19 | M | 138175 | DAILY WAGE WORKER | EPITAXIS | BENIGN | INTENSELY ENHANCING SOFT TISSUE DENSITY LESION NOTED IN LT PTERGYOPALATINE FOSSA AND ROOF OF NASOPHARYNX OF LT SIDE | - | TUMOR WAS SEEN IN THE LEFT SPHENOPALATINE FORAMEN AND LEFT PTERGYOPALATINE FOSSA
13 | MOHAMMED FAHMAN | 15 | M | 138002 | STUDENT | EPITAXIS, RT NASAL OBSTRUCTION | BENIGN | HOMOGENEOUSLY ENHANCING SOFT TISSUE DENSITY LESION ARISING FROM RT SPHENOPALATINE FORAMEN, INVOLVING RT PTERGYOPALATINE FOSSA EXTENDING TO RT NASAL CAVITY | - | TUMOR WAS SEEN OCCUPYING THE RT SPHENOPALATINE FORAMEN AND RT PTERGYOPALATINE FOSSA
14 | TAMIL SELVAN | 17 | M | 22325 | STUDENT | RT NASAL OBSTRUCTION, EPITAXIS, RT HYPOSMIA | BENIGN | A HOMOGENEOUSLY ENHANCING LESION IN RT SPHENOPALATINE FORAMEN EXTENDING UPTO THE CHOANA AND UPTO THE RT SPHENOID | - | TUMOR WAS SEEN IN RT SPHENOPALATINE FORAMEN, PTERGYOPALATINE FOSSA, SPHENOID SINUS, NO BONY EROSION
15 | VAITHEGI | 30 | F | 44503 | HOUSE WIFE | RT NASAL OBSTRUCTION | BENIGN | SOFT TISSUE DENSITY LESION ARISING FROM RT INFERIOR TURBINATE, NO BONY EROSION | - | TUMOR SEEN ATTACHED TO SUPERIOR SURFACE OF POST HALF OF RT INFERIOR TURBINE EXTENDING TO NASAL CAVITY
16 | GNANASEKARAN | 40 | M | 88929 | FARMER | RT NASAL OBSTRUCTION, EPITAXIS | BENIGN | A HOMOGENEOUS SOFT TISSUE DENSITY LESION INVOLVING THE RT NASAL CAVITY WITH OPACIFICATION OF RT FRONTAL, ETMOID SPHENOID AND MAXILLARY SINUS | INVERTED PAPILLOMA | TUMOR WAS SEEN ATTACHED TO RT NASAL WALL JUST INVOLVING THE MEDIAL PART OF THE RT MAXILLARY SINUS, ETHMOID AND SPHENOID SINUSES WERE FREE OF DISEASE
17 | ANNADURAI | 28 | M | 28610 | SHOP KEEPER | RT NASAL OBSTRUCTION, EPITAXIS | BENIGN | A LARGE MASS 6.4X4.5CM SEEN EXTENDING TO NASOPHARYNX ARISING FROM SPHENOPALATINE FORAMEN WITH OPACIFICATION OF RT FRONTAL, ETHMOID, SPHENOID SINUS, THE MASS EXTENDS TO EXTRACONAL SPACE OF LEFT ORBIT | - | MASS WAS SEEN IN RT NASAL CAVITY EXTENDING TO SPHENOID AND ETHMOID SINUSES AND MAXILLARY SINUS, AND ALSO INVOLVING THE RT PTERGYOPALATINE FOSSA
18 | MUGUNDHAN | 48 | M | 122629 | LIFT OPERATOR | LEFT NASAL OBSTRUCTION, LT NASAL DISCHARGE, DIPLOPIA | BENIGN | A HOMOGENEOUS SOFT TISSUE DENSITY LESION IN LT NASAL CAVITY INVOLVING LT FRONTAL, ETHMOID, MAXILLARY AND SPHENOID SINUSES | INVERTED PAPILLOMA | TUMOR SEEN ARISING FROM LATERAL WALL OF LT NASAL CAVITY AND ALSO MINIMAL INVOLVEMENT OF LT MAXILLARY SINUS, ETHMOID AND SPHENOID WAS FREE OF DISEASE
19 | LAXHMANAN | 50 | M | 37506 | FARMER | RT NASAL OBSTRUCTION, RT NASAL DISCHARGE | BENIGN | A HOMOGENEOUS SOFT TISSUE DENSITY LESION IN RT NASAL CAVITY INVOLVING THE LEFT ETHMOID AND LEFT FRONTAL SINUS, RT MAXILLARY SINUS AND SPHENOID SINUSES IS NORMAL, NO BONY EROSION | INVERTED PAPILLOMA | TUMOR SEEN IN RT NASAL CAVITY IN THE RIGHT ANTERIOR AND POSTERIOR ETHMOID REGION..FRONTAL SINUS WAS FREE OF TUMOR
20 | GANESAN | 46 | M | 88929 | ELECTRICIAN | LT NASAL OBSTRUCTION, LT NASAL DISCHARGE HYPOSMIA | BENIGN | SOFT TISSUE DENSITY LESION SEEN IN LT NASAL CAVITY WITH OPACIFICATION OF LT MAXILLARY SINUS, ETHMOID, SPHENOID AND FRONTAL SINUS. THE MASS ALSO EXTENDS INTO THE ORBIT JUST ABUTTING THE MEDIAL RECTUS ON LEFT SIDE | INVERTED PAPILLOMA | TUMOR SEEN IN LEFT NASAL CAVITY INVOLVING THE LEFT MAXILLARY AND ETHMOID SINUSES, LAMINA PAYERACEA WAS BREACHED ON LEFT SIDE
21 | SHIVA | 15 | M | 99665 | STUDENT | RT NASAL OBSTRUCTION, EPITAXIS, RT NASAL DISCHARGE | BENIGN | WELL DEFINED INTENSELY ENHANCING LESION FROM RT SPHENOPALATIN FORAMEN EXTENDING TO NASOPHARYNX, SPHENOID SINUS AND DESTRUCTION OF POSTEROLATERAL WALL OF MAXILLA AND MEDIA PTERGYOID PLATE | - | TUMOR WAS SEEN INVOLVING THE SPHENOPALATINE FORAMEN, PTERGYOPALATINE FOSSA, BASE OF PTERGYOID PLATE, SPHENOID SINUS, PTERGYOPALATINE FOSSA
22 | CHITHRA | 34 | F | 107436 | DAILY WAGE WORKER | LT NASAL OBSTRUCTION, LT NASAL DISCHARGE HYPOSMIA | BENIGN | SOFT TISSUE LESION IN LT NASAL CAVITY WEDGE BETWEEN INFERIOR AND MIDDLE TURBINATE, NO BONY EROSION.. BOTH SIDES MAXILLARY SINUSITIES | INVERTED PAPILLOMA | TUMOR SEEN ARISING FROM LATERAL WALL OF LT NASAL CAVITY NO BONY EROSION.MAXILLARY, ETHMOID SINUS WAS NORMAL
23 | SAVITHRI | 52 | F | 94388 | HOME MAKER | LT SIDE EPITAXIS | BENIGN | HOMOGENEOUS SOFT TISSUE LESION IN LT NASAL CAVITY ATTACHED TO NASAL SEPTUM. BOTH SIDES MAXILLARY SINUSITIES | - | TUMOR WAS SEEN ATTACHED TO THE SPETUM IN ITS ANTERIOR HALF.
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<th>NAME</th>
<th>AGE</th>
<th>SEX</th>
<th>IP NO</th>
<th>OCCUPATION</th>
<th>PRESENTING COMPLAINT</th>
<th>BENIGN/ MALIGNANT</th>
<th>PRE OP RADIOLOGICAL EXTENT OF THE TUMOR</th>
<th>PRE OP BIOPSY</th>
<th>INTRA OP EXTENT OF THE TUMOR</th>
</tr>
</thead>
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<td>24</td>
<td>CHANDRAN</td>
<td>16</td>
<td>M</td>
<td>134006</td>
<td>STUDENT</td>
<td>LT NASAL OBSTRUCTION, EPISTAXIS</td>
<td>BENIGN</td>
<td>3.3X3.5X3.9 CM SOFT LOBULATED MASS IN LT</td>
<td>TUMOR WAS SEEN IN LEFT SPHENOID SINUS, NO EVIDENCE OF BONY EROSION, MASS SITUATED IN PTERYGOPALATINE FOSSA LT SIDE</td>
<td>TUMOR WAS SEEN IN LEFT SPHENOID SINUS, NO EVIDENCE OF BONY EROSION, MASS SITUATED IN PTERYGOPALATINE FOSSA LT SIDE</td>
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<tr>
<td>25</td>
<td>SARATHI</td>
<td>13</td>
<td>M</td>
<td>25439</td>
<td>STUDENT</td>
<td>LT NASAL OBSTRUCTION, EPISTAXIS, HYPOSMIA</td>
<td>BENIGN</td>
<td>4.2X2.2X2.3 CM WELL DEFINED SOFT TISSUE DENSITY POLYPOIDAL LESION NOTED IN POSTERIOR ASPECT OF LT NASAL CAVITY WITHOUT ADJACENT BONY EROSION. THE MASS SHOWS HOMOGENOUS CONTRAST ENHANCEMENT</td>
<td>TUMOR WAS SEEN IN THE LEFT SPHENOPALATINE FORMANE REGION. NO BONY EROSION</td>
<td>TUMOR WAS SEEN IN THE LEFT SPHENOPALATINE FORMANE REGION. NO BONY EROSION</td>
</tr>
<tr>
<td>26</td>
<td>KALAIARASI</td>
<td>32</td>
<td>F</td>
<td>9807</td>
<td>HOUSE WIFE</td>
<td>LT NASAL OBSTRUCTION, HYPOSMIA</td>
<td>BENIGN</td>
<td>HOMOGENOUS SOFT TISSUE DENSITY LESION IN LT NASAL CAVITY INVOLVING THE LEFT MAXILLARY SINUS ETHMOID AND FRONTAL SINUS. NO BONY EROSION NOTED</td>
<td>TUMOR WAS SEEN IN THE LEFT LATERAL NASAL WALL, MAXILLARY SINUS AND ETHMOID SINUS, FRONTAL SINUS WAS FREE OF DISEASE</td>
<td>TUMOR WAS SEEN IN THE LEFT LATERAL NASAL WALL, MAXILLARY SINUS AND ETHMOID SINUS, FRONTAL SINUS WAS FREE OF DISEASE</td>
</tr>
<tr>
<td>27</td>
<td>KRISHNAMOORTHY</td>
<td>58</td>
<td>M</td>
<td>107149</td>
<td>UNEMPLOYED</td>
<td>LT NASAL OBSTRUCTION, LT NASAL DISCHARGE</td>
<td>BENIGN</td>
<td>EVIDENCE OF SOFT TISSUE DENSITY LESION NOTED IN LT MAXILLARY SINUS AND ALSO SPHENOID SINUS AND FRONTAL SINUS. THINNING OF ADJACENT BONES</td>
<td>TUMOR WAS SEEN INVOLVING THE MAXILLARY SINUS AND ETHMOID SINUS, FRONTAL SINUS WAS FREE</td>
<td>TUMOR WAS SEEN INVOLVING THE MAXILLARY SINUS AND ETHMOID SINUS, FRONTAL SINUS WAS FREE</td>
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<tr>
<td>29</td>
<td>SOMALINGA</td>
<td>64</td>
<td>M</td>
<td>90376</td>
<td>UNEMPLOYED</td>
<td>LT NASAL OBSTRUCTION</td>
<td>BENIGN</td>
<td>HOMOGENOUS SOFT TISSUE DENSITY LESION IN LT NASAL CAVITY INVOLVING LT MAXILLARY, ETHMOID AND FRONTAL SINUS. NO BONY EROSION</td>
<td>TUMOR WAS SEEN ARISING FROM LATERAL WALL OF NOSE AND INVOLVING THE LEFT MAXILLARY AND ETHMOID SINUS</td>
<td>TUMOR WAS SEEN ARISING FROM LATERAL WALL OF NOSE AND INVOLVING THE LEFT MAXILLARY AND ETHMOID SINUS</td>
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<td>30</td>
<td>SIVAKUMAR</td>
<td>33</td>
<td>M</td>
<td>45092</td>
<td>MASON</td>
<td>RT NASAL OBSTRUCTION, RT NASAL DISCHARGE</td>
<td>BENIGN</td>
<td>HOMOGENOUS LESION IN RT MAXILLARY AND ETHMOID SINUS EXTENDING INTO RT NASAL CAVITY. THERE IS NO EVIDENCE OF BONY EROSION</td>
<td>TUMOR WAS SEEN WITHIN THE RT MAXILLARY SINUS AND EXTENDING INTO RT NASAL CAVITY. ETHMOID SINUS WAS FREE OF TUMOR</td>
<td>TUMOR WAS SEEN WITHIN THE RT MAXILLARY SINUS AND EXTENDING INTO RT NASAL CAVITY. ETHMOID SINUS WAS FREE OF TUMOR</td>
</tr>
<tr>
<td>31</td>
<td>SUBASH</td>
<td>14</td>
<td>M</td>
<td>78381</td>
<td>STUDENT</td>
<td>RT NASAL OBSTRUCTION, EPISTAXIS</td>
<td>BENIGN</td>
<td>AN INTENSELY ENHANCING LESION IN RT NASAL CAVITY IN THE SPHENOPALATINE FORAMEN REGION EXTENDING TOWARDS CHOANA. NO EVIDENCE OF BONY EROSION SEEN</td>
<td>TUMOR WAS SEEN IN RT NASAL CAVITY IN THE SPHENOPALATINE FORAMEN REGION AND EXTENDING TO LATERAL RECESS OF SPHENOID</td>
<td>TUMOR WAS SEEN IN RT NASAL CAVITY IN THE SPHENOPALATINE FORAMEN REGION AND EXTENDING TO LATERAL RECESS OF SPHENOID</td>
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<tr>
<td>32</td>
<td>NARAYANAN</td>
<td>26</td>
<td>M</td>
<td>22777</td>
<td>SHOP EMPLOYEE</td>
<td>LT NASAL OBSTRUCTION, LT NASAL DISCHARGE</td>
<td>BENIGN</td>
<td>A SOFT TISSUE DENSITY LESION INVOLVING THE LEFT MAXILLARY, ETHMOID AND FRONTAL SINUS</td>
<td>MINIMAL POLYPOIDAL LESION SEEN IN LATERAL WALL OF NOSE, MAXILLARY, ETHMOID AND FRONTAL SINUSITIS</td>
<td>MINIMAL POLYPOIDAL LESION SEEN IN LATERAL WALL OF NOSE, MAXILLARY, ETHMOID AND FRONTAL SINUSITIS</td>
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<tr>
<td>33</td>
<td>AMARNATH</td>
<td>17</td>
<td>M</td>
<td>16458</td>
<td>STUDENT</td>
<td>LT NASAL OBSTRUCTION, EPISTAXIS</td>
<td>BENIGN</td>
<td>A HOMOGENOUS SOFT TISSUE DENSITY LESION SEEN IN RT SPHENOPALATINE REGION EXTENDING INTO SPHENOID SINUS, EROSION OF LATERAL WALL OF SPHENOID SINUS SEEN ON LT SIDE AND TOWARDS PTERYGOPALATINE FOSSA. LESION SHOWS INTENSE CONTRAST ENHANCEMENT</td>
<td>TUMOR WAS SEEN IN LT SPHENOPALATINE FORAMEN, PTERYGOPALATINE FOSSA, SPHENOID SINUS AND ALSO EROSION OF LATERAL WALL OF LEFT SPHENOID SINUS</td>
<td>TUMOR WAS SEEN IN LT SPHENOPALATINE FORAMEN, PTERYGOPALATINE FOSSA, SPHENOID SINUS AND ALSO EROSION OF LATERAL WALL OF LEFT SPHENOID SINUS</td>
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<tr>
<td>34</td>
<td>VASU</td>
<td>55</td>
<td>M</td>
<td>92363</td>
<td>UNEMPLOYED</td>
<td>RT NASAL OBSTRUCTION, EPISTAXIS</td>
<td>BENIGN</td>
<td>SOFT TISSUE DENSITY LESION NOTED IN RT NASAL CAVITY ATTACHED TO LATERAL NASAL WALL EXTENDING TOWARDS CHOANA. MUCOSAL THICKENING OF LT MAXILLARY SINUS. NO EVIDENCE OF BONY EROSION</td>
<td>TUMOR WAS SEEN IN RT NASAL CAVITY ATTACHED TO LATERAL NASAL WALL, MAXILLARY, ETHMOID AND SPHENOID SINUSES WERE NORMAL</td>
<td>TUMOR WAS SEEN IN RT NASAL CAVITY ATTACHED TO LATERAL NASAL WALL, MAXILLARY, ETHMOID AND SPHENOID SINUSES WERE NORMAL</td>
</tr>
<tr>
<td>35</td>
<td>AMEER HUSSAIN</td>
<td>10</td>
<td>M</td>
<td>47716</td>
<td>STUDENT</td>
<td>LT NASAL OBSTRUCTION, EPISTAXIS</td>
<td>BENIGN</td>
<td>A VASCULAR SOFT TISSUE LESION SHOWING VASCULAR BLUSH ON CONTRAST SEEN IN LT SPHENOPALATINE FORAMEN EXTENDING TO LT NASOPHARYNX, EVIDENCE OF EROSION OF MEDIAL ASPECT OF LT MEDIAL PTERYGOID PLATE. THERE IS NO EVIDENCE OF INTRACRANIAL EXTENSION</td>
<td>TUMOR WAS SEEN IN LEFT SPHENOPALATINE FORAMEN, LEFT PTERYGOPALATINE FOSSA</td>
<td>TUMOR WAS SEEN IN LEFT SPHENOPALATINE FORAMEN, LEFT PTERYGOPALATINE FOSSA</td>
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<tr>
<td>S. NO</td>
<td>POST OP BIOPSY</td>
<td>DIAGNOSIS</td>
<td>STAGE OF THE TUMOR</td>
<td>TREATMENT</td>
<td>ADJUVANT TREATMENT</td>
<td>INTRA OP COMPLICATIO NS</td>
<td>PERIOD OF FOLLOW UP</td>
<td>RECURRENCE</td>
<td>PATIENT PRESENT STATUS AT PRESENT</td>
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<tr>
<td>1</td>
<td>SINONASAL UNDIFFERENTIATED CARCINOMA</td>
<td>SINONASAL UNDIFFERENTIATED CARCINOMA</td>
<td>T3N0Mx</td>
<td>ENDOSCOPIC EXCISION OF THE TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>24 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
<td></td>
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<tr>
<td>2</td>
<td>ESTHESIONEUROBLASTOMA</td>
<td>ESTHESIONEUROBLASTOMA</td>
<td>KADISH A</td>
<td>ENDOSCOPIC EXCISION OF THE TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>18 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
<td></td>
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<tr>
<td>3</td>
<td>ESTHESIONEUROBLASTOMA</td>
<td>ESTHESIONEUROBLASTOMA</td>
<td>KADISH C</td>
<td>ENDOSCOPIC EXCISION OF THE TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>24 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>4</td>
<td>SQUAMOUS CELL CARCINOMA</td>
<td>SQUAMOUS CELL CARCINOMA OF FRONTAL SINUS</td>
<td>T3N0Mx</td>
<td>ENDOSCOPIC EXCISION OF THE TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>12 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>POORLY DIFFERENTIATED SQUAMOUS CELL CARCINOMA</td>
<td>POORLY DIFFERENTIATED SQUAMOUS CELL CARCINOMA</td>
<td>T3N0Mx</td>
<td>ENDOSCOPIC EXCISION OF THE TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>4 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>CHONDROSARCOMA</td>
<td>CHONDROSARCOMA</td>
<td>T4aN0Mx</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>NIL</td>
<td>NIL</td>
<td>6 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
<td></td>
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<td>HEMANGIOPERICYTOMA</td>
<td>T4aN0Mx</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>NIL</td>
<td>INTRA OP CSF LEAK, MANAGED ON TABLE BY ENDOSCOPIC CSF LEAK REPAIR</td>
<td>12 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>8</td>
<td>SINONASAL UNDIFFERENTIATED CARCINOMA</td>
<td>SINONASAL UNDIFFERENTIATED CARCINOMA</td>
<td>T4aN0Mx</td>
<td>ENDOSCOPIC EXCISION OF THE TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>4 MONTHS</td>
<td>NO</td>
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<td>9</td>
<td>SQUAMOUS CELL CARCINOMA</td>
<td>SQUAMOUS CELL CARCINOMA</td>
<td>T3N0Mx</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>NIL</td>
<td></td>
<td>8 MONTHS</td>
<td>YES, MANAGED WITH PALLIATIVE RT</td>
<td>LIVING WITH DISEASE</td>
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<td>10</td>
<td>ADENOID CYSTIC CARCINOMA</td>
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<td>T2N0Mx</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>POST OPERATIVE CHEMORADIOThERAPY</td>
<td>NIL</td>
<td>18 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>DIAGNOSIS</td>
<td>STAGE OF THE TUMOR</td>
<td>TREATMENT</td>
<td>ADJUVANT TREATMENT</td>
<td>INTRA OP COMPLICATIO NS</td>
<td>PERIOD OF FOLLOW UP</td>
<td>RECURRENCE</td>
<td>PATIENT PRESENT STATUS AT PRESENT</td>
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<td>11</td>
<td>ESTHESIONEUROBL STOMA</td>
<td>ESTHESIONEUROBLASTOMA</td>
<td>KADISH C</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>POST OPERATIVE CHEMORADIOTHERAPY</td>
<td>NIL</td>
<td>6 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>JUVNEILE NASOPHARYNGEAL ANGIOFIBROMA</td>
<td>RADKOWSKI I b</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>NIL</td>
<td>NIL</td>
<td>24 MONTHS</td>
<td>NO</td>
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<td>RADKOWSKI I b</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
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<td>NIL</td>
<td>24 MONTHS</td>
<td>NO</td>
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<td>RADKOWSKI I b</td>
<td>ENDOSCOPIC EXCISION OF TUMOR</td>
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<td>NIL</td>
<td>6 MONTHS</td>
<td>NO</td>
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<td>NIL</td>
<td>NIL</td>
<td>6 MONTHS</td>
<td>NO</td>
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<td>ENDOSCOPIC MEDIAL MAXILLECTOMY</td>
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<td>17 MONTHS</td>
<td>NO</td>
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<td>ENDOSCOPIC EXCISION OF TUMOR</td>
<td>NIL</td>
<td>NIL</td>
<td>15 MONTHS</td>
<td>NO</td>
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<td>ENDOSCOPIC EXCISION OF TUMOR</td>
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<td>12 MONTHS</td>
<td>MALIGNANT TRANSFORMATION TO SQUAMOUS CELL CARCINOMA, CURRENTLY ON PALLIATIVE RADIOTHERAPY LIVING WITH DISEASE</td>
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<td>NIL</td>
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<td>NIL</td>
<td>NIL</td>
<td>18 MONTHS</td>
<td>YES, PT UNDERWENT ENDOSCOPIC EXCISION OF THE RECURRENT LESION DISEASE FREE</td>
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<td>NIL</td>
<td>12 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>ENDOSCOPIC EXCISION OF TUMOR</td>
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<td>NIL</td>
<td>12 MONTHS</td>
<td>NO</td>
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<td>NIL</td>
<td>24 MONTHS</td>
<td>NO</td>
<td>DISEASE FREE</td>
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<td>INTRA OP COMPLICATONS</td>
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<td>NIL</td>
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