A COMPREHENSIVE STUDY ON MALIGNANT TUMOURS OF THE MAXILLARY SINUS

Submitted in partial fulfillment of the requirements for

M.S.Degree Examination- Branch IV

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UPGRADED INSTITUTE OF OTO-RHINO LARYNGOLOGY

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CERTIFICATE

This is to certify that the dissertation titled **"A COMPREHENSIVE STUDY ON MALIGNANT TUMOURS OF THE MAXILLARY SINUS"** is a bonafide work done by **Dr.VENKTESH. V**, in partial fulfillment of the requirements for MS (ENT) Branch IV Examination of The Tamilnadu Dr.M.G.R.Medical University to be held in September 2006.

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CONTENTS

INTRODUCTION

Malignant tumours of the maxillary sinus usually presents at an advanced stage due to the surrounding bony walls of maxilla. So by the time the patients reaches an oto-rhino-laryngologist, the condition is advanced making treatment difficult.

The malignant tumours of maxillary sinus occurs in only one in 2,00,000 persons per year.

This emphasizes the importance of clinical features, in detecting the disease at an earlier stage and improve the prognosis of the patients. Hence this study was conducted to evaluate the importance of symptoms and signs in facilitating early diagnosis and in predicting the appropriate extent of disease.

AIMS OF STUDY

In malignant tumours of the maxillary sinus,

1. To study the age and sex incidence of the tumours.
2. To find the incidence of different symptoms
3. To correlate the clinical findings and stage of the disease
4. To compare the clinical staging and radiological staging with per-operative involvement
5. To determine the prognostic factors in malignant tumours of maxilla particularly in relation with staging of the lesion.

SURGICAL ANATOMY OF MAXILLA

The maxilla is the second largest of facial bones maintaining the facial contour, forming roof of the mouth, lateral wall and floor of nasal cavity, anterior surface of infratemporal fossa and pterygopalatine fossa and the floor of the orbit. The body of maxilla is a quadrilateral pyramid. it contains the maxillary sinus.

It has four surfaces and four processes.

Surfaces

1. Anterolateral (Anterior surface, Facial surface)
2. Posterol ateral (Posterior surface, Infratemporal surface)
3. Medial surface (Nasal surface)
4. Superior surface (Orbital surface).

Processes

1. Zygomatic process
2. Alveolar process
3. Frontal process
4. Palatine process.

It articulates with maxilla of opposite side, nasal bone, maxillary process of fiontal bone, maxillary process of zygoma, horizontal and

pyramidal process of palatine bone, pterygoid plates of sphenoid bone, ethmoid bone and inferior nasal concha.

Maxillary sinus

It is the largest of the paranasal sinuses and is contained within the body of each maxilla. It is pyramidal in shape with its apex directed laterally and base lies medially.

Relations

Anterior wall	:	Related to the cheek
Posterior wall	:	Separates the sinus from infratemporal & pterygopalatine fossa
Medial wall	:	Separates the sinus from the nasal cavity. Contains the ostium.
Roof	:	Separates the sinus from the orbital cavity and is traversed by infraorbital nerve and vessels.
Floor	:	Related to alveolar processes carrying the molar teeth and palatine process of maxilla.

The floor of the sinus lies at a level 1.0 - 1.2 cm below that of the floor ol the nasal cavity in adults. In child floor of the sinus is at a higher

level and at 12 years the floor of sinus is at the level of the floor of nasal cavity. The average dimensions in the adult skull are 33 mm in height, 23 mm in width and 34 mm anteroposteriorly. The approximate volume is 14.75 ml but a large antrum may hold upto 30 ml.

It opens into the ethmoidal infundibulum in the middle meatus of the nasal cavity. It is 3-4 mm in diameter. The ostium is very large, but is made small by the following bones which articulate here. Ethmoid from above, lacrimal from in front, perpendicular plate of the palatine from behind and Inferior nasal concha from below. Accessory ostia are present in about 30% of specimens.

Embryology

The maxillary process grows ventrally from the dorsal end of the mandibular process to join lateral nasal process. The maxilla arises during 6th or 7th weeks from five ossification centers. The maxillary sinus is the first to appear (7 - 10 weeks) as a shallow groove expanding from primitive ethmoidal infundibulum into the mass of the maxilla.

Blood supply

Through small arteries that pierce the bony walls originating from the maxillary, facial, infraorbital and greater palatine arteries.

Veins accompany the arteries and drain into anterior facial vein and the pterygoid plexus.

Lymphatic drainage

It is relatively poor, but drains into retropharyngeal nodes and from there to the upper deep cervical nodes.

Nerve supply

The sinus is innervated by the superior alveolar nerves (anterior, middle, posterior), anterior palatine nerve, and the infraorbital nerve.

Histology

The sinus is lined by ciliated columnar epithelium which contains the highest density of goblet cells compared to other sinuses.

INFRATEMPORAL FOSSA

Boundaries

Roof	:	Infratemporal surface of greater wing of sphenoid and by a small part of squamous temporal bone.
Inferior	:	Continuous with the parapharyngeal space

Anterior	:	Posterior wall of maxilla
Posterior	:	Styloid apparatus, carotid sheath and prevertebral fascia
Medial	:	Lateral pterygoid plate
Lateral	:	Medial surface of ramus of mandible, zygomatic arch, masseter and temporalis muscles and upper most part of the deep lobe of parotid.

Contents

1. Lateral and medial pterygoid muscles
2. Mandibular nerve and its branches
3. Maxillary artery and vein
4. Pterygoid plexus of vein within lateral pterygoid muscle
5. Chorda tympani branch of facial nerve.

CLASSIFICATION OF NASAL AND PARANASAL SINUS TUMOURS

Benign	Malignant
A) Epithelial	
1. Adenoma	1. Squamous cell carcinoma
2. Papilloma	2. Adeno carcinoma
	3. Anaplastic carcinoma
	4. Transitional cell carcinoma
	5. Malignant melanoma
	6. Salivary gland tumours
	a) Adenoid cystic carcinoma
	b)Mucoepidermoid carcinoma
	c) Malignant pleomorphic adenoma
	7. Aesthesioneuroblastoma
B) Non - Epithelial	
1. Fibroma	1. Fibrosarcoma
2. Hemangioma	2. Angiosarcorna
3. Nasal glioma	3. Hemangiopericytoma
4. Neurilemmoma	4. Malignant lymphoma
5. Chondroma	5. Rhabdomyos arcoma

6. Osteoma	6. Lymphosarcoma
7. Meningioma	7. Plasmacytoma
	8. Burkitts lymphoma

FIBRO - OSSEOUS TUMOURS

Benign	**Malignant**
Osteoma	Osteosarcoma
Ossifying fibroma	Ewing's sarcoma
Osteoblastoma	
Osteoid osteoma	
Chondroma	Chondrosarcoma
Chondroblastoma	
Chondromyxoid fibroma	Fibrosarcoma
Desmoplastic fibroma	Malignant fibrous histiocytoma

ODONTOGENIC TUMOURS

Epithelial

1. Ameloblastoma
2. Adenomatoid odontogenic tumour
3. Calcifying epithelial odontogenic tumour
4. Ameloblastic fibroma
5. Ameloblastic fibrosarcorna
6. Odontoma

Mesodermal

1. Myxoma

2. Odontogenic fibroma

3. Cementoma

    a) Benign cementoblastoma

    b) Cementifying fibroma

    c) Cemento ossifying fibroma

    d) Familial gigantiform cementomas

METASTATIC TUMOURS

MISCELLANEOUS TUMOURS

1. Melanotic neuro - ectodermal tumour

STAGING OF MAXILLARY SINUS CARCINOMA

1. Sebileau classification (1906)

Draw two parallel lines 1. Through floors of the orbits

2. Through floors of the maxillary antrum

Divides into

1.	Supra structure	:	Ethmoid, sphenoid, frontal sinus and olfactory portion of nose
2.	Mesostructure	:	Maxillary sinus and respiratory portion of nose.
3.	Infrastructure	:	Alveolar process

2. Ohngren's classification (1933)

One line passing from inner canthus of the eye to the angle of the mandible and another line passing through mid pupillary region.

It divides maxillary sinus into four quadrants.

1. Antero inferior medial
2. Antero inferior lateral
3. Postero superior medial
4. Postero superior lateral

3. Modified Sisson classification (1963)

T_1 : Invasion of anterior wall (or)
Inferior nasoantral wall (or)
Anterior medial wall

} No skin involvement

T_2 : Invasion of lateral wall without muscle involvement
Invasion of superior wall without orbital involvement

T_3 : Invasion of pterygoids (or) orbit (or) anterior ethmoid cells (or) anterior wall without involvement of cheek.

T_4 : Invasion of cribriform plate (or) pterygomaxillary fossa (or) nasal fossa (or) other sinuses (or) pterygoid plate erosion.

4. Lederman classification (1969)

Two horizontal lines - one passing through floor of orbits. Other passing through floor, of maxillary sinuses.

Two vertical lines passing through medial orbital walls.

T_1 : Tumours limited to one sinus (or) tissue of origin

T_2 : Spread limited horizontally to same region (or) two adjacent but vertically related regions.

T_3 : 1. Tumour involving three regions with orbital involvement.

2. Tumour extending beyond the upper jaw with invasion into nasopharynx, cranium, pterygopalatine fossa (or) oral cavity.

5. Harrison classification (1978)

T_1 : Limited to antral mucosa without evidence of erosion of bone.

T_2 : Bone erosion but without involvement of the facial skin, orbit, ethmoid (or) pterygopalatine fossa.

T_3 : Involvement of orbit, ethmoids (or) facial skin.

T_4 : Tumour extension to the nasopharynx, sphenoid sinus, cribriform plate (or) pterygopalatine fossa.

6. American Joint Committee on Cancer (AJCC) Classification (1988) Primary tumour (T)

T_x : Minimum requirements to asses the primary tumour cannot be met.

T_0 : No evidence of primary tumour

T_{is} : Carcinoma in situ

T_1 : Tumours confined to the antral mucosa of the infrastructure with no bone erosion or destruction

T_2 : Tumour confined to the suprastructure mucosa without bone destruction, or to the infrastructure with destruction of medial (or) inferior bony walls only.

T_3 : More extensive tumour invading skin of cheek, orbit, anterior ethmoid sinus, (or) pterygoid muscles.

T_4 : Massive tumour with invasion of cribriform plate, posterior ethmoids, sphenoid, nasopharynx, pterygoid plates, base of skull (or) cranial nerves.

7. International Union for Cancer Control (UICC – 2002)

T_1 : Tumour limited to the maxillary sinus mucosa with no erosion or destruction of bone

T_2 : Tumour causing bone erosion or destruction Including extension into the hard palate and/or middle nasal meatus, except extension to posterior wall of maxillary sinus, subcutaneous tissues, floor or medial wall of orbit, pterygoid fossa, ethmoid sinuses

T_3	:	Tumour invades any of the following: Bone of the posterior wall of maxillary sinus, subcutaneous tissues, floor or medial wall of orbit, pterygoid fossa ethmoid sinuses
T_{4a}	:	Tumour invades anterior orbital contents, skin of cheek, pterygoid plates infratemporal fossa, cribriform plate, sphenoid or frontal sinuses
T_{4b}	:	Tumour invades any of the following: Orbital apex, dura, brain, middle cranial fossa, cranial nerves other than maxillary division of trigeminal nerve V nasopharynx or clivus

REVIEW OF LITERATURE

Syme et al, reported in ***1828***, a successful performance of total maxillectomy with orbital exenteration.

In ***1906, Sebileau***, described a classification for maxillary sinus neoplasms.

Ohngren et al in 1933, divided the facial skeleton as seen in profile from inner canthus of the eye to the angle of mandible creating posterosuperior and anteroinferior sectors.

In ***1943, Windeyer*** described deep x-ray exposure followed in 4 weeks by removal of the palate and alveolus.

In the same year, ***Lederman*** used palatal fenestration with intracavitary radium therapy.

In 1952, as advances in surgical techniques, anaesthesia, blood replacement and antibiotics reduced, the mortality rate of radical maxillectomy, the trend switched to radical surgery combined with radiation.

Sisson and colleagues in 1963, developed a TNM system for classification of antral carcinomas.

Harrison in 1978 developed a staging system based on presence of bony erosion with subsequent spread.

Parsons C et al in 1979 reviewed 32 patients with histologically proven malignancy of maxilla and studied the CT scans. The radiological features of tumour were sinus opacification, a soft- tissue mass, bone erosion and/or displacement, sclerosis, and new- bone formation. Measurements of tissue densities were not helpful in distinguishing tumour from benign disease. Significantly greater tumour extent was demonstrated by CT than by conventional methods in 15 patients; the additional tumour most commonly involved the pterygoid region or orbit.

Som PM in 1981 showed that although bowing of the posterior antral wall occurs most commonly with juvenile angiofibroma, it can occur with any slow growing noninvasive lesion involving the retromaxillary region. Cases of schwannomas, a lymphoepithelioma, and a fibrous histiocytoma are presented as examples of the nonspecificity of the antral bowing sign.

In ***1984, Weber AL,*** and ***Stanton AC*** showed that malignant tumours of the paranasal sinuses are often found to be greatly advanced by the time a clinical or radiologic diagnosis is established. Therefore, the

overall cure rate is low, even when surgery and radiation therapy are combined. The clinical manifestations and pathologic findings are analyzed in 200 cases to illustrate the wide spectrum of these tumours as to their type, specific location, and the extent to which they can spread within the sinuses and to adjacent anatomic areas.

Johnson et al in 1984, reviewed 79 patients with sinus and paranasal sinus tumours. Forty -seven of 79 patients with sinus and paranasal sinus had clinical, radiographic or operative evidence of orbital involvement. Seventy percent of those patients with orbital extension had clinical or radiographic involvement of the orbit at the time of initial presentation. The most common tumour seen was squamous cell carcinoma. The maxillary sinus was the most frequent site of origin. A diagnosis of sinusitis is tentative and should be reevaluated early with repeat roentgenographic studies and biopsy, especially in the presence of protracted facial and eye pain. When ordering CT scans, one must specifically request cuts of the base of the sinuses and skull as routine brain CT scans do not evaluate those regions.

Larheim et al in 1984, made comparison between the frequency of alveolar bone-palate destruction caused by carcinomas originating in the maxillary sinus (31 patients), palate (15) and maxillary gingiva (9). Radiographic examination included conventional sinus projections,

supplemented with hypocycloid tomography (47), computed tomography (28) and orthopantomography (11). Almost every second tumour presenting with alveolar bone involvement appeared to be a maxillary sinus cancer. Gingival and palatal cancers also caused frequent bone destruction. Radiographic examination, including tomography, was of great value in demonstrating the extent of these tumours. Three cases clinically diagnosed as gingival cancers proved to originate in the maxillary sinus.

In ***1986, Kondo M, Ando Y*** did a study on maxillary squamous cell carcinomas staged by CT scans. In 72 patients with maxillary squamous cell carcinoma, computed tomography (CT) alone was used for T-staging according to the AJC classification. Five, 31, and 36 tumours were diagnosed as T2, T3, T4, respectively. Addition of maxillectomy to treatment seemed to have improved the local prognosis in T3 and T4 tumours. High radiation doses of 60 Gy or more seemed to be beneficial for patients with T3 tumours and without maxillectomy. CT will be of great help in classifying tumours objectively. But more importantly, it will reveal respectability and dictate treatment of choice by delineating the tumour extent precisely.

Graber HR et al, in 1986, illustrated the CT appearances of malignant tumours of paranasal sinus on the basis of 15 patients and

discussed the differential diagnoses. Malignant soft tissue tumours in the paranasal sinuses are characterised on CT by their non homogeneous structure; they may destroy the bony margins of the sinus and infiltrate neighbouring regions in certain preferred directions, and they may enhance following the administration of contrast. Precise definition of the malignant tumour by CT permits their exact staging, may help to determine therapy and is valuable for serial observation. It remains to be seen, however, whether the improved radiological diagnosis results in improved prognosis of malignant tumours of the paranasal sinuses.

In ***1991, Ben Achour, et al,*** reported about a retrospective study on 52 cases of malignant tumours of the maxillary sinus gathered from January 1, 1977 to December 31, 1985 in the Department of Cervicofacial and ENT Carcinological Surgery of the Salah Azaiz Institute in Tunis. Epidermoid carcinomas dominate, but the histological types encountered are quite various; the tumours are very advanced on the first consultation in most cases. Computed tomography was a great help to assess extension prior to treatment and during follow-up. The evolution involved frequent recurrence and a great number of deaths during the first year.

Pera Ramon E et al in 1991, described 2 cases of adenocarcinoma of nasal cavities and paranasal sinuses. Adenocarcinomas are most often

seen in the middle turbinate and ethmoid sinus. He reported 2 cases and discussed its clinical findings, the treatment and possible etiologies.

Shibuya H in 1991 discussed CT features of second cancers of the maxillary sinus. Five patients with a second maxillary cancer (squamous cell carcinoma), which developed 6 to 17 years after initial treatment for the first cancer on the opposite side, were compared with 21 control cases with a primary cancer on the basis of computed tomography (CT) findings. Generally, the second cancer was found at an earlier stage. The specific CT findings of early sinus carcinoma were uneven soft tissue distribution in the antrum and tumour permeation with bone fragments remaining at the original tumour site. These findings may be helpful for distinguishing this cancer from benign chronic sinusitis and/or other malignant sinus disease. The pterygoid process, medial bony wall, and ethmoid sinus had a tendency to be spared in most of the 5 patients with second maxillary cancer compared to the 21 control cases.

Sakaguchi M, Moriya K et al, in 1993, reported a 68-year-old male with a rare case of synchronous bilateral carcinomas of the maxillary sinus. A CT scan revealed a large tumour mass that extruded from the left maxillary sinus; tissue of soft density filled the right antrum which had intact bony walls. A probe antrostomy on the right side disclosed a tumour which was diagnosed histologically as the same

poorly differentiated squamous cell carcinoma as that in the left antrum. The incidence and aetiology of this disorder are presented, and its diagnosis and management are discussed.

In ***1993, Ichimura et al*** evaluated Trismus in patients with malignant tumours in the head and neck. 21 patients manifesting trismus out of 212 patients with malignant tumours in the head and neck (treated in Tokyo University Branch Hospital from 1983 to 1991) were reviewed. Nine patients developed trismus either by infiltration of the muscles of mastication or by reflex spasm. Trismus was considered to have developed as a result of irradiation in five cases and of surgical intervention in seven cases. Maxillary sinus tumours were often without trismus even when they extended posteriorly to the infratemporal fossa.

Wang P et al in 1997 discussed the CT examination and diagnosis of oral and maxillofacial tumour invading pterygopalatine fossa. CT findings in 33 cases (proven histopathologically) suffered from oral and maxillofacial tumours affecting the pterygopalatine space were retrospectively analyzed. The authors conclude that the main CT manifestations of this space involvement by tumours can be depicted as a soft tissue mass occupancy and the wall structures destruction. Tumours occurring in different locations of oral and maxillofacial areas have

different features of CT appearances. As a modality of imaging, CT has an important role for assessing the lesions of this fossa.

Ram B, Saleh HA in 1998, described rare case of verrucous carcinoma of maxillary antrum. Verrucous carcinoma is a distinct variant of well differentiated squamous cell carcinoma. Its occurrence in the maxillary antrum is rare. Only three cases have previously been documented. We present a case report of verrucous carcinoma in the maxillary antrum and a review of the literature.

MATERIALS AND METHODS

The study was done in Upgraded Institute of Otorhinolaryngology, Government General Hospital, Chennai from July 2003 to Dec 2004.

Out of the patients who attended the outpatient department during the period, those with symptoms and signs suggestive of malignant tumour of maxillary sinus were screened further.

After thorough clinical examination, the patients were subjected to diagnostic nasal endoscopy and CT scan of the paranasal sinus.

A diagnostic nasal endoscopy and biopsy was done. Those with histologically confirmed malignancy were selected for the study.

The total number of 20 patients were selected for the study and their peroperative findings were noted.

Depending on the clinical assessment of the extent of the tumour and the condition of patient, treatment was planned and executed. Curative treatment consisted of surgery followed by radiotherapy.

The surgeries performed were total maxillectomy, total maxillectomy with orbital exenteration.

Patient were advised to report for a followup regularly at intervals of monthly duration of first 6 months and once in 3 months of the next 1 year.

The symptoms of the patients were categorized into five groups.

Group I : Oral symptoms like dental pain in premolars and molars, malocclusion, loosening of tooth, trismus, oro-antral fistula's ulceration of the palate (or) alveolar ridge and ill fitting denture

Group II : Nasal symptoms like unilateral nasal obstruction, unilateral nasal discharge and chronic epistaxis

Group III : Ocular symptoms like exopthalmos, diplopia, impairment of vision and epiphora

Group IV : Facial symptoms like cheek swelling numbness (or) paraesthesia of cheek skin, skin ulceration, widening of nasal dorsum and widening of intercanthal distance.

Group V Neurological symptoms not found in other groups like headache, unilateral anosmia, pain and numbness over the face due to involvement of entire maxillary division of V nerve and rare occurrence of VII and VIII palsy

The clinical examination and findings were done in the following order uniformly :

1) Examination of nasal cavity and noting of any intranasal mass (or) medial displacement of lateral nasal well.

2) Examination of oral cavity, which includes, inspection and palpation of hard palate, maxillary teeth, alveolar and gingivobuccal sulcus.

3) Visualization of nasopharynx and choana

4) Examination of the cheek for the presence of mass, inflammation (or) involvement of infraorbital nerve.

5) Assessment of visual acuity, extra – ocular movements and displacement of the globe.

6) Examination of the ear for otitis media with effusion

7) Performing a cranial nerve examination

8) Examination of neck for regional lymph nodes.

Imaging

CT scan paranasal sinuses were done in all 20 patients (coronal and axial view, plain and contrast)

Attenuation values in the range of 30 – 90 HU were considered positive for growth and their extent noted.

Involvement of antral mucosa, alveolar, hard palate, orbital floor, lamina papyraceae, orbital apex, nasal cavity, anterior and posterior ethmoidal cell; nasopharynx, sphenoid, cribriform plate, upper deep cervical submandibular lymphnodes, pterygoid plates and infratemporal fossa were noted.

During surgery, the exact extent of tumour involvement noted.

PROFORMA

Name : Age : Sex : IP.No :

Occupation : Socioeconomic Status

- Low / Middle / High

Address :

Symptoms : Yes No

- Oral Symptoms
- Nasal Obstruction
  - Epistaxis
  - Others
- Orbital symptoms
- Cheek swelling
  - Anaesthesia / Paraesthesia
  - Ulcer
- Neurological symptoms

Signs Yes No

- Hard palate
  - Maxillary tooth loosening
  - Alveolar
  - Gingivobuccal sulcus
  - Mouth opening

Yes No

- Nasal Mass

  Choana

  Nasopharyngeal extension

  Otitis media with effusion

- Displacement of globe

  Restriction of extraocular movements

  Change in Visual Acquity

- Mass in the Check

  Anaesthesia / Paraesthesia

  Ulceration of Skin

  Peau de orange

- Involvement of

  Maxillary N

  VII N

  VIII N

- Lymphnode

  Upper Deep cervical

  Submandibular

RADIOLOGICAL FINDINGS

Involvement of	Yes	No
▪ Antral mucosa		
▪ Alveolar		
Hard palate		
▪ Orbital floor		
Lamina Papyraceae		
Orbital Apex		
▪ Middle Meatus		
Anterior ethmoidal cells		
Posterior ethmoidal cell		
Nasopharynx		
Sphenoid		
Cribriform plate		
▪ Nerve involvement		
▪ Lymph node		
- Upper deep cervical		
- Submandibular		
▪ Pterygoid plate		

Diagnosis :

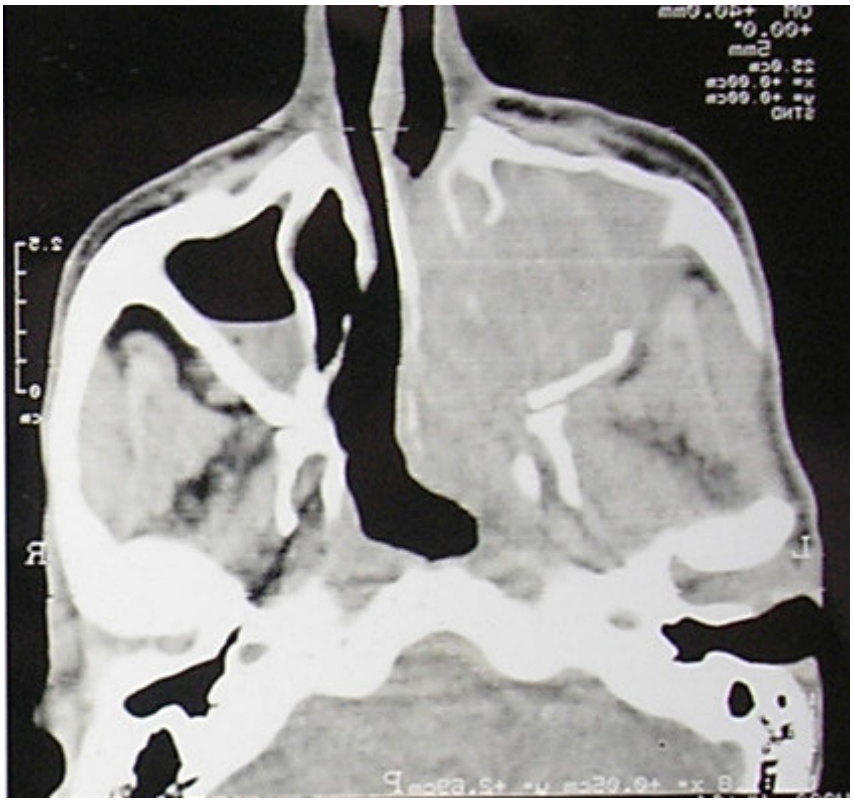
Operative Procedure :

PER – OPERATIVE FINDINGS

Involvement of	Yes	No
▪ Antral mucosa		
▪ Alveolus		
▪ Hard palate		
▪ Orbital floor		
Lamina papyraceae		
Orbital Apex		
Orbital Periosteum		
▪ Skin of cheek		
▪ Middle meatus		
Anterior ethmoidal cells		
Posterior ethmoidal cells		
Nasopharynx		
Sphenoid		
Cribriform plate		
▪ Nerve involvement		
▪ Pterygoid muscle		
Pterygoid plate		
Intratemporal fossa		
Skull base		

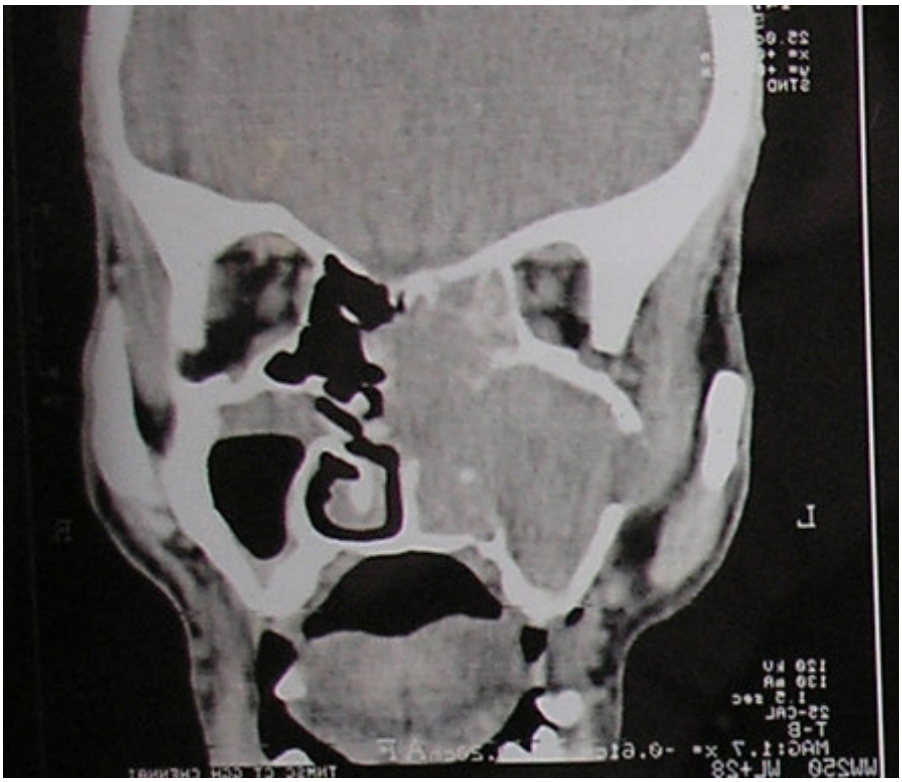
CT SCAN PARANASAL SINUS

INVOLVEMENT OF THE TUMOUR IN THE NASAL CAVITY AND MAXILLARY SINUS WITH EROSION OF THE PTERYGOID PLATE

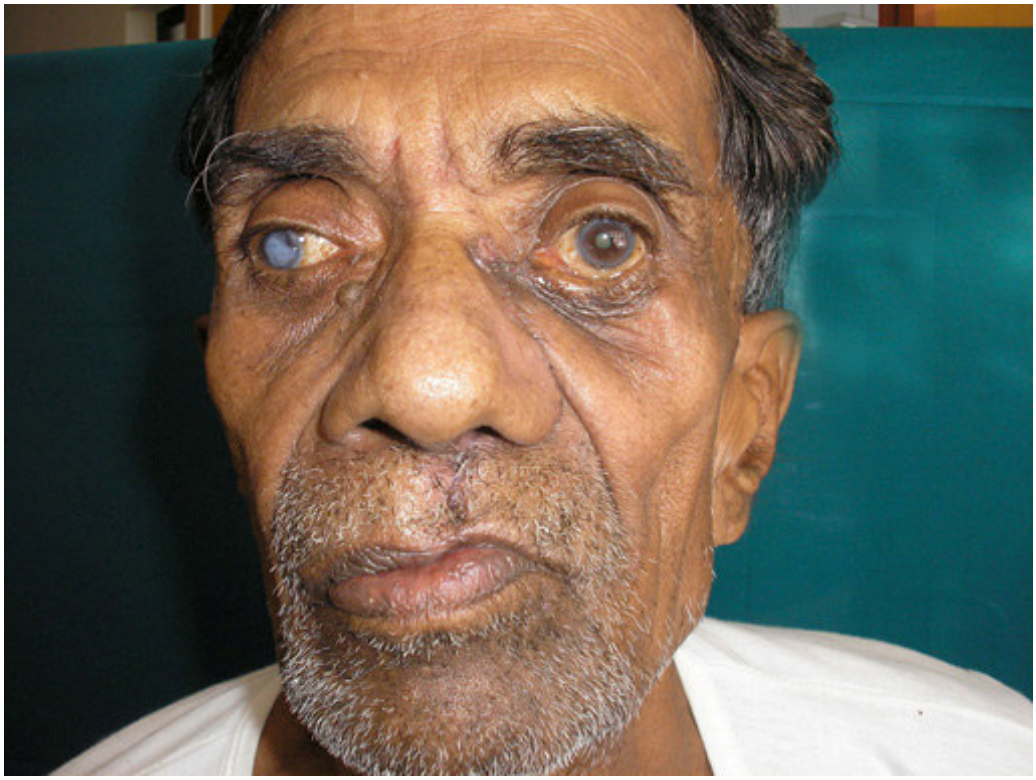


CT SCAN PARANASAL SINUS

INVOLVEMENT OF THE TUMOUR IN THE NASAL CAVITY AND MAXILLARY SINUS WITH EROSION OF THE POSTEROLATERAL WALL WITH EXTENSION INTO THE ANTERIOR ETHMOID AIR CELLS.



POST OPERATIVE PICTURE



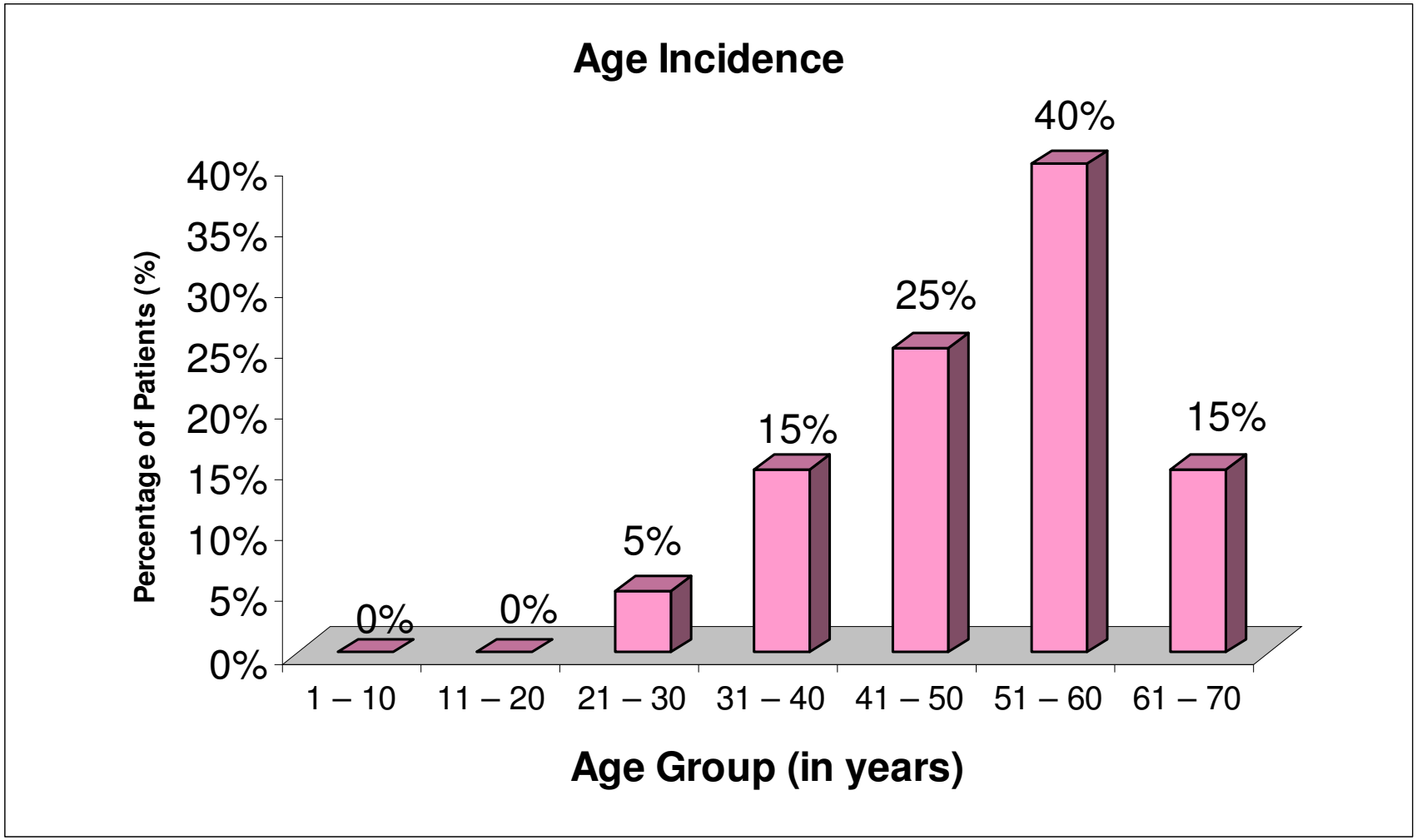
OBSERVATION

AGE INCIDENCE

The maximum age of the patient in the study was 65 years and minimum was 29 years.

Age in years	No. of Patients	Percentage
1 – 10	0	0
11 – 20	0	0
21 – 30	1	5%
31 – 40	3	15%
41 – 50	5	25%
51 – 60	8	40%
61 – 70	3	15%

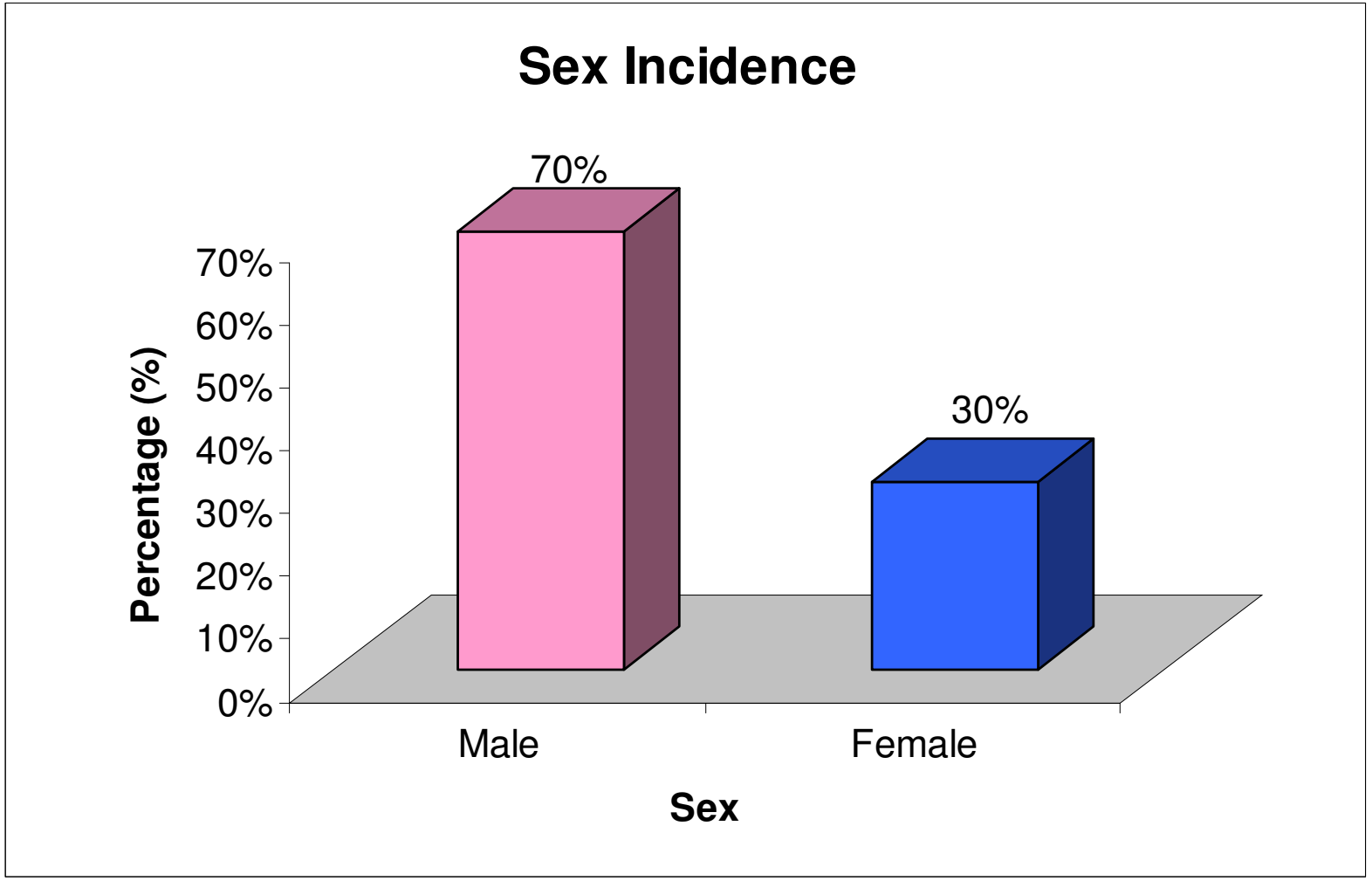
Patients belonging to fifth and sixth decade of life had the maximum incidence (i.e.) 65%.


Age Incidence
Percentage of Patients (%)
40%
35%
30%
25%
20%
15%
10%
5%
0%
0%
0%
5%
15%
25%
40%
15%
1 – 10
11 – 20
21 – 30
31 – 40
41 – 50
51 – 60
61 – 70
Age Group (in years)

SEX INCIDENCE

Sex	No. of Patients	Percentage
Male	14	70%
Female	6	30%

Around 3/4th of our patients were males


Sex Incidence
70%
30%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage (%)
Male
Female
Sex

DURATION OF COMPLAINTS

Duration	No. of cases	Percentage
1 – 29 days	0	0
1 – 3 months	4	20%
4 – 6 months	11	55%
7 – 12 months	4	20%
1 – 1 ½ years	1	5%
1 ½ - 2 years	0	0

Most of the patients presented to our OP department at 4 to 6 months duration. i.e., 55%.

INCIDENCE OF DIFFERENT SYMPTOMS

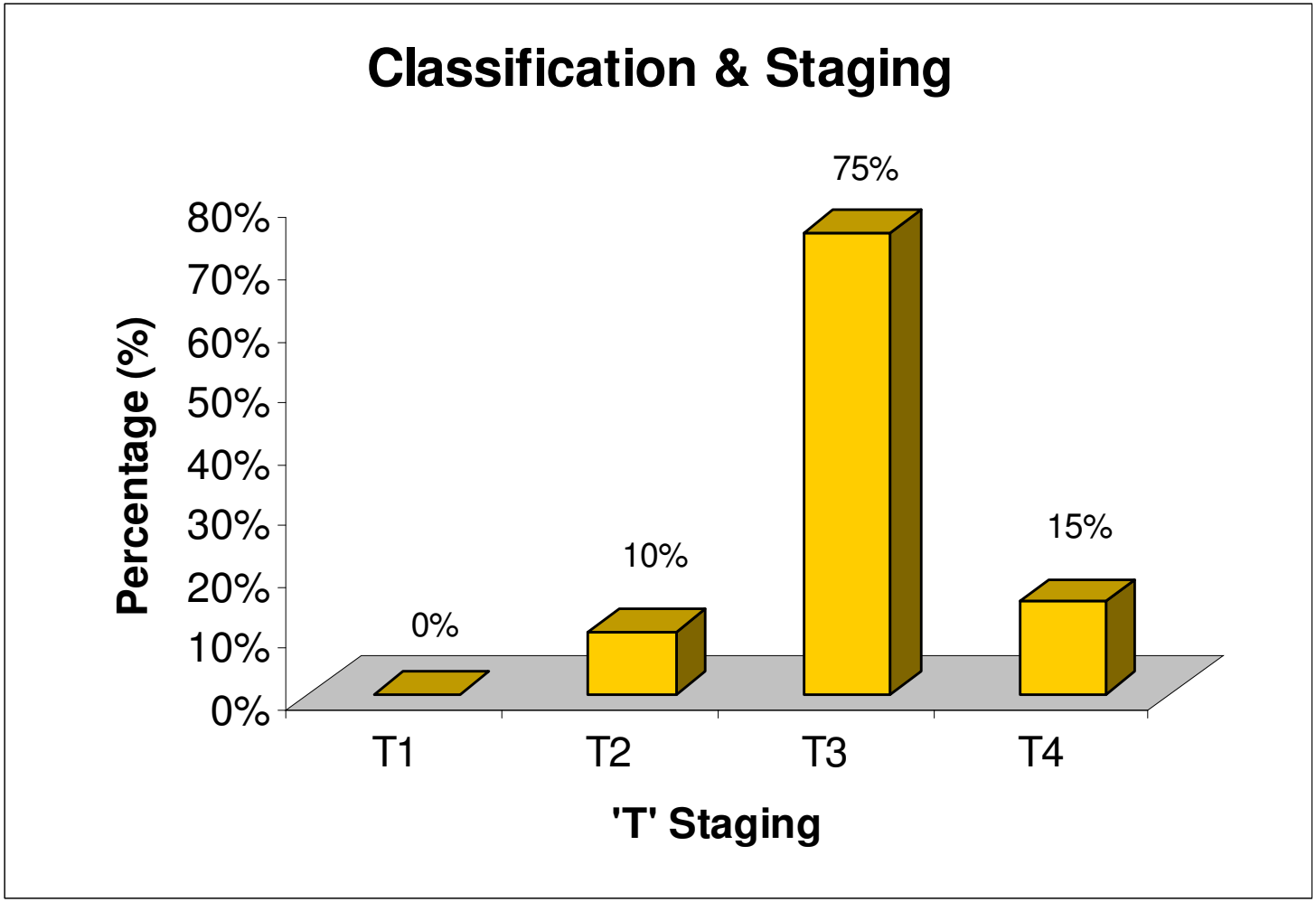
Symptoms	No. of cases	Percentage
Oral	12	60%
Epistaxis	15	75%
Nasal Obstruction	13	65%
Cheek swelling	10	50%

Only common symptoms are noted above. The symptoms in order to frequency are epistaxis, nasal obstruction, nasal disturbances oral symptoms and cheek swelling. More than one symptoms were present in all cases.

CLASSIFICATION AND STAGING

TNM staging	No. of cases
T_1	0
T_2	2
T_3	15
T_4	3
N_0	20
N_1	0
M_0	20

We classified these tumours along the UICC classification. Majority of the lesions were T3 lesions. None of the patients in our study had regional neck nodes and distal metastasis.


Classification & Staging
Percentage (%)
80%
70%
60%
50%
40%
30%
20%
10%
0%
0%
10%
75%
15%
T1
T2
T3
T4
'T' Staging

HISTOLOGICAL CLASSIFICATION

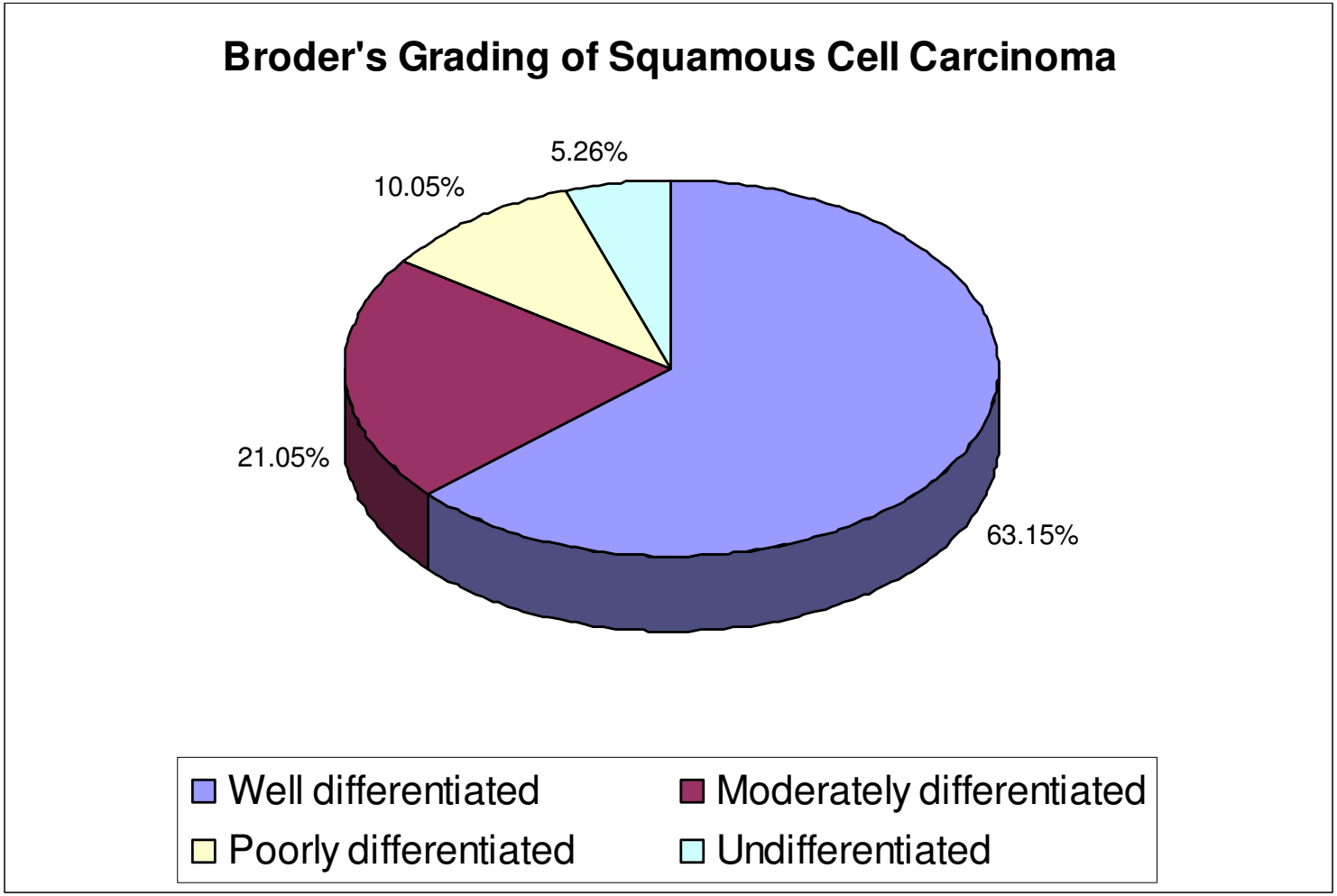
Type	No. of cases	Percentage
Squamous cell carcinoma	19	95%
Adenoid cystic carcinoma	1	5%

Majority of cases were squamous cell carcinoma (i.e.,) 95%.

BRODER'S GRADING OF SQUAMOUS CELL CARCINOMA

Type	No. of cases	Percentage
Well differentiated	12	63.15%
Moderately differentiated	4	21.05%
Poorly differentiated	2	10.05%
Undifferentiated	1	5.26%

Majority of the patients in our study had well differentiated squamous cell carcinoma. Only one patient had undifferentiated carcinoma.


Broder's Grading of Squamous Cell Carcinoma
5.26%
10.05%
21.05%
63.15%
Well differentiated
Moderately differentiated
Poorly differentiated
Undifferentiated

CT SCAN PNS

	No. of cases	**Percentage**
CT PNS showing bony erosion	18	90%

CT scan showed bony erosion in 18 patients. In 2 cases in which no erosion was seen, there was cloudiness and soft tissue shadow in the maxillary sinus.

SYMPTOMS AND SIGNS AND STAGE OF DISEASE

Symptoms and signs	T1	T2	T3	T4	Total
Oral	0	2	8	3	13
Nasal	0	2	10	6	18
Orbital	0	0	7	2	9
Facial	0	0	8	2	10
Neurological	0	0	0	3	3

Of the 13 patients presenting with oral symptoms and signs, 8 come under T3, 3 under T4 and 2 under T2. Eventhough oral involvement starts with T2, it is observed that most patients with oral symptoms come under T3 and next comes T4.

18 patients presented with nasal symptoms and signs. Out of them 10 belong to T3, 6 to T4 and two in T2.

9 patients presented with orbital symptoms and signs. Out of them 7 belong to T3 while 2 belong to T4.

10 patients presented with facial symptoms and signs. Out of them 8 belong to T3 while 2 belong to T4.

Only 3 patients presented with neurological symptoms and signs and all the 3 belong to T4.

CLINICAL STAGING AND PEROPERATIVE STAGING

Peroperative Stage / Clinical Stage	T1	T2	T3	T4	Total
T1	0	0	0	0	0
T2	0	2	0	0	2
T3	0	0	12	3	15
T4	0	0	0	3	3
Total	0	2	12	6	20

Two patients belonging to clinical T2 correlate well with peroperative T stage. Out of the 15 clinical T3 tumours, 12 belong to peroperative T3 and 3 belong to per operative T4. All the clinical T4 belong to peroperative T4.

RADIOLOGICAL STAGING AND PER – OPERATIVE STAGING

Peroperative Stage / Radiological Stage	T1	T2	T3	T4	Total
T1	0	0	0	0	0
T2	0	2	0	0	2
T3	0	0	8	0	8
T4	0	0	4	6	10
Total	0	2	12	6	20

Two patients belonging to radiological T2 correlated well with peroperative T stage. All the 8 radiological T3 belong to peroperative T3. Out of the 9 radiological T4 tumours, 3 belong to peroperative T3 and 6 belong to peroperative T4.

CLINICAL STAGING AND PROGNOSIS

Clinical stage	3 months	6 months	1 years	2 years
T1	0	0	0	0
T2	2/2	2/2	2/2	1/1
T3	15/15	12/13	9/10	7/8
T4	3/3	3/3	2/2	1/2
No. of cases followed up	20	18	14	11

The patients were followed upto a maximum of 2 years. All patients belonging to clinical T2 has 100% survival rate upto 2 years. In T3 clinical staging, 15 out of 15 survived. 3 months follow up, 12 out of 13 survived 6 months follow up, 9 out of 10 survived 1 year follow up and 7 out of 8 survived in 2 years follow up.

In T4 clinical stage 3 out of 3 survived 3 months follow up, 3 out of 3 survived 6months, follow up 2 out of 2 survived 1 years follow up and 1 out of 2 survived for 2 years.

DISCUSSION

Malignant tumours of the maxillary sinus forms less than 2% of ENT malignancy.

AGE INCIDENCE

Majority of the cases presented in the later decades of life (i.e) in the 5^{th} and 6^{th} decades (65%). This compares favourably with studies carried out by other authors. Gallengher and Boles in their study of 60 cases carried out at Michigan Hospital, found an average age of 62.5 years with maximum incidence in 6^{th} decades.

SEX INCIDENCE

In our study 20 patient, there were 14 males and 6 female. 70% of the patients were males, which correlates well with other studies.

INCIDENCE OF VARIOUS SYMPTOMS

Malignant tumours of maxillary sinus presents with wide range of symptoms. The symptoms occur only when the tumour breaches the bony walls maxilla. Due to its peculiar anatomy it often mimics other common and benign conditions. Thus it is invariably diagnosed at an advanced

stage making treatment difficulty and ineffective. So an attempt was made to find out the common symptoms thereby we can have a high degree suspicion when patients presents with these symptoms and diagnose it at an earlier stage.

In this study, it was found that epistaxis was the commonest symptom, followed by nasal obstruction, dental and facial symptoms. Oral ulcer and facial pain were found to be rare in comparison to above symptoms. So when an elderly patient present with nasal obstruction and epistaxis, carcinoma maxillary sinus should be suspected. This may help in early diagnosis.

TNM STAGING

TNM staging system is a useful parameter on which treatment protocol can be based. It also helps to compare the results and standardize disease states. In our study 15 out of 20 patients had T3 lesions (i.e.) 75%. The remaining were T2 and T4 (around 25%) with no T1 case. None of the patients in our study had regional lymphnodes (N0).

Other series show the following occurrence

S. No.	Series	T1	T2	T3	T4
1.	Gallengher & Boles	1	12	32	11
2.	Rehan	0	8	16	6
3.	Lee & Ogura	5	11	18	13
4.	Present Study	0	2	15	3

HISTOPATHOLOGY

Histopathological diagnosis was done in all the cases which presented to us and malignancy was proven in all these cases (i.e.) 100%. Of these 19 patients (i.e.) 95% patients had squamous cell carcinoma. Only one patient had adenoid cystic carcinoma.

In patients with squamous cell carcinoma, Broder's grading was used to grade the percentage of undifferentiated cells. About 63% of the cases belonged to well differentiated grade which was most common.

SYMPTOMS AND SIGNS AND STAGE OF THE DISEASE

Symptoms in malignant tumours of maxillary sinus depends on the direction of spread. A malignant tumour which spreads superiorly presents with orbital symptoms and the which spreads medially present with nasal symptoms.

Even though oral involvement starts with T2, it is observed that most patients with oral symptoms and signs come under T3 and next comes T4. It implies that involvement of hard palate and floor of maxillary need not always produce oral symptoms and when oral symptoms occur the lesion becomes more extensive.

Nasal symptoms and signs are common presentation of malignant tumours of maxilla in our study. Even though involvement of middle meatus comes under T2, most of patients, when they present with nasal symptoms and signs, belong to T3 (or) more due to quick spread to anterior ethmoid cells and other structures.

Involvement orbit elevates the T status to T3. When the patients delays their visit to the surgeon, this may advance to T4. So patients with

orbital symptoms and signs has almost equal possibility that he belongs to T3 (or) T4.

Facial symptoms produce gross disfigurement and brings the patient to the surgeon at the beginning of symptom. Most of the patients with facial symptoms and signs belong to T3.

Patients who had Group V symptoms (or) neurological symptoms belonged to T4. So neurological symptoms and signs correlate well with T stage of disease.

CLINICAL AND RADIOLOGICAL STAGING

Both clinical and radiological staging correlates well with peroperative staging in T1 and T2 tumour.

Some of the clinical T3 tumours belong to T4 peroperatively and all clinical T4 correlate well with peroperative staging. Thus clinical staging tends to understage for advanced tumour.

All the radiological T3 tumours come under peroperative T3. Whereas, some of the radiological T4 tumours belong to T3 peroperatively. This is because a haziness in the posterior ethmoids and sphenoid in CT PNS cannot be easily differentiated from a tumour or

mucosal thickening. Hence radiological staging tend to overstage for advanced tumour.

This evaluation may help in predicting the approximate extent of disease per operatively.

CLINICAL STAGING TO PREDICT PROGNOSIS

In our setup, we followed up 90% of patients at 6 months, 70% of patients of 1 year and 60% of patients at 2 year.

In our study, patients with T3 tumour had around 53% survival rate at 2 years. Rehan et al (2000) also reported a 50% survival rate at 2 years.

CONCLUSION

Malignant tumours of maxillary sinus present in a quite advanced stage, even though the duration symptoms may be less. The tumour is usually more extensive than the symptomatology and clinical examination suggests. The low success rate may be due to advanced tumour at the time of diagnosis.

Symptoms and signs have important role in detecting malignant tumours of maxillary sinus earlier and in improving the outcome of the treatment.

Nasal symptoms are the commonest symptom and majority of the patients presenting with nasal symptoms belong to T3 and above even at initial presentation.

Clinical staging tends to understage and radiological staging tends to over stage the tumour.

Complete surgical removal of tumour with postoperative radiation therapy remains the gold standard for resectable lesions.

Maintaining a high suspicion while treating patients with prolonged unexplained nasal problems could help in improving the success rate in malignant tumours of maxillary sinus.

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MASTER CHART

S. No.	Name	Age / Sex	Symptoms	Signs	Radiological Findings	Per-operative Findings	Histo-pathological grading	T Stage		
								Cli	Radio logical	Per Op.
1.	Mr.Subramani	62/M	Oral, Epistaxis	Maxillary tooth loosening	Involvement of antral mucosa and alveolus	Involvement of antral mucosa and alveolus	Squamous cell carcinoma, Well differentiated	T2	T2	T2
2.	Mr.Periannan	55/M	Oral	Palatal bulge	Involvement of antral mucosa and alveolus	Involvement of antral mucosa and alveolus	Squamous cell carcinoma, Moderately differentiated	T2	T2	T2
3.	Mrs.Anjalatchi	58/F	Oral, Nasal Obstruction, Epistaxis	Ulcer over the hard palate and alveolar	Involvement of antral mucosa and alveolus, middle meatus, AEC.	Involvement of antral mucosa and alveolus, hard palate, middle meatus, AEC	Squamous cell carcinoma, Moderately differentiated	T3	T3	T3
4.	Mrs.Meenakshi	33/F	Oral, Epistaxis, Cheek swelling	Maxillary tooth loosening, nasal mass, cheek anaesthesia	Involvement of antral mucosa and alveolus, orbital floor middle meatus, AEC.	Involvement of antral mucosa and alveolus, orbital floor middle meatus, AEC. Pterygoid muscle	Squamous cell carcinoma, Well differentiated	T3	T3	T3
5.	Mrs.Malliga	50/F	Oral, Epistaxis, Nasal Obstruction	Hard palate erosion, trismus	Involvement of antral mucosa and alveolus, pterygoid fossa	Involvement of antral mucosa alveolus, hard palate pterygoid fossa ethroid sinus	Squamous cell carcinoma, Well differentiated	T3	T3	T3

S. No.	Name	Age / Sex	Symptoms	Signs	Radiological Findings	Per-operative Findings	Histo-pathological grading	T Stage		
								Cli	Radio logical	Per Op.
6.	Mr.Loganathan	31/M	Oral, Epistaxis	Nasal Mass, proptosis	Involvement of antral mucosa, alveolus, orbital floor, middle meatus, AEC, PEC, Sphenoid.	Involvement of antral mucosa, alveolus, orbital floor, middle meatus, AEC	Squamous cell carcinoma, Well differentiated	T3	T4	T3
7.	Mr. Shankar	38/M	Nasal Obstruction, Epistaxis, cheek swelling	Gingivo buccal sulcus obliteration, nasal mass, cheek anaesthesia	Involvement of antral mucosa, alveolus, and sub cutaneous tissue of cheek	Involvement of antral mucosa, alveolus, anterior ethmoid sinus	Squamous cell carcinoma, Well differentiated	T3	T3	T3
8.	Mr.Krishnan	55/M	Oral, Epistaxis, cheek swelling	Obliteration of gingivobuccal sulcus mass in cheek anaesthesia	Involvement of antral mucosa, orbital floor, middle meatus, AEC.	Involvement of antral mucosa, orbital floor, middle metaus, AEC.	Squamous cell carcinoma, Well differentiated	T3	T3	T3
9.	Mr.Krishnan	41/M	Oral, Epistaxis, Cheek Swelling	Hard palate erosion, cheek mass	Involvement of antral mucosa, alveolus, hard palate, middle meatus, AEC, PEC, Sphenoid	Involvement of antral mucosa, alveolus, hard palate, middle meatus, AEC, Subcutaneous tissue of cheek	Squamous cell carcinoma, Well differentiated	T3	T4	T3
10.	Mr.Duraisamy	43/M	Oral, Epistaxis, Cheek swelling	Palatal bulge, trimus, nasal mass, cheek anaesthesia	Involvement of antral mucosa, alveolar, hard palate, middle meatus, AEC.	Involvement of antral mucosa, alveolus, hard palate, middle meatus, AEC	Squamous cell carcinoma, Well differentiated	T3	T3	T3

S. No.	Name	Age / Sex	Symptoms	Signs	Radiological Findings	Per-operative Findings	Histo-pathological grading	T Stage		
								Cli	Radio logical	Per Op.
11.	Mr.Rangasamy	65/M	Nasal Obstruction, Cheek Swelling	Hard palate, erosion, mass in cheek, cheek anaesthesia, nasal mass	Involvement of antral mucosa, hard palate, orbital floor, AEC, PEC, middle meatus, pterygoid plate	Involvement of antral mucosa, hard palate, orbital floor, AEC, middle meatus, pterygoid fossa	Squamous cell carcinoma, Well differentiated	T3	T4	T3
12.	Mrs.Annama	60/F	Nasal Obstruction, Watering of eye	Nasal mass	Involvement of antral mucosa, middle meatus, AEC	Involvement of antral mucosa, middle meatus, AEC	Squamous cell carcinoma, Well differentiated	T3	T3	T3
13.	Mrs.Govindammmal	60/F	Oral, Epistaxis, Nasal Obstruction	Nasal mass, hard palate bulge	Involvement of central mucosa, alveolar middle meatus, AEC	Involvement of antral mucosa, alveolar, middle meatus, AEC	Squamous cell carcinoma, Moderately differentiated	T3	T3	T3
14.	Mr.Munusamy	45/M	Oral, epistaxis, Nasal Obstruction	Nasal Mass, Hard palate, Swelling	Invovlment of antral mucosa, alveolar, orbital floor, middle meatus, AEC, PEC, sphenoid	Invovlement of antral mucosa, alveolar, orbital floor, middle meatus, AEC.	Squamous cell carcinoma, Moderately differentiated	T3	T4	T3

S. No.	Name	Age / Sex	Symptoms	Signs	Radiological Findings	Per-operative Findings	Histo-pathological grading	T Stage		
								Cli	Radio logical	Per Op.
15.	Mr. Chennan	62/M	Nasal Obstruction, Epistaxis, Watering of eye	Nasal mass, proptosis	Involvement of antral mucosa, alveolus, orbital floor, lamina, papyracea, middle meatus, AEC, PEC, Sphenoid, pterygoid, plate, infratemporal fossa	Involvement of antral mucosa, alveolus, orbital floor, lamina, papyracea, middle meatus, AEC, PEC, Sphenoid, pterygoid, plate, infratemporal fossa	Squamous cell carcinoma, Well differentiated	T3	T4	T4
16.	Mr.Bala Subramanian	57/M	Nasal Obstruction, Epistaxis, Cheek Swelling	Palatal bulge, maxillary tooth, loosening, trismus, EOM restriction, mass in cheek, involvement of maxillary nerve	Involvement of antral mucosa, alveolus, hard palate, orbital, floor, lamina, papyracea, middle meatus, AEC, PEC, pterygoid, plate, infratemporal, fossa	Involvement of antral mucosa, alveolar, hard palate, orbital, floor, lamina, papyracea, middle meatus, AEC, PEC, pterygoid, plate, infratemporal, fossa	Squamous cell carcinoma, Well differentiated	T3	T4	T4
17.	Mr.Selvakumar	52/M	Nasal obstruction, Oral, cheek swelling	Hard palate erosion, alveolar erosion, nasal mass, trismus, proptosis, cheek swelling, involvement maxillary nerve	Involvement of antral mucosa, alveolus, hard palate, orbital floor, lamina papyraceae, middle meatus, AEC, PEC, sphenoid, pterygoid plate, infratemporal fossa	Involvement of antral mucosa, alveolus, hard palate, orbital floor, lamina papyraceae, middle meatus, AEC, PEC, sphenoid, pterygoid plate, infratemporal fossa	Adenoid cystic carcinoma	T3	T4	T4

S. No.	Name	Age / Sex	Symptoms	Signs	Radiological Findings	Per-operative Findings	Histo-pathological grading	T Stage		
								Cli	Radio logical	Per Op.
18.	Mr.Ramar	29/M	Nasal Obstruction, Epistaxis, cheek swelling, Watering of eye	Nasal Mass maxillary tooth loosening, cheek mass, cheek anaesthesia, proptosis	Involvement of antral mucosa, alveolus, orbital floor, lamina papyraceae, middle meatus, AEC, PEC, pterygoid plate, infratemporal fossa	Involvement of antral mucosa, alveolus, orbital floor, lamina papyraceae, middle meatus, AEC, PEC, sphenoid, pterygoid muscle, pterygoid plate infratemporal fossa	Squamous cell carcinoma, Undifferentiated	T4	T4	T4
19.	Mrs.Kanchana	41/F	Nasal Obstruction, Oral, Cheek Swelling	Palatal bulge, obliteration of gingivo buccal sulcus, trismus, nasal mass, cheek mass, proptosis, cheek anaesthesia, nasopharyngeal extension	Involvement of antral mucosa, alveolus, hard palate, orbital floor, middle meatus, AEC, PEC, sphenoid, nasopharynx.	Involvement of antral mucosa, alveolus, hard palate, orbital floor, middle meatus, AEC, PEC, sphenoid, nasopharynx.	Squamous cell carcinoma, Poorly differentiated	T4	T4	T4
20.	Mr.Annamalai	65/M	Nasal Obstruction, Epistaxis, Orbital, Neurological	Nasal mass proptosis, Nasopharynx extension	Involvement of antral mucosa, orbital floor, lamina papyracea, middle meatus, AEC, PEC, Nasopharynx, Sphenoid	Involvement of antral mucosa, orbital floor, lamina papyracea, middle meatus, AEC, PEC, Nasopharynx, Sphenoid, Orbital periosteum	Squamous cell carcinoma, Moderate differentiated	T4	T4	T4

KEY TO MASTER CHART

1. Cli.	-	Clinical
2. Per Op	-	Peroperative
3. AEC	-	Anterior ethmoidal cells
4. PEC	-	Posterior ethmoidal cells
5. OME	-	Otitis Media with Effusion
6. EOM	-	Extra Ocular Movements