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Diagnosis and Management of Common Oral and Maxillofacial Lesions

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1. Introduction

Diagnosis and management of oral and maxillofacial lesions is of paramount important to practicing surgeons. Multiple references and textbooks are needed to study these lesions. Herein we attempted to gather common pathological entities occurring in this region and describe the characteristics, clinical presentation, histopathology, diagnosis and management of each in one chapter. Epithelial tumors are presented first.

2. Epithelial tumors

Common epithelial tumors of concern to oral and maxillofacial surgeons are: Inverted papilloma, Squamous cell carcinoma, Pleomorphic adenoma, Mucoepidermoid carcinoma, Sinonasal undifferentiated carcinoma, Adenoid cyctic carcinoma, Basal cell carcinoma and Verrucous carcinoma.

2.1. lnverted papilloma

2.1.1. Clinical features

Inverted papillomas characteristically arise from the lateral nasal wall in the region of the middle turbinate or ethmoid recess, and often extend secondarily into the sinuses, especially the maxillary sinus. Nasal obstruction is the most common presenting symptom. Other manifestations include nasal drainage, epistaxis, anosmia, headaches (especially frontal), epiphora, proptosis and diplopia. Pain, on the other hand, is an uncommon initial complaint,

occurring in only about, 10% of all cases. When present, it should always arouse suspicion of secondary infection or malignant change (Fig. 1).[1,2]
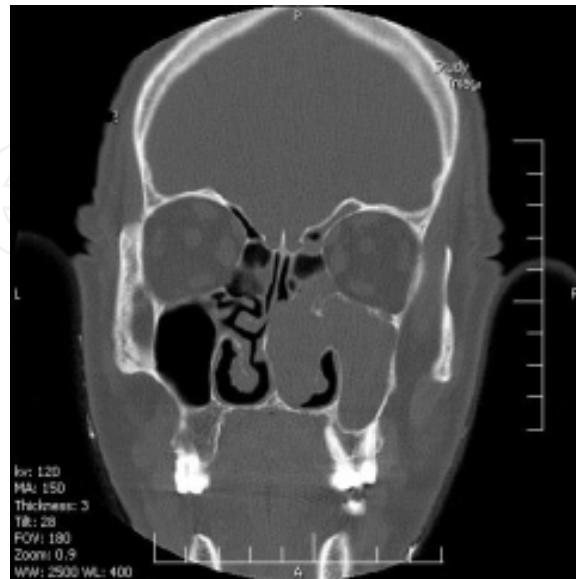
Figure 1. Inverted papilloma of the right nasal cavity and maxillary sinus.

2.1.2. Histopathology

Inverted papillomas are composed exclusively or almost exclusively of hyperplastic ribbons of basement membrane-enclosed epithelium that grow endophytically into the underlying stroma. Infrequently, a minor exophytic component may be seen. The epithelium is multilayered, usually 5-30 cells thick, and formed of squamous or ciliated columnar (respiratory epithelial) cells admixed with mucocytes. Nonkeratinizing squamous or transitional-type epithelium tends to predominate, and is often covered by a single layer of ciliated columnar cells (Fig. 2).[1,-3]

2.1.3. Treatment and prognosis

Complete surgical excision is the treatment of choice. Inadequate excision of lesions probably accounts for the local recurrence rate of 22-50% [1-,3]

2.2. Squamous cell carcinoma

2.2.1. Clinical features

Squamous cell carcinoma (SCC) of the jaws or antrum is not an uncommon malignancy. It is largely of unknown cause but may be related to known carcinogens. However, unlike squamous cell carcinomas in other head and neck sites, squamous cell carcinomas of the paranasal sinuses have been associated only weakly with tobacco use. It occurs more often in men (2–5 times) and affects individuals with a mean or median age of 60 to 65 years. Signs and
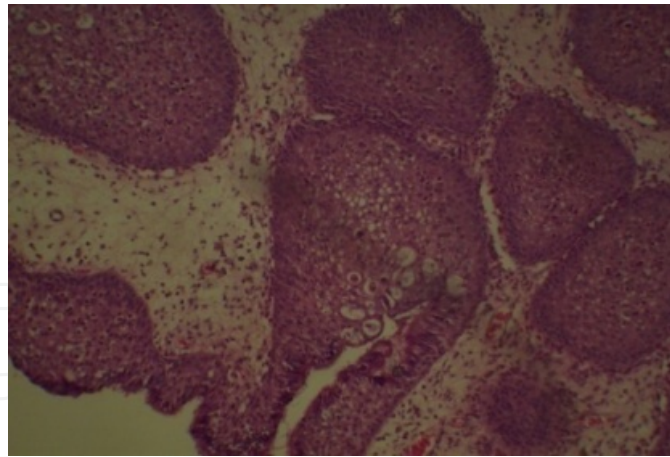
Figure 2. Inverted papilloma low power photomicrograph. Note epithelial-lined, duct-like structures that endophytically project into the underlying stroma

symptoms depend on the stage of the disease and direction of tumor growth. Early on, they are vague and often confused with other lesions. [1,3- 8] Complaints can be grouped into five categories: nasal, oral, ocular, facial, and neurological. Nasal manifestations include unilateral stuffiness, obstruction rhinorrhea, and epistaxis. Oral findings include pain referred to the upper premolar and molar teeth; loosening of the teeth; swelling or ulceration of the palate, alveolar ridge, or gingivobuccal sulcus; or a fistula. Common ocular features consist of swelling of the eyelids, excessive tearing, visual disturbances, and proptosis. Facial symptoms from involvement of the anterior wall of the sinus and are characterized by swelling and asymmetry of the cheeks. Neurological manifestations are often due to tumor infiltration of the branches of the fifth cranial nerve with subsequent numbness or paresthesia of the lips or cheek. Approximately 10% to 15% of patients present with positive regional lymph nodes, usually the upper jugular, submandibular and retropharyngeal. Distant metastases at the time of diagnosis, however, are uncommon [9-11] Clinically, it usually appears exophytic with an indurated margin. Extension into structures, such as the tongue, cheek, oral cavity, alveolus or palate, infratemporal fossa, and periorbital soft tissue, is not uncommon (Fig. 3). [1,3-8]

Figure 3. Squamous cell carcinoma ulcerated lesion of the hard palate

2.2.2. Radiographic features

Computed tomography and MRI are indispensable, not only in determining the extent of disease, but also in assisting the surgeon in selecting the best operative approach (Fig. 4).
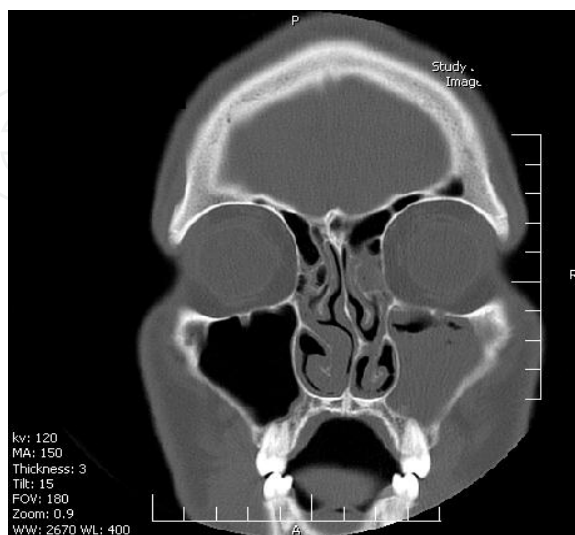
Figure 4. SCC of the right maxillary sinus.

2.2.3. Histopathologic features

The vast majority of squamous carcinomas are either well or moderately differentiated. Poorly differentiated tumors are less common (Fig. 5).[2]
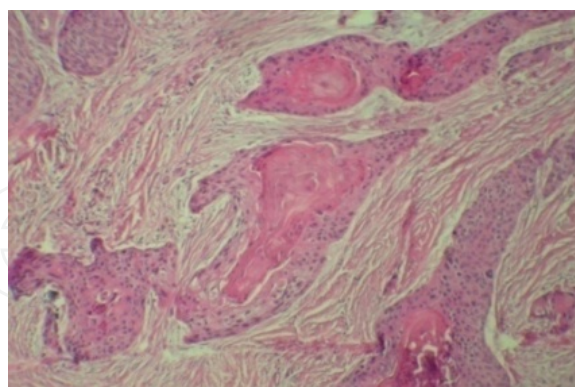
Figure 5. Moderately differentiated SCC; small nests of squamous cells with central keratinization.

2.2.4. Treatment and prognosis

SCC of the jaws and oral cavity usually is treated by block resection and 1-2 cm free margins. Some cases are treated by radiotherapy or combined radical surgery and radiotherapy. However, even with radical treatment the prognosis is poor, with a 5-year survival rate of

approximately 40%. The presence of metastatic deposits in local lymph nodes reduces the survival rate to less than 8%, as does involvement of the pterygopalatine fossa. With or without cervical node involvement, death usually occurs from local destruction and the inability to control the primary disease [1,3- 8] Because the tumors of the sinus are generally advanced at the time of diagnosis, a combination of surgery and radiation is used in most instances, with or without chemotherapy. Local recurrence, seen in about 30% to 45% (range 18–75%) of cases, is the most common cause of treatment failure and death. Virtually, all recurrences appear within two years of therapy and most within one year. During the course of the disease, 25% to 30% of patients will develop positive regional lymph nodes and 10% to 20% may experience distant metastases.[9,10,11]

2.3. Pleomorphic adenoma

Pleomorphic adenoma is the most common salivary gland tumor and accounts for about 60% of all salivary neoplasms[1,2,8]

2.3.1. Clinical features

Pleomorphic adenomas are usually slow-growing painless masses. Small tumors typically form smooth, mobile, firm lumps but larger tumors tend to become bossellated and may attenuate the overlying skin or mucosa. Pain or facial palsy is uncommon but are occasionally seen, usually in relation to infarcted tumors. The size of most tumors vary from about 2-5 cm but some reported cases have been massive. In the palate, tumors are usually seen at the junction of the hard and soft palate unilaterally. In the hard palate they feel fixed due to the proximity of the underlying mucoperiosteum.[2,8]

2.3.2. Histopathology

Pleomorphic adenoma shows a remarkable degree of morphological diversity The essential components are the capsule, epithelial and myoepithelial cells, and mesenchymal or stromal elements. The epithelial component shows a wide variety of cell types including cuboidal, basaloid, squamous, spindle cell, plasmacytoid and clear cells. Rarely, mucous, sebaceous and serous acinar cells are seen. These cells are cytologically bland and typically have vacuolated nuclei, without prominent nucleoli, and a low mitotic activuty. The epithelium usually forms sheets or duct-like structures. The mesenchymal-like component is mucoid/myxoid, cartila-ginous or hyalinized and sometimes this tissue forms the bulk of the tumor (Fig. 6). [1]

2.3.3. Treatment and prognosis

Although pleomorphic adenoma is a benign tumor it can cause problems in clinical manage-ment due to its tendency to recur and the risk of malignant transformation. Therefore it should be removed with free margins and the adjacent bone i.e. hard palate (or a layer of bone i.e. cortex of mandible). Recurrences are rare in the minor glands but in a meta-analysis of parotid tumors 3.4% of tumors recurred after 5 years and 6.8% after 10 years with a range of 1-50%.
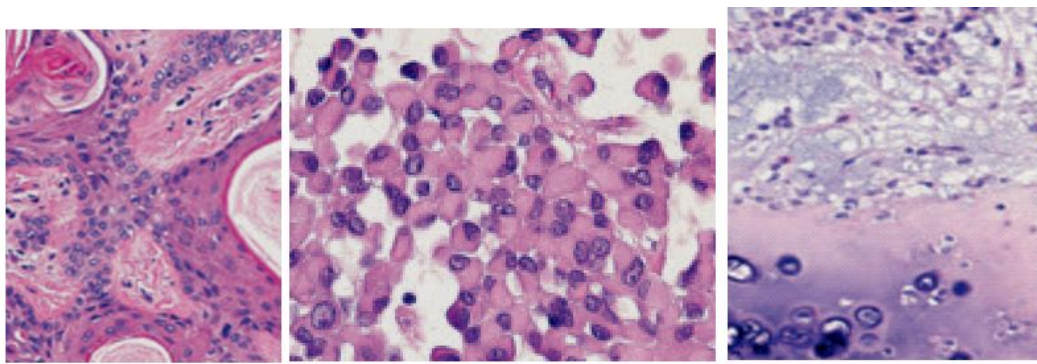
Figure 6. Pleomorphic adenoma. A.Squamous differentiation B.Plasmacytoid differentiation. C. Chondroid differentiation.
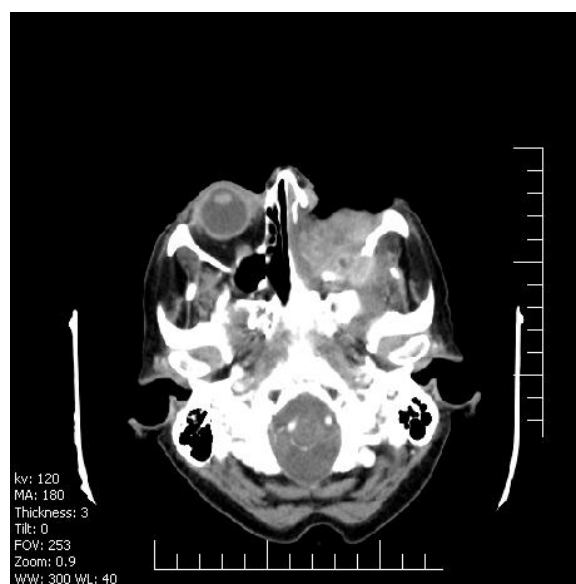
Figure 7. CT scan of mucoepidermoid carcinoma in right maxillary sinus.

Many recurrent pleomorphic adenomas are multifocal and some are so widely distributed that surgical control becomes impossible.[2]
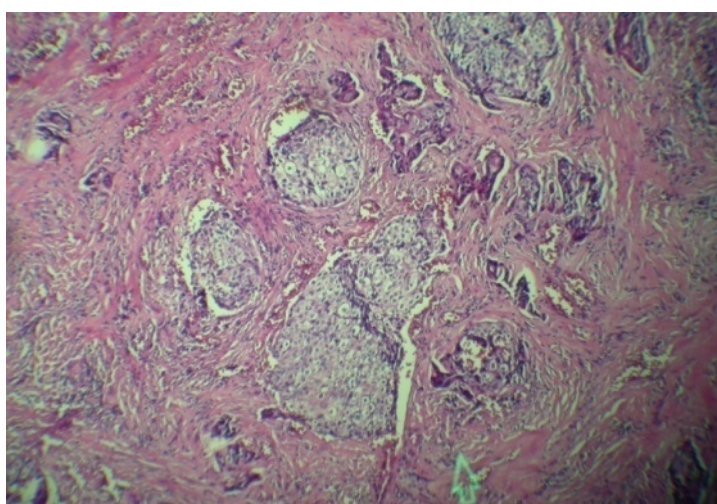
2.4. Mucoepidermoid carcinoma

2.4.1. Clinical and radiographic features

Mucoepidermoid carcinoma is most common in the parotid gland and usually appears as an asymptomatic swelling. Mucoepidermoid carcinoma is the most common malignant salivary gland tumor in children. The minor glands constitute the second most common site, especially in the palate. Intraosseous tumors also may develop in the jaws. Pain or facial nerve palsy may develop, usually in association with high grade tumors. [1,2,8]. CT scan and MRI are essential prior to treatment (Fig.7).

2.4.2. Histopathologic features

As its name implies, *mucoepidermoid carcinoma* is composed of a mixture of mucus-producing cells and squamous (epidermoid) cells The mucous cells vary in shape but contain abundant foamy cytoplasm that stains positively with mucin stains. The epidermoid cells are characterized by squamoid features, often demonstrating a polygonal shape, intercellular bridges, and. rarely, keratinization. In addition, a third type of cell—the intermediate cell is typically present and is believed to be a progenitor of both the mucous and the epidermoid cells. Intermediate cells vary in appearance from small, basaloid ("maternal") cells to slightly larger ovoid cells with scant, pale eosinophilic cytoplasm. Some tumors also show variable numbers of clear cells (Fig.8).[1]

Figure 8. High-grade salivary-type mucoepidermoid carcinoma cells, and rare mucinous cells exhibiting mild nuclear changes, cords and strands of squamoid cells and clear pleomorphism.

2.4.3. Treatment and prognosis

The treatment of mucoepidermoid carcinoma is predicated by the location, histopathologic grade, and clinical stage of the tumor. Early-stage tumors of the parotid can often be treated by subtotal parotidectomy with preservation of the facial nerve. Advanced tumors may necessitate total removal of the parotid gland, with sacrifice of the facial nerve. Submandibular gland tumors are treated by total removal of the gland. Mucoepidermoid carcinomas of the minor glands usually are treated by assured complete surgical excision with free margins. For low-grade. Neoplasms, only a modest margin of surrounding normal tissue may needed to be removed, but high-grade or large tumors warrant wider resection, similar to that required for squamous cell carcinomas. If there is underlying bone destruction, then the involved bone must be excised. Radical neck dissection is indicated for patients with clinical evidence of metastatic disease and also may be considered for patients with larger or high-grade tumors. Postoperative radiation therapy also may be used for more aggressive tumors.[1] The prognosis depends on the grade and stage of the tumor. Patients with low-grade tumors generally

have a good prognosis. For most primary sites, local recurrences or regional metastases are uncommon, and around 90% to 98% of patients are cured. The prognosis for those with intermediate-grade tumors is slightly worse than that for low-grade rumors. The outlook for patients with high-grade tumors is guarded, with only 30% to 54% of patients surviving.[1]
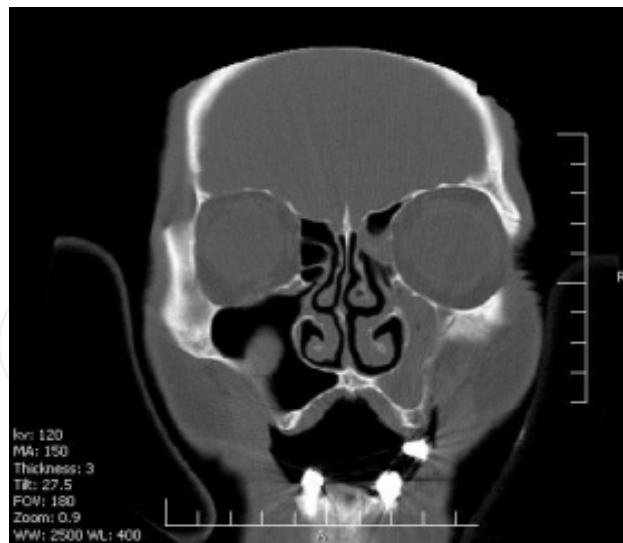
2.5. Sinonasal undifferentiated carcinoma

Sinonasal undifferentiated carcinoma (SNUC) is a rare, highly aggressive, and clinicopatho-logically distinctive neoplasm of the nasal cavity and paranasal sinuses. The tumor was first described in 1986. Since then fewer than 100 cases have been reported. In the earlier literature, tumors of this type were probably reported as anaplastic or undifferentiated carcinomas. The histogenesis is uncertain; some investigators have theorized that the cell of origin may be related to the Schneiderian membrane or olfactory epithelium. The pathogenesis of SNUC is poorly understood. A few cases have been associated with a history of smoking or the presence of Epstein-Barr virus (EBV). Although a strong correlation with these factors has not been established. In some instances, patients have developed SNUC secondary to radiation therapy for nasopharyngeal carcinoma or retinoblastoma.[1,3-8]

### 2.5.1. Clinical and radiographic features

Although a broad age range (3rd- 9th decades) has been reported, there is a tendency for older patients to be affected, with a median age at presentation being in the 6th decade. Men are affected more commonly than women, with a male to female ratio of approximately 2:1 to 3:1. SNUC is well known for rapid development of locally extensive disease. The neoplasm typically appears as a large tumor mass that can involve multiple regions of the sinonasal tract, usually including the nasal cavity, maxillary sinus, and ethmoid sinuses. In addition, extension into contiguous sites—such as the nasopharynx, orbit, and cranial cavity—is common. Inferior penetration into the oral cavity is possible as well. There is usually relatively rapid development of multiple sinonasal symptoms, including nasal obstruction, discharge, epistaxis, swelling, and pain. Orbital involvement may lead to proptosis, periorbital swelling, diplopia and vision loss. Cranial nerve palsies are a common finding as well. Radiographic assessment is best performed by CT or MRI, which typically reveals a large, expansile sinonasal mass with bony destruction and invasion of adjacent structures (Fig.9). [1-8]

2.5.2. Histopathologic features

Sinonasal undifferentiated carcinoma is characterized by trabeculae, ribbons, sheets, and nests of polygonal cells with minimal cytoplasm and pleomorphic, hyperchromatic vesicular nuclei. No squamous or glandular differentiation should be observed. Mitotic figures are numerous. Tumor necrosis, apoptosis. and lymphovascular invasion are usually prominent. The surface epithelium overlying the tumor may exhibit dysplasia or carcinoma *in situ*. Immunohisto-chemical staining for cytokeratin or epithelial membrane antigen is typically positive (Fig. 10). [1 -8]

Figure 9. Sinonasal undifferentiated carcinoma mass in the right maxillary sinus.
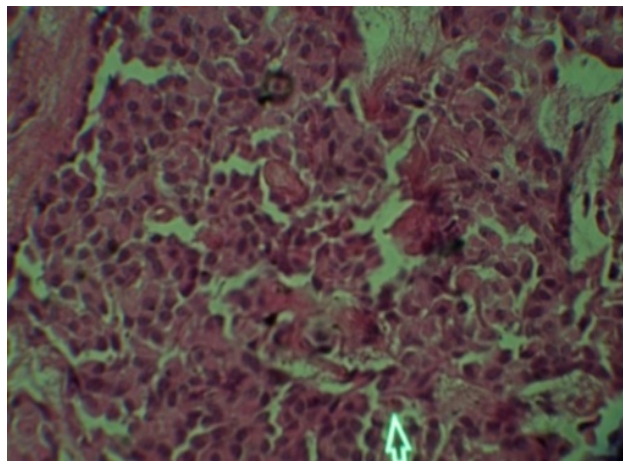
Figure 10. Undifferentiated carcinoma neoplastic cells with characteristic, chromatically uniform, vesicular nuclei, with no evidence of squamous differentiation.

2.5.3. Treatment and prognosis

The standard approach has been aggressive multimodal therapy, including complete surgical resection when feasible followed by adjuvant radiation and/or chemotherapy. The prognosis for this lesion is extremely poor, with an overall 5-year survival rate of less than 20%. However, a few centers recently have reported promising results with induction chemotherapy followed by radiation and surgical resection of any remaining disease. This newer treatment approach has been associated with 2-year survival rates of 64% to75%. High-dose chemotherapy and bone marrow transplantation may extend the life of the patient. Local recurrence is common and is the major cause of morbidity and mortality. Metastasis is possible, usually to cervical lymph nodes, bone, liver, or brain. [1-8]

2.6. Adenoid cystic carcinoma

2.6.1. Clinical and radiographic features

The adenoid cystic carcinoma usually appears as a slow growing mass. Pain is a common and important finding, occasionally occurring early in the course of the disease before there is a noticeable swelling. Patients often complain of a constant, low-grade, dull ache, which gradually increases in intensity. Facial nerve paralysis may develop with parotid tumors. Palatal tumors can be smooth surfaced or ulcerated. Tumors arising in the palate or maxillary sinus often show radiographic evidence of bone destruction of the hard palate with extension of the tumor into the nasal cavity and maxillary sinuses (Fig.11).[1-8]
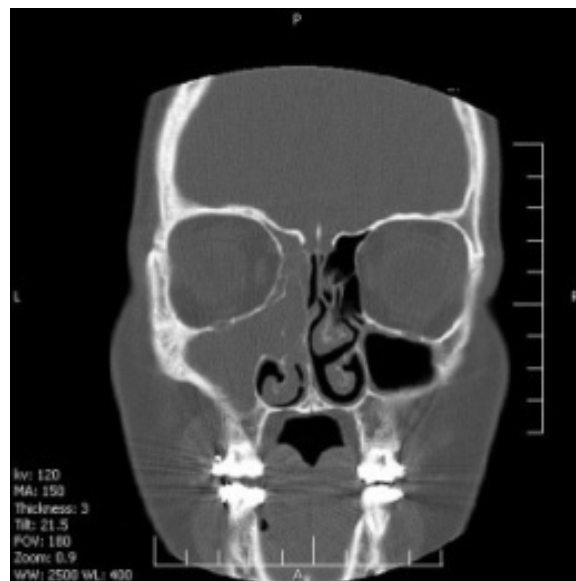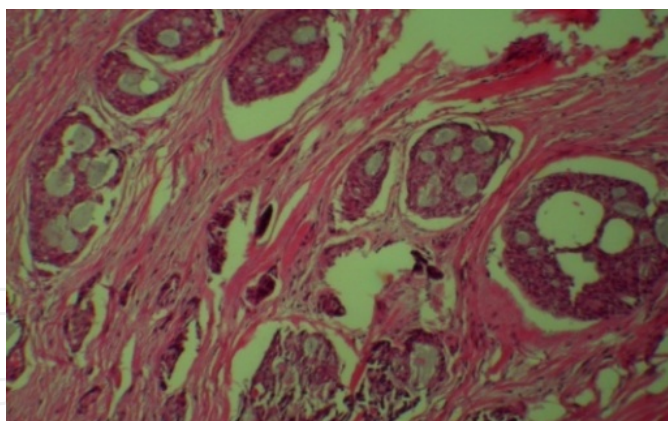
Figure 11. Adenoid cystic carcinoma. Note destruction of the left maxillary sinus.

2.6.2. Histopathologic features

Three major patterns are recognized: [1] cribriform. [2] tubular, and [3] solid. Usually a combination of these is seen, and the tumor is classified based on the predominant pattern (Fig.12).[1-8]

2.6.3. Treatment and prognosis

Adenoid cystic carcinoma is a relentless tumor that is prone to local recurrence and eventual distant metastasis. Surgical excision is usually the treatment of choice, and adjunct radiation therapy may slightly improve patient survival in some cases. Because metastasis to regional lymph nodes is uncommon, neck dissection typically is not indicated. Because of poor overall prognosis, regardless of treatment, clinicians should be cautioned against needlessly aggressive and mutilating surgical procedures for large tumors or cases showing metastases. [1- 8]

Figure 12. Adenoid cystic carcinoma; cribriform variants may show tumor cell sheets containing cylindrical, pseudoluminal spaces.

2.7. Basal cell carcinoma

2.7.1. Clinical features

Basal cell carcinoma (BCC), the most common skin cancer (and the most common of all cancers), is a locally invasive, slowly spreading, primary epithelial malignancy that arises from the basal cell layer of the skin and its appendages. Basal cell carcinoma is a disease of adult caucasions, especially those with fair complexions. Although most patients are older than 40 years of age at the time of diagnosis, some lesions are detected as early as the second decade of life, particularly in patients with red or blonde hair and blue or green eyes. Approximately 80% of lesions occur on the head and neck, with the remainder involving the trunk and limbs[1,8]

2.7.2. Histopathologic features

The basal cell carcinoma displays a considerable diversity of appearances under the microscope i.e. nodulocystic (noduloulcerative), superficial, adenoid, pigmented, infiltrative, morpheaform, and keratotic. The noduloulcerative pigmented, and syndrome-related basal cell carcinomas are comprised of uniform ovoid, dark-staining basaloid cells with moderate-sized nuclei and relatively little cytoplasm. The cells are arranged into well-demarcated islands and strands, which appear to arise from the basal cell layer of the overlying epidermis and invade into the underlying dermal connective tissue. Epithelial islands typically demonstrate palisading of the peripheral cells; frequently a clear zone of artifactual retraction is seen between the epithelial islands and the connective tissue (Fig.13).[1,8]

2.7.3. Treatment and prognosis

The treatment of basal cell carcinoma often depends on the size and site of the lesion. Small lesions (lesions < l cm) are treated by routine surgical excision, laser ablation or electrodesiccation and curettage (with 3- to 5 mm margins of clinically normal-appearing skin beyond the visible lesion). These methods result in a cure rate of 95% to 98%. Radical surgical excision and
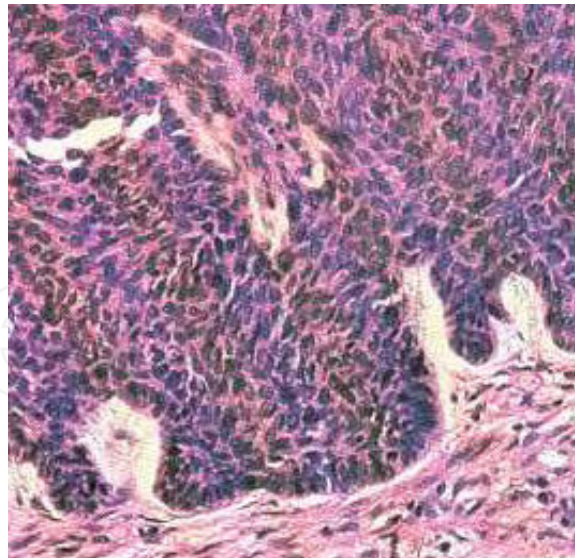
Figure 13. BCC. Tumor nests are composed of small, monotonous cells with dark nuclei and scant basophilic cytoplasm.

radiation therapy are recommended for large or aggressive lesions. For sclerosing types of BBC, recurrent lesions, or lesions situated near embryonic planes of fusion (along which these tumor cells tend to invade), a procedure called Mohs micrographic surgery should be used. This technique essentially uses frozen-section evaluation of specially mapped and marked surgical specimens to determine whether tumor tissue has been left behind. If it has, then the surgeon can return immediately to that particular area and remove more tissue, repeating the process until the patient is free of diseased margins.[1,8]

2.8. Verrucous carcinoma

Verrucous carcinoma (VC) is a nonmetastasizing variant of well-differentiated squamous cell carcinoma (SCC) characterized by an exophytic, warty, slowly growing neoplasm with invading margins.[2,8]

2.8.1. Clinical features

Hoarseness is the most common presenting symptom; other symptoms include airway obstruction, weight loss, dysphagia, and throat pain. Enlarged lymph nodes are common and reactive rather than neoplastic (Fig. 14).[2,8]

2.8.2. Histopathology

VC consists of thickened club-shaped papillae and blunt intrastromal invaginations of well-differentiated squamous epithelium with marked keratinization and thin fibrovascular cores. The squamous epithelium lacks cytologic criteria of malignancy, and by morphometry, the cells are larger than those seen in SCC. Mitoses are rare, and observed in the basal layers (Fig. 15).[2,8]

Figure 14. Verrucous carcinoma wart-like appearance.
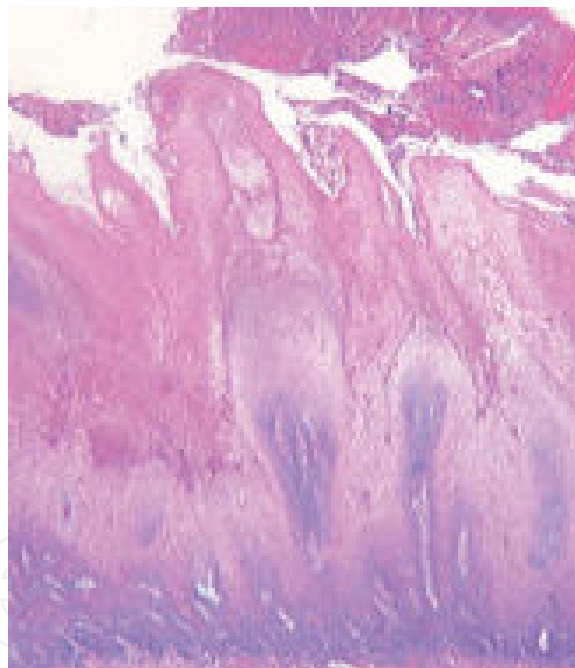
Figure 15. Verrucous carcinoma. A large lesion with abundant keratosis arranged in "church-spire" configuration. There is a broad, pushing border of infiltration.

2.8.3. Treatment and prognosis

Patients with VC may be treated by excision (by laser or surgery), or by radiotherapy. Although surgery is more effective, radiotherapy is an acceptable alternative for patients who are poor surgical candidates.

3. Malignant soft tissue tumors

Malignant soft tissue tumors included here are Fibrosarcoma, Malignant fibrous histocytoma, Angiosarcoma, Rhabdomyosarcoma, Leiomyosarcoma, Kaposi sarcoma, Liposarcoma.
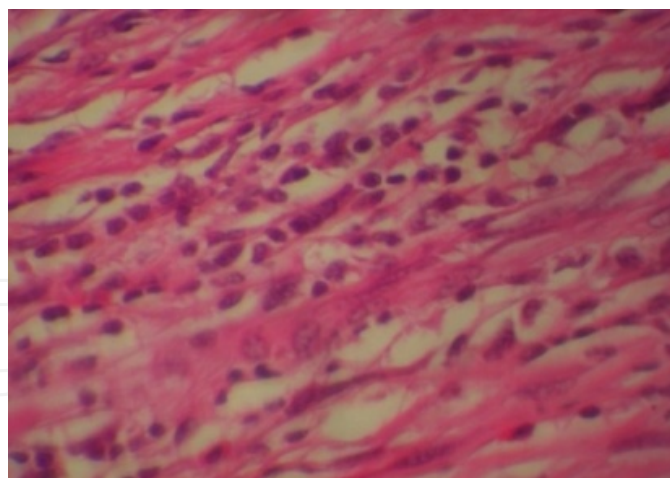
3.1. Fibrosarcoma

3.1.1. Clinical features

Presenting complaints are typically related to a nasal mass, obstruction or epistaxis, nasal discharge, pain or swelling in the facial region, or sensory changes involving the regional nerves. Radiographic studies typically documented a nasal or paranasal sinus mass with some associated bone erosion [12-14] This is also seen in the jaws.

3.1.2. Histopathologic features

Unlike the fibromatoses, fibrosarcomas are highly cellular proliferations. The spindle cells are often oriented in well-formed fascicle that frequently intersect at approximately 90 degree angles, creating a herringbone" pattern. Nuclear pleomorphism is usually not striking, but mitotic figures are often abundant, even in well-differentiated forms of the tumor. In the head and neck region, most fibrosarcomas are well-differentiated, low-grade neoplasms (Fig. 16).[1,8]

Figure 16. Low-grade fibrosarcoma consists of interlacing fascicles of spindle cells infiltrating around seromucinous glands.

3.1.3. Immunohistochemistry

The immunohistochemical reactivity of fibrosarcoma does not differ from that of aggressive fibromatosis. The neoplastic cells are often strongly reactive for vimentin and weakly reactive

for actin. Negativity for epithelial markers (cytokeratin epithelial membrane antigen) and 8-100 protein is helpful in excluding differential diagnosis.[2,8]

3.1.4. Treatment and prognosis

Optimal treatment for aggressive fibromatosis is wide surgical resection. Unfortunately, this is often not an option in the head and neck region. Accordingly, the behavior in this location is more aggressive than in areas of easy resectability. In the head and neck, recurrence rates approach 60 to 70 percent excluding oral and paraoral lesions which are more amenable to surgery and have a recurrence rate of approximately 25 %. [2,8]
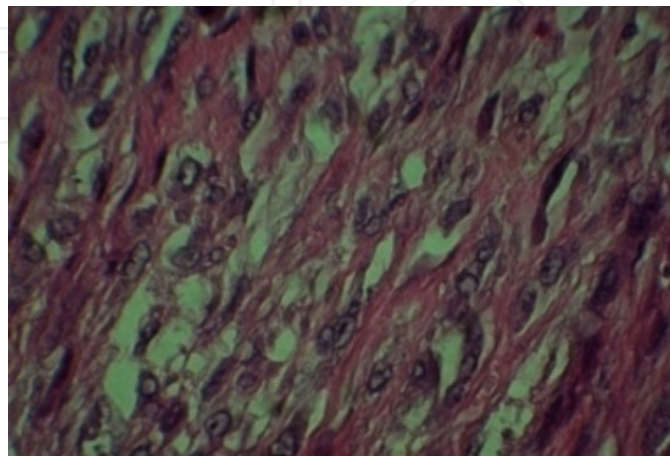
3.2. Malignant fibrous histiocytoma

3.2.1. Clinical features

Patients may have nasal obstruction, often associated with epistaxis while pain, sinusitis, nasal discharge, swelling, anosmia, and proptosis are less common. Malignant fibrous histiocytoma (MFH) is currently used as a diagnosis of exclusion for sarcomas. Only 3% of MFH occur in the head and neck, with 30% of these arising in the sinonasal area.[2,8]

3.2.2. Histopathology

Sinonasal MFH are generally infiltrative and ulcerative, but can occasionally be circumscribed. Pleomorphic MFH, the most frequent morphologic subtype of MFH in the sinonasal tract, is characterized by spindle to pleomorphic cells in a storiform growth pattern, with easily identified mitotic figures including atypical forms, and necrosis. The cells are fusiform with, indistinct cytoplasm. Tumoral giant cells with multiple nuclei may be found (Fig. 17).[1,2,8]

Figure 17. Malignant fibrous histocytoma showing spindle-shaped cells with storiform pattern.

3.2.3. Immunohistochemistry

MFH is usually positive for vimentin and focally for actins. Importantly, MFH is a diagnosis of exclusion and is generally negative for desmin, skeletal muscle specific markers, S100 protein, HMB-45, epithelial markers and lymphoid markers.[2,8]

3.2.4. Treatment and prognosis

Compared with other anatomical sites, MFHs of the head and neck generally have a slightly lower rate of recurrence and metastases.[15]
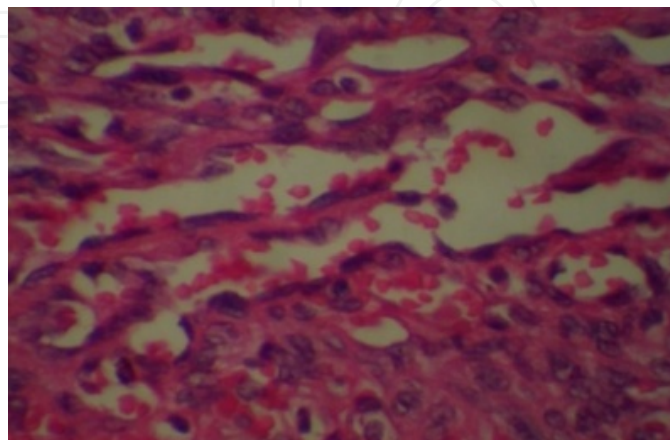
3.3. Angiosarcoma

Angiosarcoma is a malignant neoplasm of vascular phenotype whose constituent tumor cells have endothelial features.

3.3.1. Clinical features

Presenting symptoms include swelling, pain, epistaxis, deviation or swelling of tonsils, nasal obstruction, and sinusitis. [16,17]

3.3.2. Histopathology

Most sinonasal angiosarcomas are histologically low-grade. They infiltrate the adjacent tissues and bone, accompanied by necrosis and hemorrhage. They are comprised of tortuous anastomosing vascular channels that dissect the stroma, capillary sized vessels and cavernous vascular spaces. The lining endothelial cells range from flat to plump spindly to epithelioid, and often form papillary tufts (Fig. 18). [1- 8]

Figure 18. Angiosarcoma shows large vessel like spaces partially lined by enlarged, hyperchromatic endothelial cells.

3.3.3. Immunohistochemistry

Angiosarcomas are immunoreactive for CD34, CD31, Factor VIII R-Ag and vimentin, and focally keratin (especially the epithelioid variant) and actin [18]

3.3.4. Treatment and prognosis

Patients are usually treated by surgical resection with radiation and/or chemotherapy. Recurrences are common (50%), likely due to incomplete excision or possible multifocality. Metastasis is uncommon, and the predilection sites are the lung, liver, spleen, and bone marrow. [1,2,4,5,7,8,19]
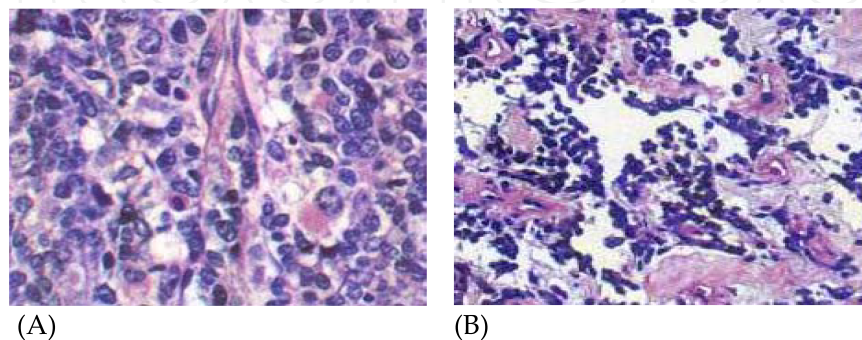
3.4. Rhabdomyosarcoma

3.4.1. Clinical and radiographic features

Rhabdomyosarcoma primarily occurs during the first decade of life but also may occur in teenagers and young adults. It is rare in people older than 45 years, and approximately 60% of all cases occur in males. Embryonal rhabdomyosarcomas are most common in the first 10 years of life and account for about 60% of all cases. Alveolar rhabdomyosarcomas occur most often in persons between 10 and 25 years of age: they account for 20% to 30% of all tumors. Pleomorphic rhabdomyosarcomas represent less than 5% of all cases and show a peak prevalence in patients older than 40 years of age. The tumor is most often a painless, infiltrative mass that may grow rapidly. In the head and neck region the face and orbit are the most frequent locations followed by the nasal cavity. The palate is the most frequent intraoral site, and some lesions may appear to arise in the maxillary sinus and break through into the oral cavity[1- 8]

3.4.2. Histopathologic features

Several microscopic patterns of pediatric rhabdomyosarcoma are recognized including: Embryonal rhabdomyosarcoma, Non Otherwise Specified, Botryoid, Spindle, Alveolar rhabdomyosarcoma, Undifferentiated sarcoma and Anaplastic rhabdomyosarcoma. The anaplastic cells vary according to type (Fig.19).

(A)   (B)

Figure 19. A. Embryonal rhabdomyosarcoma. B. Alveolar subtype of rhabdomyosarcoma.

3.4.3. Immunohistochemistry

There is immunoreactivity for desmin, muscle specific actin, myoglobin, fast myosin, nuclear MyoD1 and nuclear myogenin (skeletal muscle myogenin myf4). CD99 may be positive in 16% of cases [20,21].

3.4.4. Treatment and prognosis

Before 1960 the prognosis for a patient with rhabdomyosarcoma was extremely poor, with more than 90% of patients dying. With the advent of multimodal therapy during the past several decades, the prognosis has improved dramatically. Treatment typically consists of local surgical excision followed by multiagent chemotherapy (vincristine actinomycin D. and cyclophosphamide). Postoperative radiation therapy also is used, except for localized tumors that have been completely resected at initial surgery. The 5-year survival rate for embryonal rhabdomyo sarcoma not otherwise specified [NOS]) is around 66%, although the figures for botryoid (95%) and spindle cell variants (88%) are much better. The 5-year survival rate for alveolar rhabdomyosarcoma is only 53%. and survival drops to slightly less than 50% for anaplastic rhabdomyosarcoma and undifferentiated sarcomas. [1-8]

3.5. Leiomyosarcoma

Leiomyosarcoma is a malignant tumor of smooth muscle phenotype.

3.5.1. Clinical features

Patients may have swelling, pain and the duration of symptoms is usually long. There is usually no lymphadenopathy. Plain radiographs show opacification of the nasal cavity or sinus(es), often suggesting sinusitis Only a small number of sinonasal leiomyosarcomas have been reported, accounting for <1% of all non-epithelial tumors. They occur in all ages, with a peak in the 6th decade (mean, 53 years) without a gender difference. [2,22]

3.5.2. Histopathology

Leiomyosarcomas are infiltrative neoplasms accompanied by surface ulceration Bone or cartilage invasion is more frequent than surface or seromucinous gland invasion. Leiomyo-sarcomas are composed of right-angle intersecting bundles of spindle cells. Pallisading storiform and "haemangiopericytoma -like" patterns can occur. The tumors are hypercellular, but coagulative tumor necrosis and hemorrhage can create a hypocellular appearance. The tumor cells have elongated, vesicular to hyperchromatic, lobulated or indented nuclei with blunt ends ("cigar shaped"). The cytoplasm is fibrillary and eosinophilic, with frequent perinuclear vacuolation. Mitoses, both typical and atypical, are present to a variable degree. [2,22] Histochemistry and immunoprofile intracytoplasmic glycogen can be demonstrated with a PAS stain. Masson trichrome stain demonstrates red, longitudinally oriented parallel fibrils within the cytoplasm. Tumor cells are diffusely and strongly immunoreactive for vimentin, actin(smooth muscle or muscle- specific), desmin and h-caldesmon.There is

generally no reactivity with keratin CD34, CD117, S-100 protein or HMB-45 The Ki-67 index is usually >15% (Fig. 20).[2,3,22]
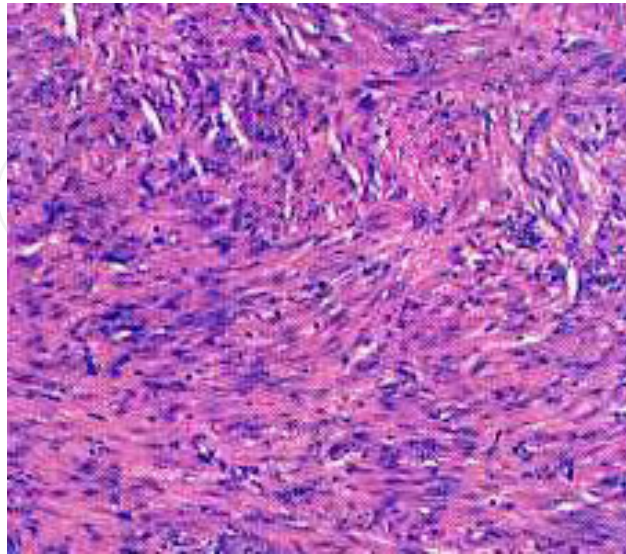
Figure 20. Leiomyosarcoma fascicles of spindle-shaped cells with conspicuous eosinophilic cytoplasm.

3.5.3. Treatment and prognosis

About half of the reported cases develop local recurrence, often within a year and nearly 1/3 of these patients subsequently develop metastasis (mostly to the lungs and liver). Complete surgical excision is difficult to achieve, and radiation and chemotherapy are used with variable success. Poor prognostic factors include involvement of more than one contiguous site, large tumor size (>5 cm), high mitotic count (>20/10 high power field), tumor necrosis, and tumor stage. [2,22,23]

3.6. Kaposi sarcoma

Kaposi sarcoma (KS) is a locally aggressive tumor that typically presents with cutaneous lesions in the form of multiple patches, plaques or nodules but may also involve mucosal sites, lymph nodes and visceral organs. The disease is uniformly associated with HIV and human herpes virus 8 (HHV-8) infection.[2,8]

3.6.1. Clinical features

KS is characterized by the appearance of purplish, reddish blue or dark brown macules, plaques and nodules that may ulcerate. They are particularly frequent in distal extremities and may be accompanied by lymphedema. Early oral KS is represented by solitary or multiple red or bluish flat lesions, while the later stage is characterized by a nodular, sometimes massive appearance with or without secondary ulceration (Fig. 21). [2,8]

Figure 21. Kaposi sarcoma of the palate.

3.6.2. Histopathology

KS lesions of the skin or the mucosa are uncharacteristic and present with subtle vascular proliferation; vascular spaces are increased in number, of irregular shape, and may dissect collagen fibres in the superficial corium. They often run parallel to the epithelium. The vascular proliferation is often perivascular and periadnexal. Endothelial cells lining the spaces are flattened or more oval, with little atypia. Preexisting blood vessels may protrude into the lumen of new vessels. Admixed are sparse lymphocytes and plasma cells; frequently, extravasated erythrocytes and deposits of hemosiderin surround the vascular structures (Fig. 22). [2,8]
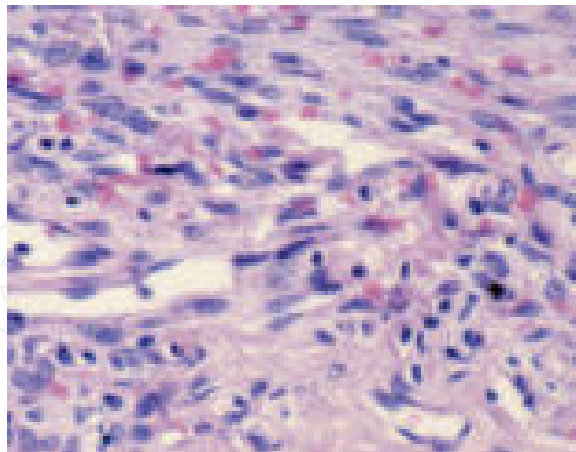
Figure 22. Vascular slits and sparsely distributed lymphocytes of KS.

3.6.3. Immunohistochemistry

The lining cells of clearly developed vascular structures are usually positive for vascular markers, while the spindle cells consistently show positive reaction for CD34 and commonly

for CD31 but are factor VIII negative. All cases, irrespective of epidemiologic subgroup, are HHV-8 positive. The new marker FLI1, a nuclear transcription factor, appears to be expressed in almost 100% of different vascular tumors, including KS [24]

3.6.4. Treatment and prognosis

The evolution of disease depends on the epidemiological-clinical type of KS and on its clinical extent. It is also modified by treatment that includes surgery, radio and chemotherapy. [25]
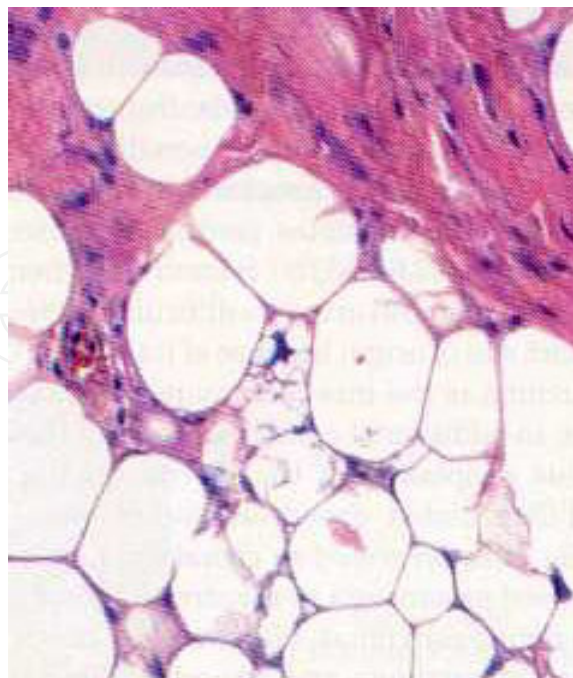
3.7. Liposarcoma

3.7.1. Clinical features

Liposarcomas are primarily seen in adults, with peak prevalence between the ages of 40 and 60. The tumor is typically a soft, slow-growing, ill-defined mass that may appear normal in color or yellow. Pain or tenderness is uncommon: when present, it is usually a late feature. The neck is the most common site for liposarcomas of the head and neck region. The most frequent oral locations are the tongue and cheek.[1,8]

3.7.2. Histopathologic features

Most liposarcomas can be divided into three major categories: 1. Well-differentiated liposarcoma/atypical lipomatous tumor, 2. Myxoid/round cell liposarcoma, 3. Pleomorphic liposarcoma(Fig.23). [1,8]

Figure 23. Liposarcoma showing lipoblasts interspersed between mature appearing adipocytes.

3.7.3. Treatment and prognosis

Radical excision is the treatment of choice for most liposarcomas throughout the body. In spite of this, around 50% of all tumors recur. The overall 5-year survival rate ranges from 59% to 70%. There is a 10-year survival rate of approximately 50%[1,8]

4. Benign and malignant odogentic tumors

Benign and malignant odogentic tumors included here are the Calcifying epithelial odonto-genic tumor (CEOT), Ameloblastic fibroma (AF), Cementoblastoma, Odontoma, Odontogenic myxoma, Ameloblastoma, Ameloblastic carcinoma and Adenomatoid odontogenic tumor.

4.1. Calcifying epithelial odontogenic tumor (CEOT)

CEOT accounts for approximately 1% of all odontogenic tumors occurring in patients between 20 and 60 years of age, with a mean age of 40 years. There is no gender predilection. Most cases are intraosseous, approximately 6% arise in extraosseous locations. Intraosseous tumors affect the mandible more often than the maxilla with a ratio of 2:1.[2,8]

4.1.1. Clinical and radiographic features

The tumor presents as an asymptomatic slow-growing expansile mass of the jaw. Peripheral gingival lesions are firm painless masses. Radiographically, most CEOTs present as mixed radiolucent-radiopaque lesions, but they may show considerable variation. They may be unilocular or multilocular. In about half of the cases, an unerupted tooth, most often a mandibular third molar, is associated with the lesion. CT and MRI provide useful information in the diagnosis and treatment of CEOT [26]
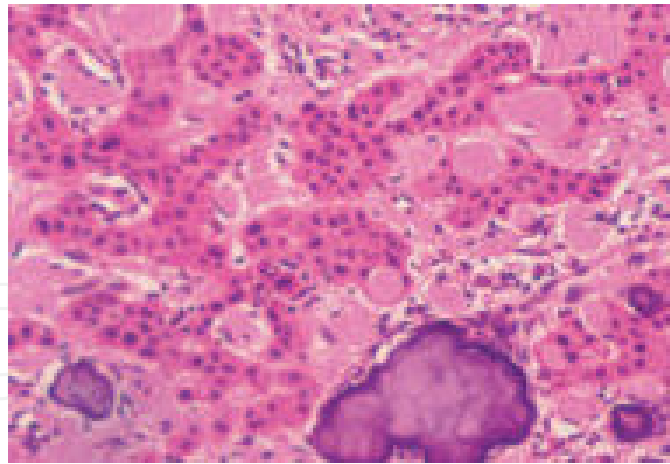
4.1.2. Histopathology

The tumor consists of a fibrous stroma with islands and sheets of polyhedral epithelial cells with abundant eosinophilic cytoplasm, sharply defined cell borders and well-developed intercellular bridges. Their nuclei are frequently pleomorphic, with giant nuclei being common. Mitotic figures are rarely encountered unless malignant transformation occurs (Fig. 24).[27]

4.1.3. Treatment and prognosis

The CEOT is a locally invasive tumor. Small tumors may be enucleated, but larger ones require local resection. An overall recurrence rate of about 14% has been noted.A relatively higher recurrence rate of 22% has been noted for the clear cell variant. [28,29]

Figure 24. CEOT depicting fibrous stroma with islands and sheets of polyhedral epithelial cells with abundant eosinophilic cytoplasm.

4.2. Ameloblastic Fibroma (AF)

4.2.1. Clinical and radiographic features

Most cases of AF present as a painless swelling or are discovered due to disturbances of tooth eruption. Radiographically, the tumor presents as a well-demarcated radiolucency, often in connection with a malpositioned tooth (Fig.25).[30]


Figure 25. AF presenting as well demarcated osteolysis with sclerotic rim.

4.2.1. Histopathology

The epithelial component of AF consists of branching and anastomosing epithelial strands that form knots of varying size. These have a peripheral rim of columnar cells similar to the inner enamel epithelium that embraces a loosely arranged spindle-shaped epithelium identical to stellate reticulum.The epithelial component resembles ameloblastoma. The stromal compo-

nent however differs in that it is an immature cell-rich myxoid tissue with an embryonic appearance. Some AFs may contain granular cells (Fig.26). [30]
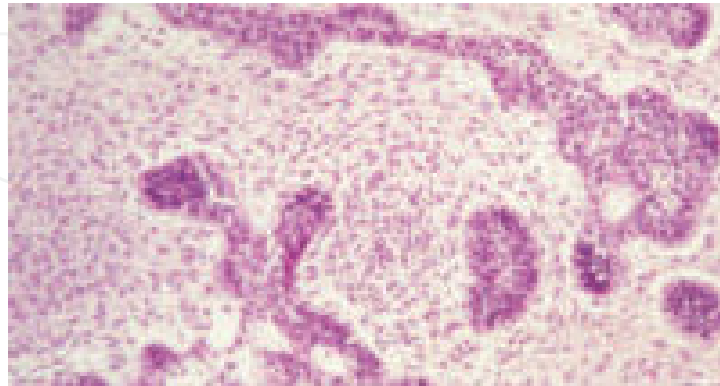
Figure 26. Ameloblastic fibroma with strands and islands of odontogenic epithelium showing peripheral palisading, embedded in a cell-rich ectomesenchyme resembling the dental papilla.

4.2.2. Treatment and prognosis

Treatment consists of enucleation and curettage. Recurrence may occur but this does not justify initial aggressive treatment.[30] Rarely, AF may progress to malignancy (ameloblastic fibrosarcoma).

4.3. Cementoblastoma

Cementoblastoma is a rare benign neoplasm which forms cementum-like material attached to the tooth root.

4.3.1. Clinical features

Cementoblastomas are rare, accounting for only about 4% of cementum-containing lesions. There is no significant gender predilection and lesions are discovered in the 2nd-3rd decades. Lesions present with varied levels of pain and a swelling of the buccal or lingual aspect of the alveolar ridge as a result of bone expansion. The involved tooth usually remains vital. There is a predilection for the mandibular, particularly the mandibular permanent first molar.[5,8]

4.3.2. Radiologic features

The tumor is well-defined, radiopaque or mixed density, round mass, intimately associated with the tooth root. Additionally, a thin radiolucent rim surrounds the tumor, representing the periodontal ligament. Root resorption is common. Irregular soft tissue may surround the lesion (Fig. 27). [5,8]

Figure 27. Radiograph of a radiodense calcified mass attached to the root of the mandibular first molar is characteristic for a cementoblastoma.

4.3.3. Histopathologic features

Cementoblastoma is composed of a dense mass of cementum in a loose fibrovascular stroma. Lesions usually show prominent cementoblastic rimming and may demonstrate a characteristic basophilic appearance and reversal lines of the cementum. Multinucleated osteoclastic giant cells are usually present. The periphery may have radiating columns of unmineralized tissue (Fig. 28). [5,8]
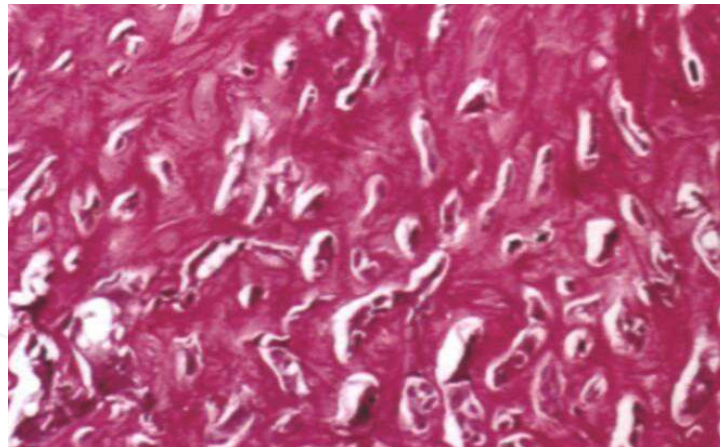
Figure 28. Cementoblastoma. Mineralized tissue containing numerous plump cementoblasts.

4.3.4. Treatment and prognosis

Treatment requires removal of the mass and associated tooth, usually a surgical extraction. Recurrences do not occur, unless the lesion is incompletely removed.[1,8]

4.4. Odontoma (complex and compound)

Odontoma is the most common odontogenic tumor, although it may best be classified as a hamartoma composed of enamel, dentin, pulpal tissue, and cementum. Academically, odontomas are subclassified into two types, although management is identical: *compound* when composed of rudimentary teeth-like structures and *complex* when composed of haphazardly arranged tooth structure. [5,8]

4.4.1. Clinical features

Odontoma occurs more frequently than all other odontogenic tumors combined. Odontomas show no gender predilection. Odontomas develop most commonly in the first two decades, the time normal teeth are developing and erupting. Most odontomas are asymptomatic, found incidentally on routine dental radiographs, while larger lesions may interfere with eruption of normal adjacent teeth, prompting radiographic investigation. [5,8]

4.4.2. Radiologic features

Odontomas present as a radiodense calcified mass surrounded by a thin radiolucent rim. Compound odontomas will appear like small, malformed teeth while complex odontomas present as radiodense masses of calcified tooth material, slightly more difficult to diagnose[5,8]

4.4.3. Histopathology

Sections of immature, developing compound odontomas show several dysmorphic tooth germs in a loosely textured connective tissue with cords and islands of odontogenic epithelium. Much of the enamel matrix is preserved in spite of decalcification The distinction between complex and compound odontoma is mainly based on the presence of tooth- like structures in compound odontomas (Fig. 29). [5,8]

(A)   (B)
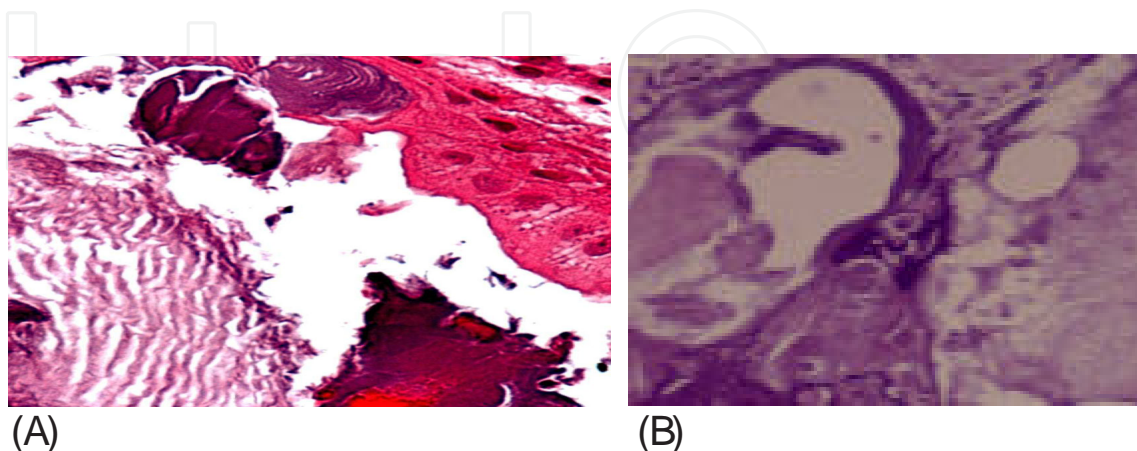
Figure 29. A. Compound odontoma. Enamel matrix and odontogenic epithelium in an odontoma. B. Odontoma, complex type. Enamel, dentin, and cementum-like tissue are arranged in a haphazard pattern.

4.5. Odontogenic Myxoma (OM) /Myxofibroma

4.5.1. Clinical and radiographic features

Small OMs are asymptomatic. Large OMs cause painless expansion. Cortical perforation may occur when large. Unilateral sinonasal obliteration may mimic nasal polyposis. Radiographically, OM appears as a unilocular or multilocular radiolucency, sometimes showing a fine "soap bubble" or"honeycomb" appearance occasionally with fine trabeculations. The borders of the tumor are usually well-defined and corticated but can be poorly defined or diffuse. Root displacement occurs, as does root resorption. Larger OMs may present with periosteal reactions. CT may reveal the fine bony septa and allows for anatomic deliniation.[1,2,31]

4.5.2. Histopathology

OM is characterized by randomly oriented stellate, spindle-shaped and round cells with long, fine, anastomosing pale or slightly eosinophilic cytoplasmic processes extending from the centrally placed nucleus. Cells are evenly dispersed in an abundant mucoid or myxoid stroma that contains only a few fine collagen fibres. Binucleated cells, mild pleomorphism and mitotic figures may occur. Rests of odontogenic epithelium are not obvious in most lesions and are not required for establishing final diagnosis. Some OMs may permeate into the marrow spaces in a pseudo-malignant pattern. Some OMs have a tendency to produce collagen fibres and are designated myxofibroma. There is no evidence that these more collagenous variants behave differently. Histochemical studies show that the ground substance is rich in acid mucopolysaccharides, primarily hyaluronic acid and, to a lesser degree, chondroitin sulphate (Fig.30). [1,2,32]
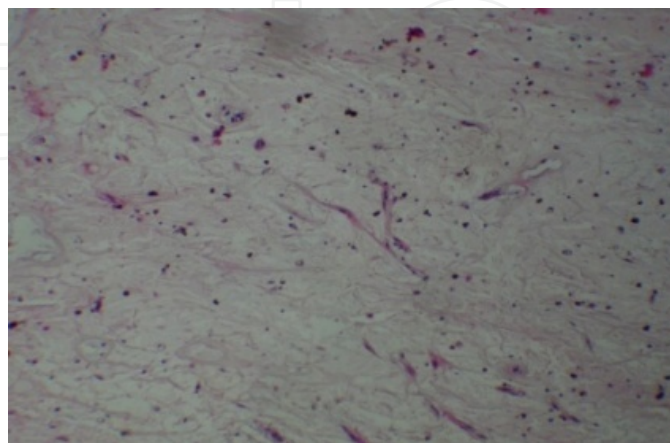
Figure 30. Odontogenic myxoma with randomly oriented stellate, spindle-shaped and round cells with long cytoplasmic processes.

4.5.3. Treatment and prognosis

The tendency of OM to permeate into marrow spaces makes effective enucleation and curettage difficult. Small lesions have been successfully treated in this way but larger lesions may require complete excision with free margins. Recurrence rates from various studies average about 25% but in spite of this, the prognosis is good. Recurrence usually follows incomplete removal within 2 years but may also occur later. Death may ensue due to cranial base extension.[1-3,33]

4.6. Ameloblastoma

### 4.6.1. Clinical and radiographic features

Ameloblastoma occurs exclusively in the jaws, rarely in the sinonasal cavities. Most maxillary cases occur in the posterior region. Small lesions may be asymptomatic swellings of the jaws. Pain or paraesthesia is rare. They may be unilocular or multilocular radiolucencies resembling cysts and they may reveal scalloped borders [1,2,34]. The most typical radiographic feature is that of a multilocular radiolucent lesion. The lesion is often described as having a "soap bubble" appearance (when the radiolucent loculations are large) or as being "honeycombed"(when the loculations are small). Buccal and lingual cortical expansion is frequently present. Resorption of the roots of teeth adjacent to the tumor is common. In many cases an unerupted tooth, most often a mandibular third molar is associated with the radiolucent defect. Solid ameloblastomas may radiographically appear as unilocular radiolucent defects, which may resemble almost any type of cystic lesion (Fig. 31). [1-5]
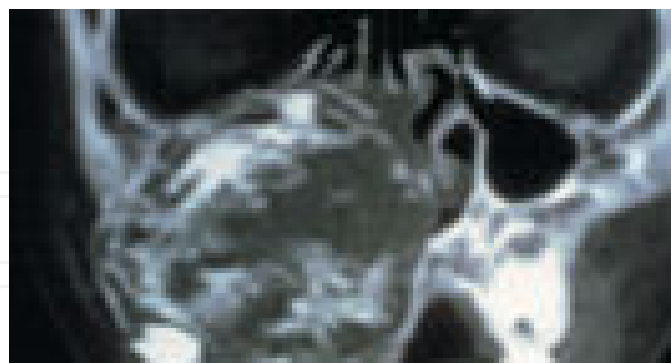
Figure 31. Ameloblastoma involved maxillary sinus.

4.6.2. Histopathology

The follicular and plexiform patterns are the most common. Less common histopathologic patterns include the acanthomatous, granular cell, desmoplastic, and basal cell types (Fig. 32).[1-3, 8]
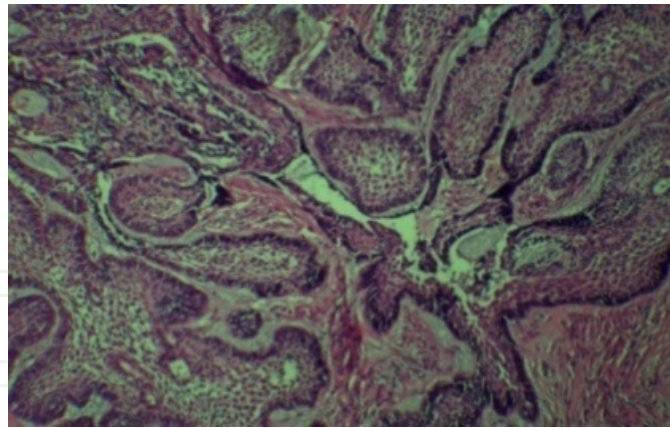
Figure 32. Follicular ameloblastoma

4.6.3. Treatment and prognosis

Patients with conventional solid or multicystic intraosseous ameloblastomas have been treated by a variety of means. These range from simple enucleation and curettage to *en bloc* resection. Other surgeons advocate that the margin of the resection should be at least 1.0 to 1.5 cm past the radiographic limits of the tumor. Ameloblastomas of the posterior maxilla are particularly dangerous because of the difficulty of obtaining an adequate surgical margin around the tumor. Marginal resection is the most widely used treatment but recurrence rates of up to 15% have been reported after marginal or block resection.[1,2,8]
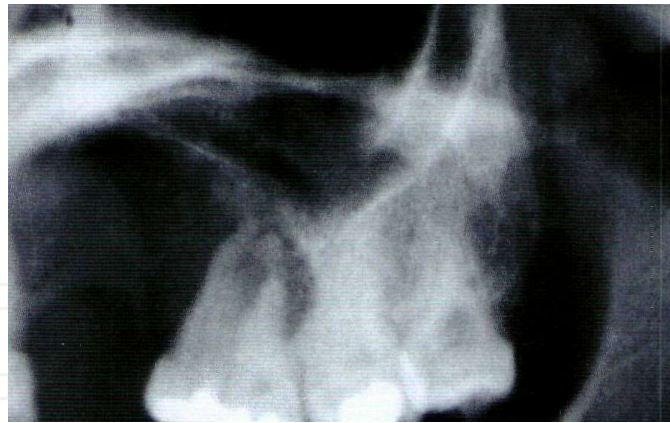
4.7. Ameloblastic carcinomas

*4.7.1. Clinical and radiographic features*

Only 19 cases have been reported to occur in the maxilla. Males and females are equally affected. The posterior segments of the jaws represent the most common site. Generally, ill defined or irregularly marginated radiolucencies are characteristic. Cortical expansion often with perforation, may be present as well as infiltration into adjacent structures (Fig. 33).[2,35]

4.7.2. Histopathology

Ameloblastic carcinoma is characterized by malignant cytologic features in combination with the overall histological pattern of an ameloblastoma. A tall columnar cellular morphology with pleomorphism mitotic activity, focal necrosis, perineural invasion and nuclear hyperchromatism may be present. Peripheral palisading and so-called reverse or inverted nuclear polarity will be present. A stellate reticulum structure will usually be seen. Cystic spaces may be present that are lined by epithelium Atypical cells form nests and broad ribbons which may branch and anastomose with focal areas of subtle necrosis to more obvious central, comedo necrosis like areas (Fig. 34).[1,2,36]

Figure 33. Ameloblastic carcinoma in maxillary sinus
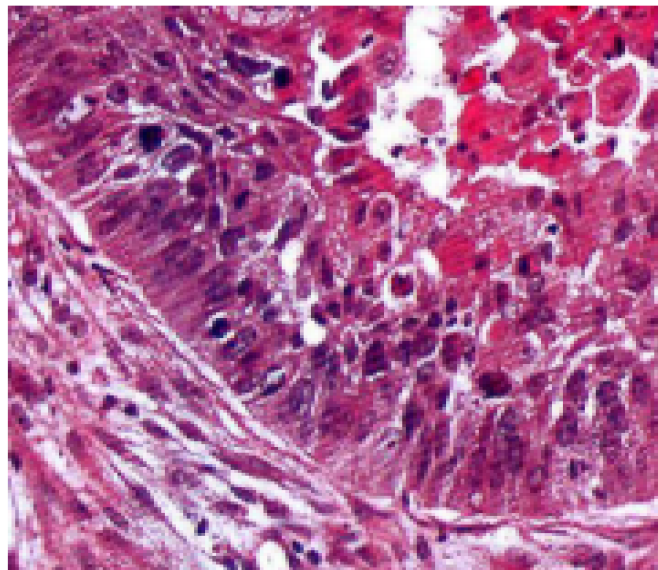
Figure 34. Ameloblastic Carcinoma. A tall columnar cellular morphology with pleomorphism mitotic activity

4.7.3. Treatment and prognosis

Maxillary ameloblastic carcinomas demonstrate tumor-related deaths or pulmonary metastases in over one-third of cases. Mandibular counterparts behave in a similar manner, where local recurrences are likely to precede metastases. [1,2,27,37]

4.8. Adenomatoid odontogenic tumor

4.8.1. Clinical and radiographic features

Intraosseous AOTs may be found in association with unerupted permanent teeth (follicular type), in particular the four canines that account for 60% with the maxillary canines alone accounting for 40%. Most AOTs are asymptomatic. When growth of the intraosseous variants

causes cortical expansion, it may present as a palpable bony-hard swelling with or without slight pain. The intraosseous AOTs may cause displacement of neighbouring teeth. The peripheral variant presents as a fibroma or an epulis-like lesion of the gingiva Radiographically, the intraosseous, follicular AOT, shows a well-defined, unilocular radiolucency around the crown and often part of the root of an unerupted permanent tooth, mimicking a dentigerous cyst. If not associated with an unerupted tooth (extrafollicular type), AOT presents as a unilocular radiolucent lesion. In two thirds of the intraosseous variant, the radiolucency shows discrete radiopaque foci. The peripheral variant may disclose erosion (saucerization) of the alveolar bone crest.(Fig.35).[1,2,8]


Figure 35. AOT involving the maxillary sinus.

4.8.2. Histopathologic features

Microscopically, the tumor is composed of spindle shaped epithelial cells that form sheets, strands, or whorled masses of cells in a scant fibrous stroma. The epithelial cells may form rosette-like structures about a central space, which may be empty or contain small amounts of eosinophilic material. This material may stain for amyloid. The tubular or ductlike structures, which are the characteristic feature of the adenomatoid odontogenic tumor, may be prominent, scanty, or even absent in a given lesion. These consist of a central space surrounded by a layer of columnar or cuboidal epithelial cells. The nuclei of these cells tend to be polarized away from the central space. The mechanism of formation

of these tubular structures is not entirely clear but is likely the result of the secretory activity of the tumor cells, which appear to be preameloblasts. In any event, these structures are not true ducts, and no glandular elements are present. Small foci of calcification may also be scattered throughout the tumor (Fig. 36).[1,2]
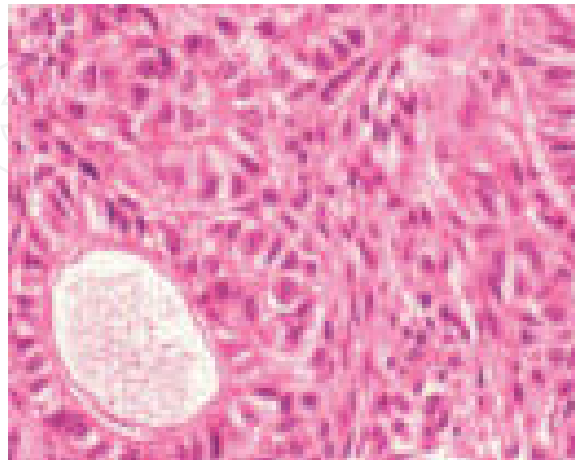
Figure 36. AOT. Solid, cell-rich area of minimal stromal connective tissue showing duct-like structures.

4.8.3. Treatment and prognosis

The adenomatoid odontogenic tumor is completely benign: because of its capsule, it enucleates easily from the bone. Aggressive behavior has not been documented, and recurrence after enucleation seldom, if ever, occurs. [1-8]

5. Lesions of hematologic origin

These include: Hodgkins, Burkitt's lymphoma, Plasmacytoma (multiple myeloma) and Non-Hodgkins lymphoma.

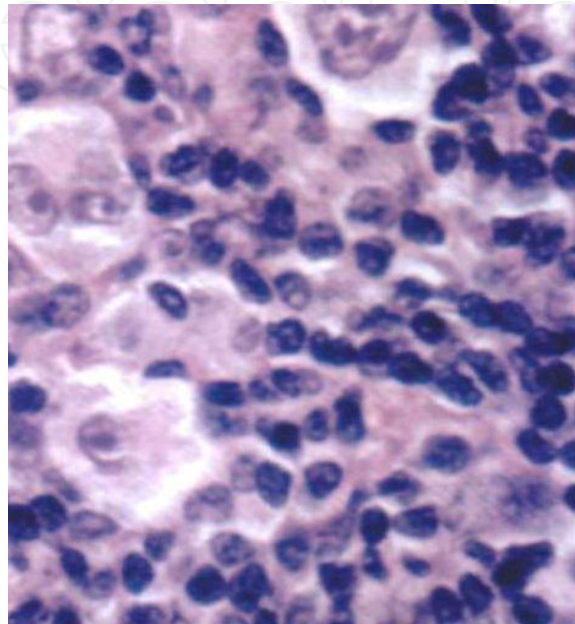### 5.1. Hodgkins lymphoma

5.1.1. Clinical features

Hodgkin's lymphoma almost always begins in the lymph nodes, and any lymph node group is susceptible. Oral involvement has been reported, but it is rare. In about 30% of patients with Hodgkin's disease, other systemic signs and symptoms may be present, such as weight loss, fever, night sweats, and generalized pruritus (itching).[1,8]

5.1.2. Histopathologic features

Hodgkin's lymphoma is recognized to comprise two main forms. [1] Nodular Ivmphocyte-predominant Hodgkin's lymphoma and [2] Classic Hodgkin's lymphoma, the latter of which

is divided into five subtypes. Although this group of diseases has certain features in common, current immunohistochemical and molecular biologic techniques have allowed distinctions to be made among the various types. The common features include effacement of the normal nodal architecture by a diffuse, often mixed, infiltrate of inflammatory cells that is interspersed with large, atypical neoplastic lymphoid cells. In the case of classical Hodgkin's lymphoma, this atypical cell is known as a Reed- Sternberg cell (Fig. 37). [1,8]

Figure 37. Hodgkin's lymphoma. This high-power photomicrograph shows the characteristic Reed-Sternberg cell.

5.1.3. Treatment and prognosis

The treatment of Hodgkin's lymphoma depends on the stage of involvement. Patients who had limited disease often were managed by local radiation therapy alone. Recent treatment trends, however, combine less extensive radiotherapy fields with milder multiagent chemo‐ therapy regimens to maximize disease control and minimize long-term complications of therapy. [1,8]

5.2. Burkitt's lymphoma

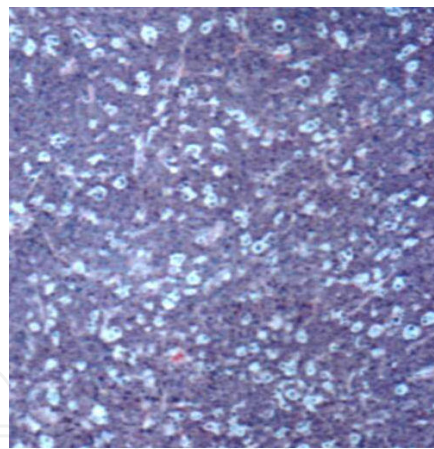Burkitt's lymphoma is a malignancy of B-lymphocyte origin that represents an undifferenti‐ ated lymphoma[1,8]

5.2.1. Clinical and radiographic features

As many as 50% to 70% of the cases of endemic Burkitt's lymphoma present in the jaws. The malignancy usually affects children (peak prevalence, about 7 years of age) who live in Central Africa, and a male predilection is usually reported. The posterior segments of the jaws are more commonly affected, and the maxilla is involved more commonly than the mandible (a

2:1 ratio). Sometimes all four quadrants of the jaws show tumor involvement. The tendency for jaw involvement seems to be age related; nearly 90% of 3 year-old patients have jaw lesions, in contrast to only 25% of patients older than age 15. Sporadic Burkitt's lymphoma tends to affect patients over a greater age range than is noted for the African tumor. Although the abdominal region is typically affected, jaw lesions have been reported in sporadic cases.[1,8] The growth of the tumor mass may produce facial swelling and proptosis. Pain, tenderness, and paresthesia are usually minimal, although marked tooth mobility may be present because of the aggressive destruction of the alveolar bone. Premature exfoliation of deciduous teeth and enlargement of the gingiva or alveolar process may also be seen. The radiographic features are consistent with a malignant process and include a radiolucent destruction of the bone with ragged, ill-defined margins. [1,8]

5.2.2. Histopathologic features

Burkitt's lymphoma histopathologically represents an undifferentiated, small, noncleaved B-cell lymphoma. The lesion has broad sheets of tumor cells that exhibit round nuclei with minimal cytoplasm. Each tumor nucleus often has several prominent nucleoli and numerous mitotic cells. Immunohistochemical studies using markers identify proliferating cells (e.g. Ki-67) typically show that almost 100% of the tumor cells are in the process of replicating. On viewing the lesion on low-power magnification, a classic "starry-sky" pattern is seen (Fig. 38) [1,8]

Figure 38. Burkitt's lymphoma "starry-sky" appearance, a pattern caused by interspersed histiocytic cells with abundant cytoplasm

5.2.3. Treatment and prognosis

Burkitt's lymphoma is an aggressive malignancy that usually results in the death of the patient within 4 to 6 months after diagnosis if it is not treated. Treatment generally consists of an intensive chemotherapeutic regimen, which emphasizes the use of high doses of cyclophosphamide. More than 90% of the patients respond to this treatment. The prognosis for Burkitt's lymphoma in the past was poor, with a median survival time of only months.

5.3. Plasmacytoma

The plasmacytoma is a unifocal, monoclonal, neoplastic proliferation of plasma cells that usually arises within bone. [1- 8]

5.3.1. Clinical and radiographic features

The plasmacytoma usually is detected in an adult male, with an average age at diagnosis of 55 years. The male-to-female ratio is 3:1. Most of the lesions present centrally within a single bone.

Approximately 80% to 90% of extramedullary plasmacytomas develop in the head and neck region, and such lesions have been reported in the tonsils, nasopharynx, and paranasal sinuses. [1-8]

5.3.2. Histopathologic features

The histopathologic features of the plasmacytoma are identical to those of multiple myeloma. Sheets of plasma cells show varying degrees of differentiation. Immunohistochemical studies demonstrate that these plasma cells are monoclonal. As many as 25% to 50% of these patients also show a monoclonal gammopathy on evaluation by serum protein immunoelectrophoresis (Fig. 39).[1-8]
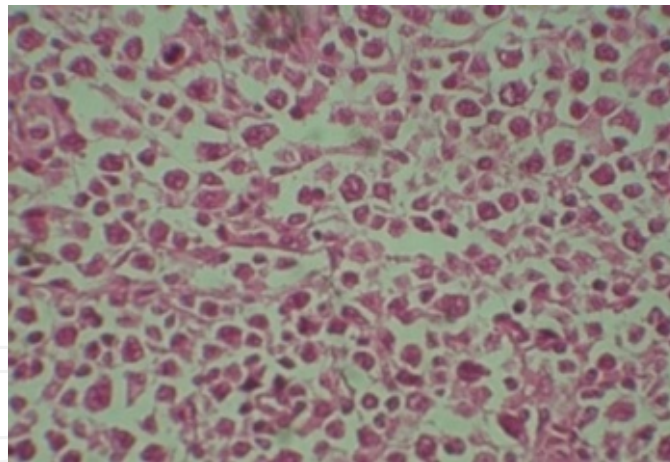
Figure 39. Plasmacytoma. Sheets of monomorphous-appearing plasma cells

5.3.3. Immunohistochemistry

Immunohistochemically, the plasma cells express cytoplasmic immunoglobulin with light chain restriction. CD20 is negative in most cases, and some cases express CD79a. PAX-5 is negative, while Oct-2 and Bob.1 are frequently positive. There is usually expression of CD38, CD138 and VS38, markers characteristically positive in but not specific for plasma cells. Epithelial membrane antigen is commonly positive, and rare cases can show cytokeratin immu-

noreactivity (often with a dot pattern). Leukocyte common antigen, CD31 or CD56 is sometimes positive. [1-8]

5.3.4. Treatment and prognosis

Plasmacytomas are usually treated with radiation therapy, and typically a dose of at least 4000 cGy is delivered to the tumor site. A few lesions have been surgically excised with good results, although this is not the preferred treatment in most instances. Unfortunately, when patients with plasmacytoma of bone are observed on a long-term basis, most will eventually develop multiple myeloma. [1-8]

5.4. Non-Hodgkin's lymphoma

5.4.1. Clinical and radiographic features

Lymphomas of the paranasal sinuses commonly show bony destruction and local extension to adjacent structures including the orbit, palate, nasal cavity, nasopharynx, and soft tissues in the cheek and infratemporal fossa. The maxillary sinus is the most commonly involved paranasal sinus. Patients may present with nasal obstruction, epistaxis, nasal discharge, pain and nasal swelling or facial swelling. Locally advanced cases can cause destruction of midline facial structures. The nasal septum or palate may be perforated. Extension to the orbits can lead to proptosis and visual disturbance. Regional lymph node involvement may occur in some patients. Occasional patients have systemic symptoms including fever and weight loss. Hemophagocytic syndrome with pancytopenia occurs at presentation in a minority of patients with extranodal NK/T cell lymphoma of nasal type. [1-8, 38]Lymphoma in patients with AIDS usually occurs in extranodal locations, with the CNS being the most common site. Oral lesions are seen in approximately 4% of patients with AIDS-related NHL and most frequently involve the gingiva, palate, tongue, tonsil, or maxillary sinus (Fig. 40). [1-8]

5.4.2. Histopathologic features

Non-hodgkins lymphoma consists of several subtypes: Diffuse small cleaved cell, Diffuse mixed small and large cell, Diffuse large cell, Diffuse large cell immunoblastic, Follicular large cell, Small noncleaved cell, Lymphoblastic, Follicular mixed small and large cell, Small lymphocytic and Follicular small cleaved cell variants.

5.4.3. Immunohistochemistry

The lymphoma most commonly exhibits an NK-cell immunophenotype of CD2+, surface CD3(Leu4)-, cytoplasmic CD3+, CD56+. CD43 and CD45RO are commonly positive, but other T-cell markers (including CD5) and NK-cell markers (CD16, CD57) are usually negative[1-8,39]
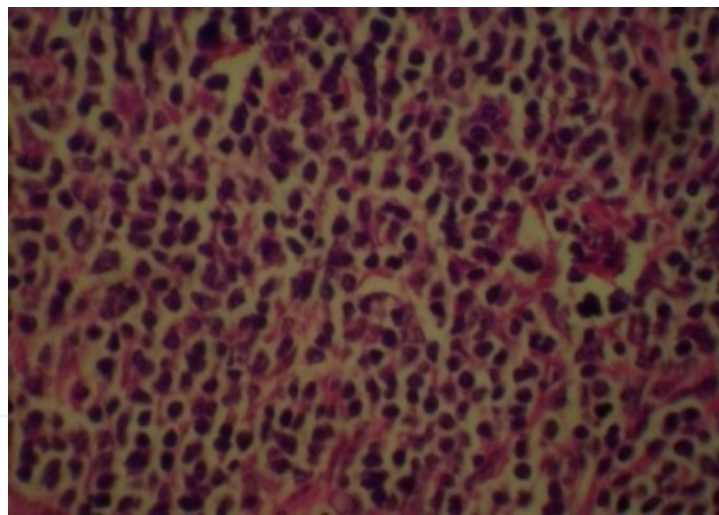
5.4.4. Treatment and prognosis

Radiotherapy and/or systemic chemotherapy is the treatment of choice for localized disease. Treatment of DLBCL follow protocols for similar tumors elsewhere in the body, as some series
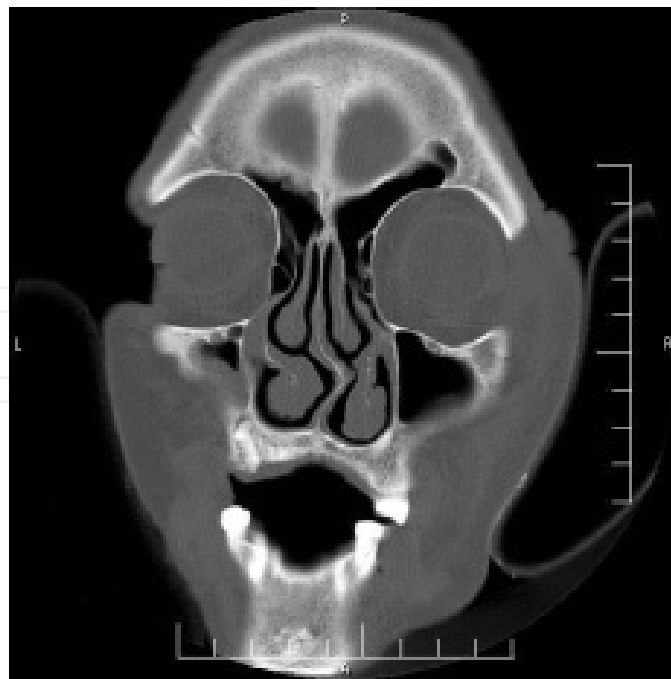
Figure 40. Non-hodgkins lymphoma with destruction in the left maxillary sinus.

Figure 41. Non-Hodgkins lymphoma; Diffuse small cell lymphoma.

showed that chemotherapy might be beneficial. The overall survival for extranodal NK/T cell lymphoma of nasal-type is only 30-50%. In patients achieving complete remission, local relapse occurs in one-third to one-half of cases, and systemic failure is also common. Factors associated with a worse outcome include: Advanced stage, poor systemic status and severe disease.There is no conclusive evidence to suggest that the histological grading of NK/T cell lymphoma can predict the clinical outcome. Expression of cutaneous lymphocyte antigen (CLA) may be associated with a worse prognosis, but this finding has yet to be confirmed. [1-8]

6. Bone tumors

Cherubism, Paget's Disease, Osteoid osteoma, Osteoma, Juvenile ossifying fibroma, Fibrous dysplasia, Giant cell tumor (central and peripheral), Chondrocarcoma, Osteosarcoma and Ewing's sarcoma are common bone tumors discussed herein.
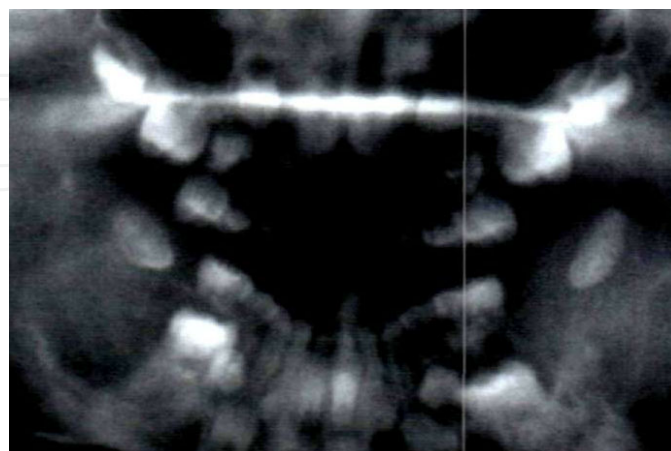
6.1. Cherubism

Cherubism is a rare, autosomal dominant inherited disease that causes bilateral swelling of at least the mandible but often also the maxilla. [1,5,8]

6.1.1. Clinical features

Males are affected more commonly than females and most patients present in early childhood. There is often a history of other afflicted family members. The resulting painless, symmetrical, facial deformity mimics the angelic faces of the cherubs portrayed in Renaissance and Baroque paintings, hence its name. Sometimes there is upward displacement of both eyes. The disease progression is self-limited, stabilizing at the end of puberty. Complications developing from the jaw disorder can result in poor dentition, impacted teeth, and malaligned teeth. [1,5,8]

6.1.2. Radiologic features

Radiographic findings are not pathognomonic, but the presence of bilateral, usually symmetrical involvement of the maxilla and mandible is certainly most suggested. The affected jaw areas show cortical expansion and attenuation (thinning) as well as a soap bubble-like multilocular radiolucency. Teeth and tooth germs may be displaced (Fig.42).[1,5,8]

Figure 42. Bilateral soap bubble-like radiolucencies with displaced teeth and tooth germs in cherubism.

6.1.3. Histopathologic features

Cherubism shows multinucleated, osteoclast-like giant cells lying in a fibroblastic background stroma. The fibroblastic tissue may vary in cellularity from very dense to cell-poor. Mitotic figures may be encountered but are usually not numerous and not atypical. The giant cells mostly cluster in areas of hemorrhage, but they also may lie more dispersed among the lesion. Bone formation is usually confined to the periphery of the lesion, as a reactive remodeling.There may also be a component consisting of immature odontogenic tissue due to developing tooth germs lying within the lesional tissue (Fig.43). [1,5,8]
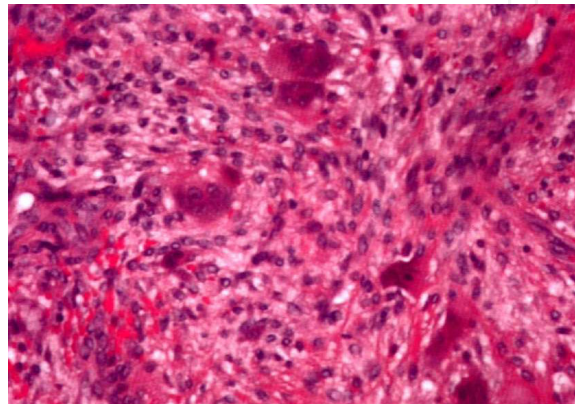
Figure 43. Histologically cherubism shows moderately cellular fibroblastic tissue with dispersed osteoclast-like giant cells and some extravasation of erythrocytes.

6.1.4. Prognosis and therapy

With the onset of puberty, the lesions may lose their activity and may mature to fibrous tissue and bone. Facial deformity may necessitate cosmetic surgery.

6.2. Paget's disease

Paget's disease of bone is a condition characterized by abnormal and anarchic resorption and deposition of bone, resulting in distortion and weakening of the affected bones. The cause of Paget's disease is unknown, but inflammatory, genetic, and endocrine factors may be contributing agents. In some studies 15% to 40% of affected patients have a positive family history of the disease. In recent years, recurrent mutations in the sequestosome 1 gene (SQSTA11, also known as p62) which participates in the regulation of osteoclastic activity via the nuclear factor-KB (NF-KB) transcription activation pathway, have been identified in *both* familial and sporadic cases of the disease. [1,8]

6.2.1. Clinical and radiographic features

Jaw involvement is present in approximately 17% of patients diagnosed with Paget's disease. Maxillary disease, which is far more common than mandibular involvement, results in enlargement of the middle third of the face. In extreme cases, the alteration results in a lion-

like facial deformity (leontiasis ossea). Nasal obstruction, enlarged turbinates, obliterated sinuses, and deviated septum may develop secondary to maxillary involvement. The alveolar ridges tend to remain symmetrical but become grossly enlarged. If the patient is dentulous then the enlargement causes spacing of the teeth. Edentulous patients may complain that their dentures no longer fit because of the increased alveolar size. Radiographically, the early stages of Paget's disease reveal a decreased radiodensity of the bone and alteration of the trabecular pattern. Particularly in the skull, large circumscribed areas of radiolucency may be present (osteoporosis circumscripta (Fig.44).[1,8]


Figure 44. Paget's disease. Periapical film showing the "cotton wool" appearance of the bone.

*6.2.2. Histopathologic features*

Microscopic examination shows an apparent uncontrolled alternating resorption and forma‐ tion of bone. In the active resorptive stages, numerous osteoclasts surround bone trabeculae and show evidence of resorptive activity. Simultaneously, osteoblastic activity is seen with formation of osteoid rims around bone trabeculae. A highly vascular fibrous connective tissue replaces the marrow. A characteristic microscopic feature is the presence of basophilic reversal lines in the bone. These lines indicate the junction between alternating resorptive and formative phases of the bone and result in a "jigsaw puzzle." or "mosaic," appearance of the bone (Fig. 45). [1,8]

6.3. Osteoid osteoma

Osteoid osteoma is a benign bone-forming tumor of limited growth potential, usually less than 1.5 cm, typically associated with nocturnal pain that is relieved by salicylates. It is very rare in the head and neck. It occurs in young patients (first three decades), with male predominance. On plain radiographs, dense cortical sclerosis surrounds a radiolu‐ cent nidus. Histologically, the nidus shows interconnected, ossified woven bone rimmed by osteoblasts. Fibrous tissue, vessels and multinucleated giant cells are identified inbetw‐ een the bony trabeculae (Fig.46).[1,2,8]
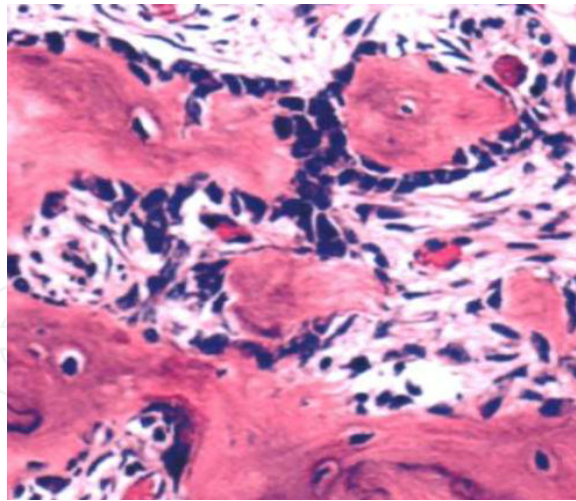
Figure 45. Paget's disease. Osteoblastic and osteoclastic activity surround the bone trabeculae.
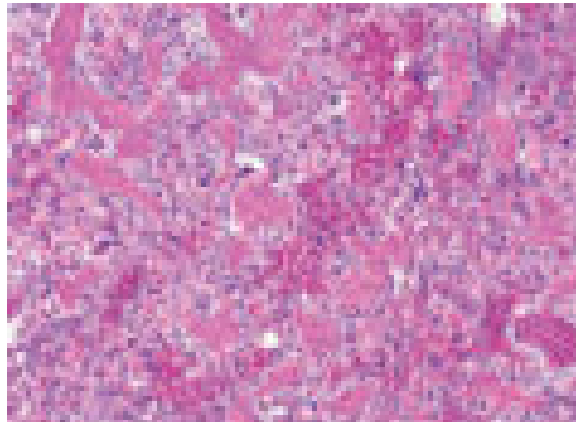
Figure 46. Osteoid osteoma. Osteoblasts surround the trabeculae.

6.3.1. Treatment and prognosis

Most cases of ostcoid ostcoma are treated by local excision or curettage. The prognosis is good, and some lesions will regress even after incomplete excision. [1,2,8]

6.4. Osteoma

6.4.1. Clinical and radiographic features

Osteomas are benign tumors composed of mature compact or cancellous bone. Osteomas are essentially restricted to the craniofacial skeleton and rarely symptomatic. Although pain, swelling, sinusitis, and nasal discharge are possible. In rare cases, paranasal sinus osteomas may expand into orbital structures and result in proptosis, diplopia, and decreased visual acuity. [1-8] Osteomas of the jaws may arise on the surface of the bone, as a polvpoid or sessile mass (periosteal, peripheral or exophytic osteoma). Or they may be located in the medullary

bone (endosteal or central osteoma). Extraskeletal lesions of soft tissue, typically located within muscle or the dermis of the skin (osteoma cutis), also are possible. Most jaw osteomas are detected in young adults and are generally asymptomatic. Paranasal sinus lesions also are possible and are actually more common than gnathic lesions. The frontal sinus is most commonly involved, followed by the ethmoid and maxillary sinuses. [1-8] Radiographically. osteomas appear as circumscribed sclerotic masses. Periosteal osteomas may show a uniform sclerotic pattern or may demonstrate a sclerotic periphery with a central trabecular pattern. Smaller endosteal osteomas are difficult, if not impossible, to differentiate from foci of sclerotic bone representing the end stage of an inflammatory process (condensing osteitis, focal chronic sclerosing osteomyelitis) or from noninflammatory foci of sclerotic bone (idiopathic osteoscle-rosis). The true nature of these osteomas can be confirmed only by documentation of continued growth (Fig.47). [1-8]
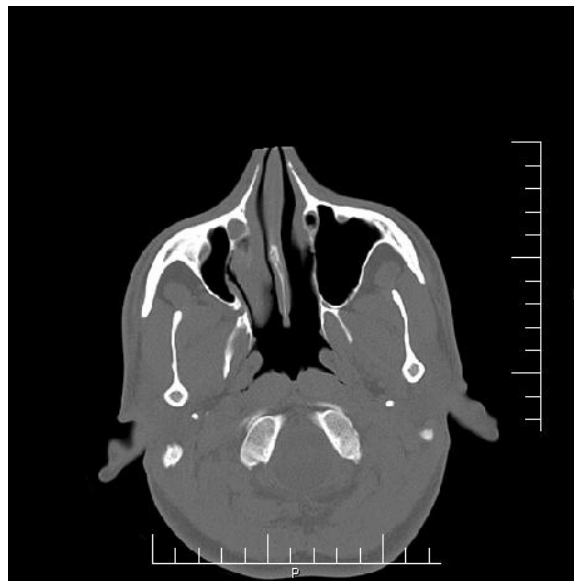

Figure 47. Osteoma in left side of maxilla.

6.4.2. Histopathologic features

A well-circumscribed nodule of mature dense bone is the characteristic feature.Bony trabecu-lae sometimes are rimmed by osteoblasts. Between bony trabeculae there may be fibrous tissue or fatty stroma with varying amounts of hematopoietic elements. Occasionally there are foci of mature cartilage (Fig.480.[1,8]

6.4.3. Treatment and prognosis

Paranasal sinus osteomas may not require removal unless they become large or symptomatic; small, periosteal lesions may be removed endoscopically. Whereas larger lesions typically require an open surgical approach. Osteomas are completely benign, and patients do not experience malignant change. Recurrence after excision is extremely rare.[1- 8]
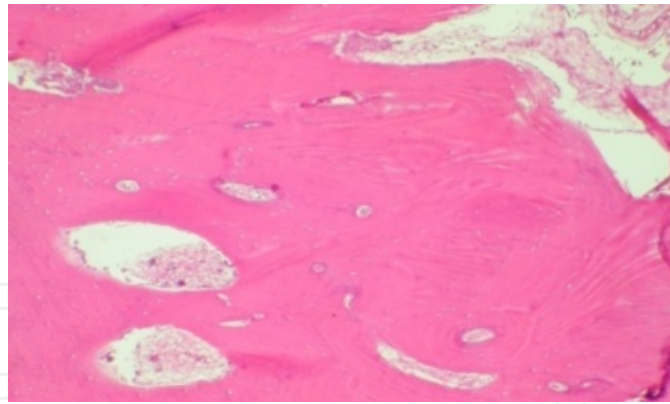
Figure 48. Osteoma. Trabeculae of lamellar bone with an intervening bland fibrous stroma.

6.5. Juvenile ossifying fibroma

Although the two forms demonstrate different histopathologic and clinical features, several investigators have chosen to compromise and accept two patterns of juvenile ossifying fibroma: [1] trabecular and [2] psammomatoid.[1- 8]

6.5.1. Clinical and radiographic features

In most instances, the neoplasms often grow rapidly, are well-circumscribed, and lack continuity with the adjacent normal bone. The lesions are circumscribed radiolucencies that in some cases contain central radiopacities. In some cases "ground glass" opacification may be observed. The age at diagnosis varies, with reported cases occurring in patients from younger than 6 months to older than 70 years of age. Lesions arising in the paranasal sinuses penetrate the orbital, nasal, and cranial cavities. Nasal obstruction, exophthalmos. or proptosis may be seen. Rarely, temporary or permanent blindness occurs in maxillary lesions exhibiting aggressive behavior (Fig.49).[1-8]

Figure 49. CT of Juvenile ossifying fibroma in left maxillary sinus.

6.5.2. Histopathologic features

Both patterns are typically nonencapsulated but well demarcated from the surrounding bone. The tumor consists of cellular fibrous connective tissue that exhibits areas that are loose and other zones that are so cellular that the cytoplasm of individual cells is hard to discern because of nuclear crowding. Myxomatous foci are not rare and often are associated with pseudocystic degeneration. Mitotic figures can be found but are not numerous. Areas of hemorrhage and small clusters of multinucleated giant cells are usually seen (Fig.50).[1-8]
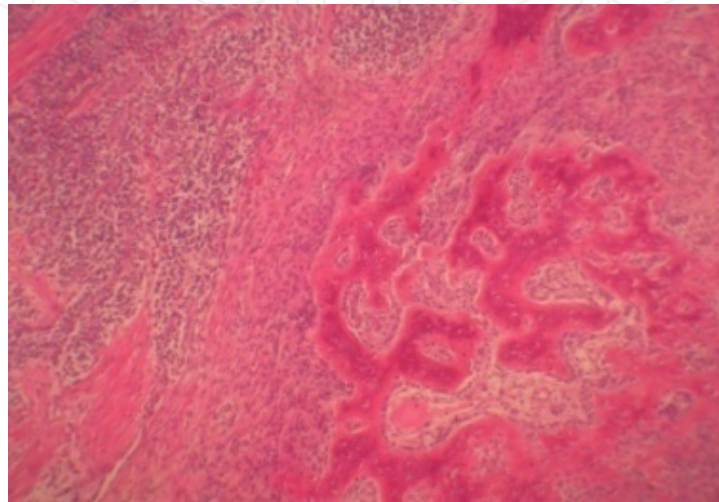
Figure 50. Juvenile ossifying fibroma bony trabeculae lined by a rim of osteoblasts

6.5.3. Treatment and prognosis

For smaller lesions, complete local excision or thorough curettage appears adequate. For some rapidly growing lesions, wider resection may be required. In contrast to the negligible recurrence rate seen in the common types of ossifying fibromas. Recurrence rates of 30% to 58% have been reported for juvenile ossifying fibromas. Malignant transformation has not been documented.[1-8]

6.6. Fibrous dysplasia

Fibrous dysplasia is a developmental tumor-like condition that is characterized by replacement of normal bone by an excessive proliferation of cellular fibrous connective tissue intermixed with irregular bony trabeculae. Fibrous dysplasia is a sporadic condition that results from a postzygotic mutation in the GNAS1 (guanine nucleotide-binding protein, a-stimulating activity polypeptide 1] gene. Clinically, fibrous dysplasia may manifest as a localized process involving only one bone, as a condition involving multiple bones, or as multiple bone lesions in conjunction with cutaneous and endocrine abnormalities (Fig.51). [1 -8]

Figure 51. Clinical features of fibrous dysplasia

6.6.1. Clinical and radiographic features

6.6.1.1. Monostotic fibrous dysplasia of the jaws

The disease is limited to a single bone. This type accounts for about 80% to 85% of all cases, with the jaws being among the most commonly affected sites. The chief radiographic feature is a fine "ground glass" opacification that results from superimposition of a myriad of poorly calcified bone trabeculae arranged in a disorganized pattern. When the maxilla is involved, the lesional tissue displaces the sinus floor superiorly and commonly obliterates the maxillary sinus. Imaging studies in cases with maxillary involvement may show increased density of the base of the skull involving the occiput, sphenoid, roof of the orbit, and frontal bones. This is the most characteristic radiographic feature of fibrous dysplasia of the skull (Fig.52). [1 -8]

6.7. Polyostotic fibrous dysplasia

6.7.1. Jaffe-Lichtenstein syndrome and McCune-Albright Syndrome

Involvement of two or more bones is termed polyostotic fibrous dysplasia. a relatively uncommon condition. The number of involved bones varies from a few to 75% of the entire skeleton. When seen with *cafe au lait* (coffee with milk) pigmentation, the process is termed Jaffe-Lichtenstein syndrome. Polyostotic fibrous dysplasia also may be combined with *cafe au lait* pigmentation and multiple endocrinopathies. such as sexual precocity, pituitary adenoma, or hyperthyroidism. This pattern is known as the McCune-Albright Syndrome.[1-8]
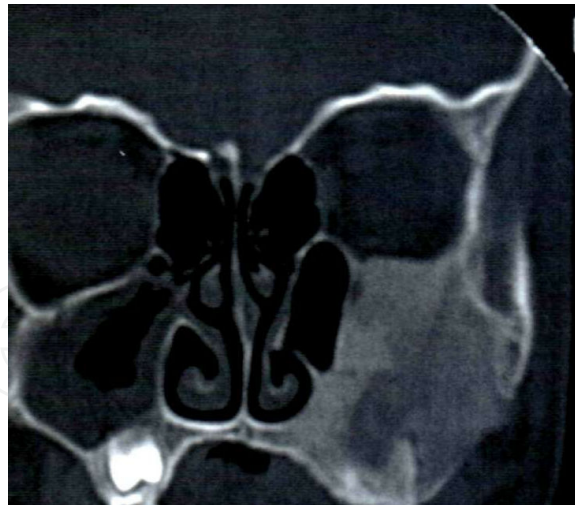
Figure 52. Fibrous dysplasia of the maxilla.-ground glass appearance.

6.7.2. Histopathologic features

The prototypical appearance of fibrous dysplasia consists of irregularly shaped trabeculae of osteoid and woven bone diffusely embedded in a cellular fibrous tissue stroma (Fig.53).[1,2]
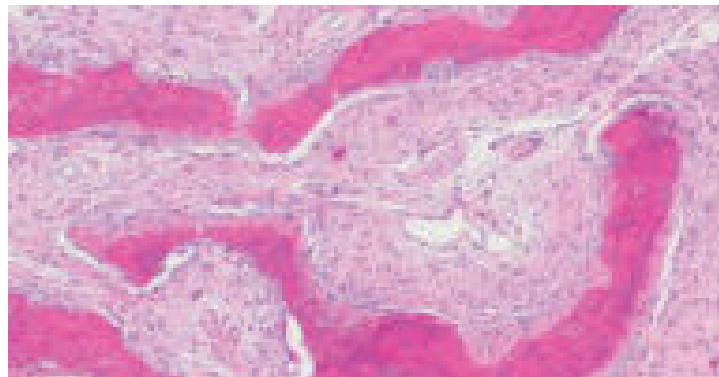
Figure 53. Fibrous dysplasia. Trabeculae of woven bone without osteoblastic rimming.

6.7.3. Treatment and prognosis

Clinical management of fibrous dysplasia of the jaws may present a major problem. Although smaller lesions, may be surgically treated in their entirety without too much difficulty, the diffuse nature and large size of many lesions particularly those of the maxilla, preclude removal without extensive surgery. In many cases, the disease tends to stabilize and stop enlarging when skeletal maturation is reached. Some lesions, however, continue to grow, although slowly, in adult patients. Some patients with minimal cosmetic or functional deformity may not require or desire surgical treatment. Cosmetic deformity with associated psychologic problems or functional deformity may dictate surgical shaving in the younger patient. Such a procedure usually entails surgical reduction of the lesion to an acceptable

contour without attempts to remove the entire lesion. The cosmetic result is usually good, but regrowth may occur over time. [1 -8]

6.8. Giant cell granuloma

6.8.1. Clinical and radiographic features

Molar and premolar areas are more often affected than the anterior parts or the ascending ramus. Involvement of the condyle or maxillary sinus is rare. Most cases present as asymptomatic incidental findings. Some, however, present with pain or paraesthesia, swellings or loosening of teeth. Nasal obstruction may occur. Central or peripheral giant cell lesions (GCL) are expansile, radiolucent and often multiloculated lesions, rarely mixed opacities, with scalloped and mostly well-defined but non-corticated borders. With increasing size, multilocularity is more often noticed (Fig. 54). [1,2,40]


Figure 54. Giant cell lesion with destruction of the maxillary sinus.

6.8.2. Histopathology

The lesion consists of spindle-shaped fibroblastic or myofibroblastic cells, loosely arranged in a fibrous, sometimes fibromyxoid, vascularized tissue hemosiderin deposits, macrophages with hemorrhagic areas, lymphocytes, granulocytes and, rarely, plasma cells. Especially in the hemorrhagic, areas, evenly dispersed or small clusters of osteoclast-like giant cells are found. In addition, traversing collagen bundles are present, often accompanied by metaplastic bone formation giving the lesion a somewhat lobular appearance (Fig. 55). [1,2,3,41]
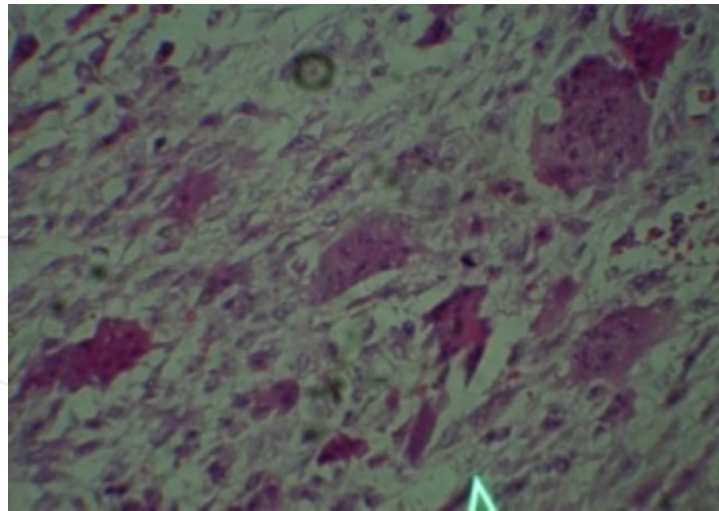
Figure 55. Giant cell lesion; scattered multinucleated cells surrounded by a fibrous tissue stroma.

6.8.3. Treatment and prognosis

Histological findings are not predictive of biological behaviour. The treatment of GCL is careful enucleation. In case of recurrences, more extensive surgery should be considered. Administration of calcitonin (intranasal or subcutaneously), or glucocorticoids (intralesional) has proven effective in some cases. Also antiangiogenic therapy with interferon alpha has been successfully applied. [1,2,3]

6.9. Chondrosarcoma

Chondrosarcoma is a malignant tumor characterized by the formation of cartilage.

### 6.9.1. Clinical and radiographic findings

A painless mass or swelling is the most common presenting sign. This may be associated with separation or loosening of teeth. Chondrosarcoma may involve the alveolar portion of the maxilla, the maxillary sinus or the nasal septum. Radiographically, the tumor usually shows features suggestive of a malignancy, consisting of a radiolucent process with poorly defined borders. The radiolucent area often contains scattered and variable amounts of radiopaque foci, caused by calcification or ossification of the cartilage matrix. Some chondrosarcomas show extensive calcification and radiographically appear as a densely calcified mass with irregular peripheral margins. Penetration of the cortex can result in a sunburst pattern similar to that seen in some osteosarcomas. When occurring in the head and neck, chondrosarcomas arise most frequently in the maxilla.[1,2,5] Maxillary tumors involve primarily the maxillary sinuses and nasal cavity and are less confined as they quickly erode the thin maxillary bone walls. Early jaw symptoms frequently include malocclusion with developing diastemas, loose teeth and eventual bony destruction (Fig. 560. [1- 5]

Figure 56. Chondrosarcoma of the left maxilla

6.9.2. Histopathologic features

Chondrosarcomas are composed of cartilage showing varying degrees of maturation and cellularity. In most cases, typical lacunar formation within the chondroid matrix is visible, although this feature may be scarce in poorly differentiated tumors. The tumor often shows a lobular growth pattern, with tumor lobules separated by thin fibrous connective tissue septa (Fig. 57). [1- 5]
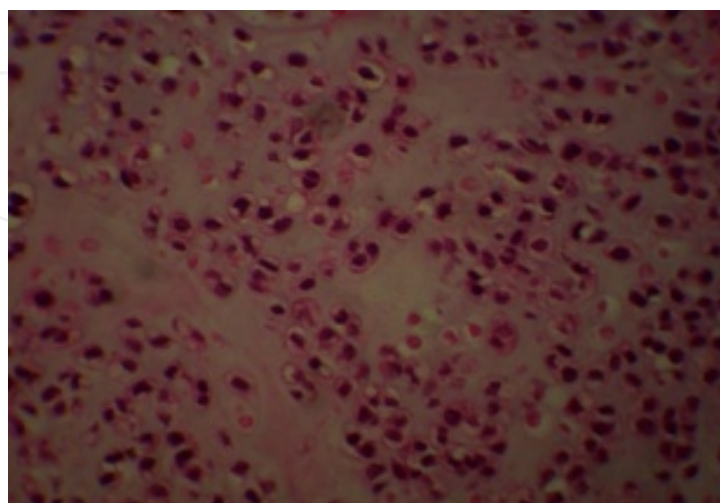
Figure 57. Chondrosarcoma. Cartilaginous neoplasm shows an abundant matrix that surrounds chondrocytes and mild nuclear irregularities.

6.9.3. Treatment and prognosis

The prognosis for chondrosarcoma is related to the size, location, and grade of the lesion. The most important factor is the location because this has the greatest influence on the ability to achieve complete resection. The most effective treatment for chondrosarcoma is radical surgical excision. Radiation and chemotherapy are less effective when compared with osteosarcoma and are primarily used for unresectable high-grade chondrosarcomas.[5,6] Chondrosarcomas are associated with an excellent prognosis if the lesions are completely resected. Approximately 20% of patients die of tumor, most often with uncontrolled local recurrence. Mesenchymal chondrosarcoma is a high-grade tumor with an unpredictable prognosis. Patients with tumor of the facial skeleton do better than those with tumors of the remainder of the skeleton[1,2,4- 6]
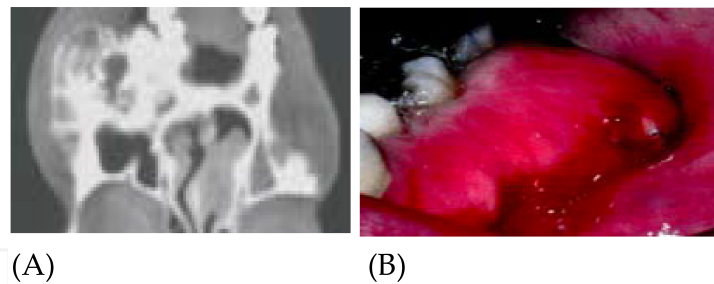
6.10. Osteosarcoma

6.10.1. Clinical and radiographic features

The maxilla and mandible are involved with about equal frequency. Mandibular tumors arise more frequently in the posterior body and horizontal ramus rather than the ascending ramus. Maxillary lesions are discovered more commonly in the inferior portion (alveolar ridge, sinus floor, palate) than the superior aspects (zygoma, orbital rim). Swelling and pain are the most common symptoms Loosening of teeth, paresthesia. and nasal obstruction (in the case of maxillary tumors) also may be noted. Some patients report symptoms for relatively long periods before diagnosis, which indicates that some rare osteosarcomas of the jaws grow rather slowly. The radiographic findings vary from dense sclerosis to a mixed sclerotic and radiolucent lesion to an entirely radiolucent process. The peripheral border of the lesion is usually ill-defined and indistinct, making it difficult to determine the extent of the tumor radiographically. In some cases, an extensive osteosarcoma may show only minimal or subtle radiographic change with only slight variation in the trabecular pattern. Occasionally, there is resorption of the roots of teeth involved by the tumor. This feature is often described as "spiking" resorption as a result of the tapered narrowing of the root. The "classic" sunburst or sun ray appearance caused by osteophytic bone production on the surface of the lesion is noted in about 25% of jaw osteosarcomas. Often this is appreciated best on an occlusal projection. In few cases a triangular elevation of the periosteum, referred to as *Codman's triangle,* may be observed (Fig. 58).[1,3,8]

6.10.2. Histopathologic features

Depending on the amount of osteoid, cartilage or collagen fibers produced by the tumor, many pathologists subclassify osteosarcomas into Osteoblastic, Chondroblastic and Fibroblastic subtypes. These histopathologic subtypes, however, do not have influence on the prognosis. Other less commonly encountered histopathologic variations include malignant fibrous histiocytoma-like, small cell, epithelioid, telangiectatic and giant cell-rich (Fig. 59).[1,2,8]

(A)   (B)

Figure 58. A. CT scan of an osteosarcoma of the maxilla. B. Oral view.
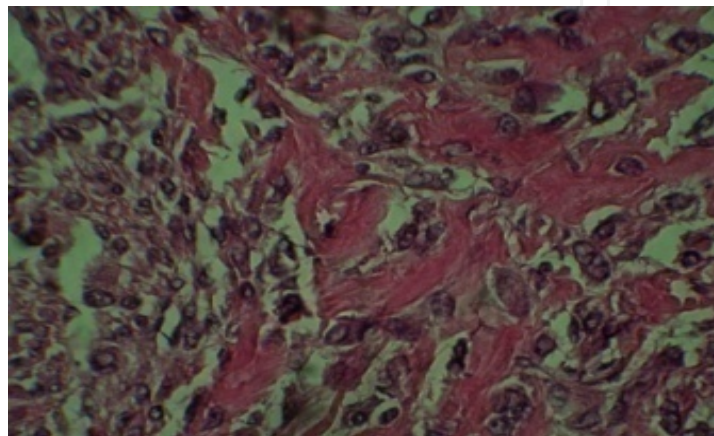
Figure 59. Osteosarcoma. Dense, irregular osteoid separated by a cellular stroma.

6.10.3. Treatment and prognosis

Multicenter investigations of different therapies to osteosarcoma of long bones have led to an improved prognosis that now appears superior to that associated with gnathic neoplasms. These protocols involve neo adjuvant (preoperative) chemotherapy followed by radical surgical excision with careful pathologic examination of the specimen to evaluate the chemotherapeutic effects on the tumor. Adjuvant (postoperative) chemotherapy is used and may be modified if poor histopathologic response to the neoadjuvant regimen is noted. Some investigators have demonstrated 4-year survival rates exceeding 80% with this approach Limited numbers of patients with jaw osteosarcomas have been treated with these protocols, and superior results have been claimed compared with surgical treatment alone.[1,2]

## 6.11. Ewing Sarcoma (EWS) /Primitive Neurvoectodermal Tumor (PNET)

6.11.1. Clinical features

Sinonasal EWS/PNET most commonly occur in the maxillary sinus and nasal fossa and mandible [1,2,8] Symptoms include pain, mass, and obstruction. The tumor can be polypoid when arising from the nasal cavity. Bony erosion may or may not be present [2,8]

6.11.2. Histopathology

The tumor is composed of densely distributed, uniform, small to medium sized, round cells with a high nuclear to cytoplasmic ratio and fine chromatin. Mitotic activity is high, and coagulative necrosis is common. Some cases show more densely clumped chromatin or a greater degree of nuclear pleomorphism. Home Wright rosettes are rare Fig. 60.[1,2,8]
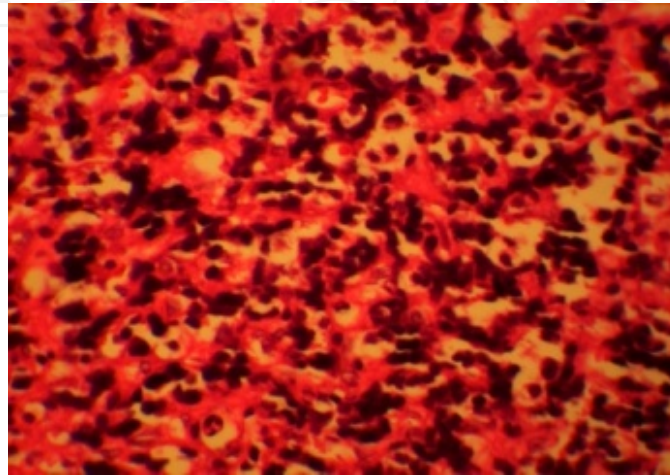
Figure 60. Ewing sarcoma. Intermediate-sized cells, scanty cytoplasm and increased mitotic figures.

6.11.3. Immunohistochemistry

The immunophenotype includes reactivity for CD99 (MIC2, O13, HBA-71, p30/32, and 12E7), vimentin, and on occasion focally for keratins. Some cases express neural markers, such as synaptophysin, S100 protein, NSE, neurofilament protein, GFAP, and chromogranin. Fli-1 (one portion of the gene fusion product of EWS/FLI1) can be detected by immunohistochemistry. [2,8]

6.11.4. Treatment and prognosis

Regardless of anatomic site in the head and neck region, complete excision is the treatment of choice, as radiation and chemotherapy have less value. For Sinonasal lesions, the 5-year survival rate is approximately 10 to 21 percent. [1,2,8]

7. Neuroectodermal tumors

Neurofibroma, Schwannoma,Malignant melanoma are common neuroectodermal lesions.

7.1. Neurofibroma

This benign tumor of peripheral nerve sheath phenotype with mixed cellular components, including Schwann cells, perineurial hybrid cells and intraneural fibroblasts.

7.1.1. Clinical features

Symptoms include epistaxis, rhinorrhoea, swelling, mass, obstruction, and pain [1,8]

7.1.2. Histopathology

Neurofibromas are generally submucosal paucicellular lesions. They are composed of spindled cells with wavy, dark-staining nuclei and scanty cytoplasm, in a background of wavy collagen fibres, myxoid stroma and mast cells. The center of the lesion usually shows residual neuritis (Fig. 61).[1,2,8]
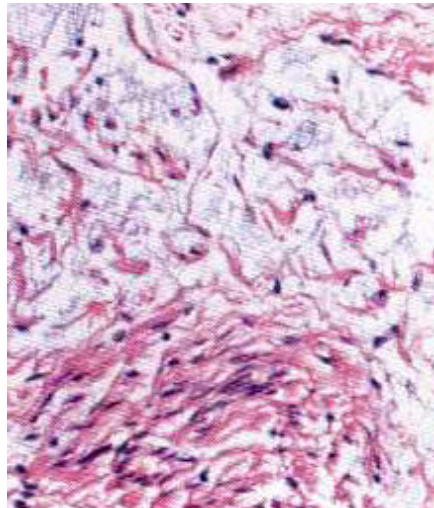
Figure 61. Oral neurofibroma. Spindle cells with dark serpentine nuclei are surrounded by a myxoid matrix.

7.1.3. Immunohistochemistry

The tumor is diffusely immunoreactive for S100 protein, but the proportion of positive cells is lower than that in schwannoma. CD34 stains the admixed fibroblasts.[2]

7.1.4. Treatment and prognosis

Neurofibromas are benign and have a very low recurrence rate. A small percentage of cases may undergo malignant transformation[1,8]

7.2. Schwannoma

A usually encapsulated, benign tumor composed of differentiated, neoplastic Schwann cells.

7.2.1. Clinical and radiographic features

Less than 4% of schwannomas involve the nasal cavity and paranasal sinuses and they occur in middle aged adults with an equal gender distribution. Sinonasal schwannomas arise from the branches of the trigeminal (5th cranial) nerve and autonomic nervous system, and most

commonly involve the ethmoid and maxillary sinuses, followed by the nasal cavity, sphenoid and frontal sinuses. The presenting symptoms include obstruction, rhinorrhea, epistaxis, anosmia, headache, dysphagia, hearing loss facial or orbital swelling, and pain Sinonasal schwannoma ranges in size up to 7 cm. It is a well-delineated but non-encapsulated globular, firm to rubbery yellow-tan mass. The cut surfaces show tan-grey, yellowish, solid to myxoid and cystic tissue, commonly with hemorrhage.[1,2,8]

7.2.2. Histopathology

Schwannoma is composed of cellular Antoni A areas with Verocay bodies and hypocellular myxoid Antoni B areas. The cells are fusiform with elongated fribillary cytoplasm, and buckled to spindled nuclei which show little pleomorphism, although scattered large pleomorphic or bizarre cells can be present in some cases. Nuclear palisading is often evident in some foci. There are frequently small to medium-sized vessels with ectasia, thrombosis and perivascular hyalinization in the Antoni B areas. Extensive degenerative changes can occur, and may result in only a thin rim of recognizable tumor. Cellular variants exhibit only the Antoni A pattern, but no fascicular growth or Verocay bodies (Fig. 62).[2,42]
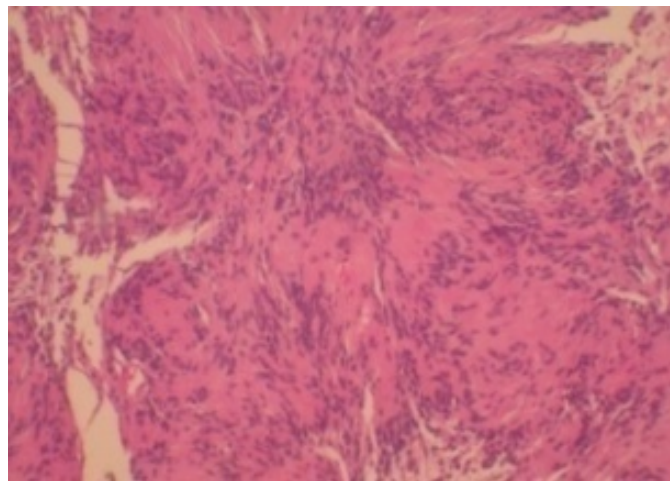
Figure 62. Schwannoma cellular areas (Antoni A) and loose, myxoid foci (Anroni B)

7.2.3. Immunohistochemistry

The tumor cells are strongly and diffusely immunoreactive for S100 protein. CD34 only stains some more slender cells in the Antoni B areas. Neurofilament is absent. GFAP and keratins may be positive.[1,8]

7.2.4. Treatment and prognosis

This tumor has a very low recurrence potential. Schwannoma is a benign tumor and transformation is rare.[1,8]

7.3. Malignant melanoma

7.3.1. Clinical features

More than half of mucosal melanomas occur in the head and neck area (including the oral and sinonasal regions). Symptoms include nasal obstruction, epistaxis, nasal polyp, pain, nasal discharge of variable duration, and melanorrhoea ("coal flecked" or brown nasal discharge (Fig. 63).[1,2,43]

**Figure 63.** Malignant melanoma involving maxillary sinus and alveolar ridge.

7.3.2. Histopathology

The tumors are comprised of epithelioid, spindled, plasmacytoid, rhabdoid and/or multi-nucleated tumor cells. The cells are generally medium to large-sized They have a high nuclear to cytoplasmic ratio with pleomorphic nuclei containing prominent eosinophilic nucleoli and intranuclear cytoplasmic inclusions. Nuclear molding may be present. The cytoplasm is usually densely eosinophilic, and variably contains melanin pigment. Mitoses, including atypical forms, are frequent and easily identifiable. Vascular invasion and neurotropism may be identified in up to 40% of cases. An inflammatory infiltrate admixed with pigment-laden histiocytes is commonly identified within or adjacent to the tumor. Tumor cell necrosis is common, particularly in tumors displaying a peritheliomatous or pseudopapillary growth pattern. Other growth patterns include solid, alveolar or sarcomatoid (Fig. 64). [1-8]

7.3.3. Immunohistochemistry

Malignant melanoma expresses S100 protein, vimentin and variably HMB45, tyrosinase, melan-A and microphthalmia transcription factor. Neuron specific enolase, CD117, CD99

synaptophysin, CD56, and CD57 have been reported to be occasionally positive but epithelial membrane antigen, cytokeratins, and muscle markers are not expressed. [2,43]
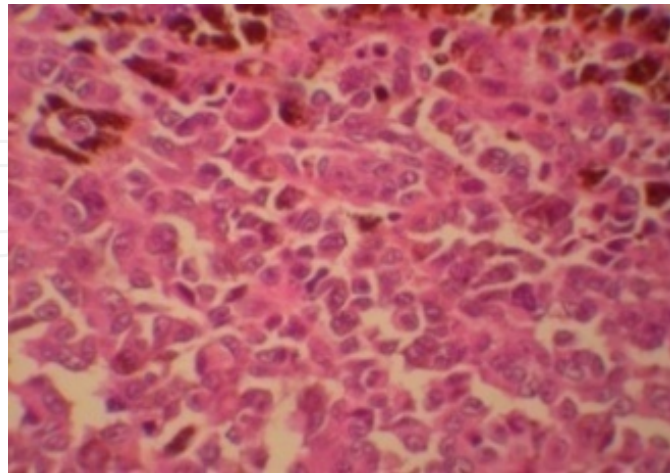
Figure 64. Malignant melanoma. Malignant cells with a high nuclear to cytoplasmic ratio with pleomorphic nuclei containing prominent eosinophilic nucleoli.

7.3.4. Treatment and prognosis

The features best related to tumor behavior are the stage of disease and the depth of invasion. Surgical excision is the mainstay of treatment although the extent of the excision is somewhat controversial. Older literature suggests that surgical margins of 3 to 5 cm around the tumor are necessary to achieve control, regardless of the site of the lesion. More recent studies indicate that a 1-cm margin is adequate for small cutaneous tumors less than 2 mm in thickness. For larger, more deeply invasive tumors, wide surgical excision still is recommended.[1,2,8]

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References

[1]   Neville, oral and maxillofacial pathology,3rd edition, Saunders 2009

[2]   Leon Barnes,John w.pathologic and genetic head and neck tumors.2007

[3] Steven G, Silverberg, surgical pathology and cytopathology, 4th edition, Churchill liv-ingstone Elsevier, 2006

[4] Leon Barnes,et-al.surgical pathology head and neck.volume 1, 3rd edition, 2009 by in-forma healthcare USA, inc, p(374-376)

[5] Lester D.R.Thompson, head and neck pathology a volume in the series foundations in diagnostic pathology, Churchill livingstone, 2006.p(497-510)

[6] Douglas R.Gnepp,MD, Diagnostic surgical pathology of the head and neck,second edition,, 2009 by sunders, an imprint of Elsevier Inc.

[7] Edward B. stelow. Stacy E. mils, Biopsy interpretation of the upper Aerodigestive tract and Ear, 2007

[8] Rosai and Akermans.,surgical pathology.,10th edition.,volume1,2.,mosby/.20011

[9] Lieberman P. Rhinitis—allergic and nonallergic. Hosp Pract (Off Ed) 1988; 23:117–132

[10] Mygind N. Pathogenesis of allergic rhinitis. Acta Otolaryngol Suppl (Stockh) 1979; 360:9–12.

[11] Mabry RL. Allergic rhinosinusitis. In: Bailey BJ, Johnson JT, Kohut RI, et al. ed. Head Neck Surgery—Otolaryngology.Philadelphia: JB Lippincott, 1993:290–301

[12] Murray JC, Pollack SV, Pinnel SR. Keloids: a review. J Am Acad Dermarol1981;4:461-70.

[13] Sheehy JL. Diffuse exostoses and osteomata of the external auditory canal: a report of 100 operations. Otolarygol Head Neck Surg 1982;90:337--42.

[14] Heffner DK, Hyams VJ. Cystic chondromalacia (endochondral pseudocyst) of the au-ricle. Arch Pathol LabMed 1986;110:740-3

[15] Barnes L, Kanbour A (1988). Malignant fibrous histiocytoma of the head and neck. A report of 12 cases. Arch Otolaryngol Head Neck Surg 114: 1149-1156 Laryngoscope 96: 1381-1384

[16] Oysu C, Aslan I, Bilgic B, Yazicioglu E (2001). Malignant triton tumor of the para-pharyngeal space. J Laryngol Otol 115:573-575

[17] Nicolai P, Tomenzoli D, Berlucchi M, Facchetti F, Morassi L, Maroldi R (2000). Malig-nant triton tumor of the ethmoid sinus and nasal cavity. Ann Otol Rhinol Laryng-ol109: 880-886

[18] Wong KF, So CC, Wong N, Siu LL, Kwong YL, Chan JK (2001). Sinonasal angiosarco-ma with marrow involvement at presentation mimicking malignant lymphoma cyto-genetic analysis using multiple techniques. Cancer Genet Cytogenet 129: 64-68

[19] Panje WR, Moran WJ, Bostwick DG, Kitt VV (1986). Angiosarcoma of the head and neck: review of 11 cases.

[20] Hicks J, Flaitz C (2002). Rhabdomyo - sarcoma of the head and neck in children. Oral Oncol 38: 450-459

[21] Tonin PN, Scrable H, Shimada H, Cavenee WK (1991). Muscle-specific gene expression in rhabdomyosarcomas and stages of human fetal skeletal muscle development. Cancer Res 51: 5100-51

[22] Huang HY, Antonescu CR (2003). Sinonasal smooth muscle cell tumors: a clinicopathologic and immunohistochemical analysis of 12 cases with emphasis on the low-grade end of the spectrum. Arch Pathol Lab Med 127: 297-304

[23] Fu YS, Perzin KH (1975). Nonepithelial tumors of the nasal cavity, paranasal sinuses, and nasopharynx: a clinicopathologic study. IV. Smooth muscle tumors(leiomyoma, leiomyosarcoma). Cancer 35: 1300-1308.

[24] Folpe AL, Chand EM, Goldblum JR, Weiss SW (2001). Expression of Fli-1, nuclear transcription factor, distinguishes a vascular neoplasms from potential mimics. Am J Surg Pathol 25: 1061-1066

[25] Rohrmus B, Thoma-Greber EM, Bogner JR, Rocken M (2000). Outlook in oral and cutaneous Kaposi's sarcoma Lancet 356: 2160

[26] Cross JJ, Pilkington RJ, Antoun NM, Adlam DM (2000). Value of computed tomography and magnetic resonance imaging in the treatment of a calcifying epithelial odontogenic (Pindborg) tumor. Br J Oral Maxillofac Surg 38: 154-157.

[27] Veness MJ, Morgan G, Collins AP, Walker DM (2001). Calcifying epithelial odontogenic (Pindborg) tumor with malignant transformation and metastatic spread Head Neck 23: 692-696.

[28] Franklin CD, Pindborg JJ (1976). The calcifying epithelial odontogenic tumor. A review and analysis of 113 cases. Oral Surg Oral Med Oral Pathol 42: 753-765

[29] Hicks MJ, Flaitz CM, Wong ME, McDaniel RK, Cagle PT (1994). Clear cell variant of calcifying epithelial odontogenic tumor: case report and review of the literature. Head Neck 16: 272-277

[30] Philipsen HP, Reichart PA, Praetorius F (1997). Mixed odontogenic tumors and odontomas. Considerations on interrelationship. Review of the literature and presentation of 134 new cases of odontomas. Oral Oncol 33: 86-99.

[31] Piattelli A, Trisi P (1992). Morphodif - ferentiation and histodifferentiation of the dental hard tissues in compound odontoma: a study of undemineralized material. J Oral Pathol Med 21, 340-342.

[32] Martins C, Carvalho YR, do Carmo MA (2001). Argyrophilic nucleolar organizer regions (AgNORs) in odontogenic myxoma (OM) and ameloblastic fibroma (AF). J Oral Pathol Med 30: 489-493

[33] A. Pahl S, Henn W, Binger T, Stein U, Remberger K (2000). Malignant odontogenic myxoma of the maxilla: case with cytogenetic confirmation. J Laryngol Otol114: 533-535

[34] Chidzonga MM (1996). Ameloblast - oma in children. The Zimbabwean experience. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 81: 168-170

[35] Dhir K, Sciubba JJ, Tufano RP (2003 Ameloblastic carcinoma of the maxilla.

[36] Cox DP, Muller S, Carlson GW, Murray D (2000). Ameloblastic carcinoma ex amelo-blastoma of the mandible with malignancy- associated hypercalcemia. Oral Surg Or-al Med Oral Pathol Oral Radiol Endod 90: 716-722.

[37] Simko EJ, Brannon RB, Eibling DE(1998). Ameloblastic carcinoma of the mandible. Head Neck 20: 654-659

[38] Takahashi N, Miura I, Chubachi A, Miura AB, Nakamura S (2001). A clinicopatho-logical study of 20 patients with T/natural killer (NK)-cell lymphoma-associated he-mophagocytic syndrome with special reference to nasal and nasal-type NK/T-cell lymphoma. Int J Hematol 74: 303-308.

[39] Jaffe ES, Chan JK, Su IJ, Frizzera G, Mori S, Feller AC, Ho FC (1996). Report of the Workshop on Nasal and Related Extranodal Angiocentric T/Natural KillerCell Lym-phomas. Definitions, differentia diagnosis, and epidemiology. Am J Surg Pathol 20: 103-111

[40] Stavropoulos F, Katz J (2002). Central giant cell granulomas: a systematic review of the radiographic characteristics with the addition of 20 new cases. Dentomaxillofac Radiol 31: 213-217

[41] El Labban NG, Lee KW (1983). Myofibroblasts in central giant cell granuloma of the jaws: an ultrastructural study.Histopathology 7: 907-918.

[42] Shugar JM, Som PM, Biller HF, Som ML, Krespi YP (1981). Peripheral nerve sheath tumors of the paranasal sinuses. Head Neck Surg 4: 72-76

[43] Briele HA, Walker MJ, Das Gupta TK(1985). Melanoma of the head and neck. Clin Plast Surg 12: 495-504