Oral tumors account for 7-12% of all feline tumors and 90% of oral tumors in cats are malignant. They may be of dental (odontogenic) or non-dental origin. Squamous cell carcinoma is the most common oropharyngeal cancer in cats accounting for 60-80% of all oral tumors, followed by fibrosarcoma which accounts 13-22% of feline oral tumors.

History and clinical signs
Cats with oral tumors may present with drooling, exophthalmos, facial swelling, epistaxis, sneezing, weight loss, dysphagia, anorexia, decreased appetite, reluctance to eat hard food, decreased activity, hiding and less interactive, halitosis, an unkempt haircoat due to poor grooming, and/or pain when opening the mouth. Beware that loose teeth in a cat with otherwise good dentition could indicate an underlying neoplastic process causing bone lysis.

Clinical staging
Clinical staging of the tumor should be completed utilizing the TMN system which involves assessment of the primary tumor (T), assessment for metastasis to distant sites (M) and to regional lymph nodes (N).

Evaluation of the primary tumor (T)
Evaluation of the primary tumor should include a clinical examination, diagnostic imaging and histopathological evaluation. The size and location of the tumor, the presence of any ulceration or necrosis, and any abnormal mobility of associated teeth should be noted. Clinical features suggestive of a malignancy include rapid growth, fixation to underlying tissue, displacement of teeth, facial deformity, ulceration, and poorly defined margins. Clinical features suggestive of a benign oral mass include an expansile, fluid filled mass.

Diagnostic imaging of the tumor
Dental radiographs should be obtained of the affected jaw to evaluate the extent of involvement of adjacent teeth and alveolar bone associated with the mass. Bone lysis is not radiographically apparent until more than 40% of the cortex of the bone is demineralized. Therefore, radiographs usually underestimate the extent of the tumor. Computed tomography is a valuable and more sensitive diagnostic tool for evaluation of bone invasion and possible extension of the oral tumor into the nasal cavity, caudal pharynx and orbit. CT imaging should be utilized for maxillary tumors and caudal mandibular tumors.

Incisional biopsy
An incisional biopsy is the procedure of choice for most oral soft tissue tumors. Punch biopsy has been shown to produce fewer artifacts than scalpel biopsy. Biopsies should be at least 4-6 mm in diameter with a depth of at least 2 mm. For incision of a hard tissue mass, consider the use of a Michel trephine. It is important to obtain the biopsy from within the oral cavity and not through the lip to avoid seeding the tumor cells into normal skin. Keep in mind the planned definitive surgical resection when obtaining biopsies. The biopsy should always be obtained within the the worst part of the lesion. Multiple biopsies may be obtained. Avoid necrotic and infected areas of the tumor and do not sample at the margin of the mass. When obtaining the biopsy consideration should be given to the plan for definitive surgery so the biopsy site is included in the definitive surgery.

Evaluation for distant metastasis (M)
Three view thoracic radiographs or thoracic CT should be evaluated for distant metastasis. CT is significantly more sensitive than thoracic radiographs for detecting soft tissue nodules. The lower size threshold is 1 mm to detect pulmonary nodules on CT images and 7-9 mm to reliably detect pulmonary nodules on radiographs. Cats less frequently develop the classical well defined appearance of lung metastasis. Metastatic disease can appear as ill-defined mass lesions or diffuse alveolar, interstitial or mixed patterns.

Lymph node evaluation (N)
Lymph nodes may be assessed by palpation to evaluate size, mobility, firmness, single vs multiple nodes, ipsilateral vs contralateral and bilateral distribution. Lymph node size is not a reliable predictor of metastasis. Remember that the lymph nodes that drain the oral cavity in the cat include the mandibular, parotid and medial retropharyngeal. Ruling out mandibular lymph node metastasis does not rule out metastatic disease. Lymph node evaluation may include fine needle aspirate of mandibular lymph nodes and/or evaluation of the other lymph nodes during CT evaluation of the oral mass.

Squamous cell carcinoma (SCC)
Squamous cell carcinoma is the most common oral tumor in cats accounting for approximately 65% of all oral tumors. Affected cats tend to be older, but may be as young as 5 months to as old as 21 years of age with a median age of 12 years. There is no gender
predilection. Various studies have shown an increased incidence of squamous cell carcinoma in cats that wear flea collars, cats that are exposed to environmental smoke, and cats with high canned food intake.

Squamous cell carcinoma in cats most often affects the frenulum and ventral surfaces of the tongue. The gingival tissue adjacent to the maxilla and mandible is second most common site. It is uncommon for the tonsil in the cat to be the primary location for a squamous cell carcinoma. Most squamous cell carcinomas occur caudal to the canine teeth. Squamous cell carcinoma is very invasive into the gingival tissue and underlying bone and may extend to involve the palate, pharynx or ramus of the mandible.

Bone invasion in feline squamous cell carcinoma is usually extensive and radiographically these cancers cause an intensely sclerotic, periosteal proliferation in the mandible. Marked osteolysis can also occur. In a study of cats with mandibular swellings only 50% had a tumor and osteomyelitis could not be differentiated from cancer based on radiographic appearance.

Nodal metastasis is seen in about 10% of affected cats. When lymph node metastasis is present the mandibular and retropharyngeal lymph nodes are most commonly affected. Lung metastasis in cats is rare, though it is not possible to determine a true metastatic rate since so few cats have their local disease controlled.

Squamous cell carcinoma in cats is very frustrating to treat as most cases are diagnosed at a late stage in the disease process, leading to few viable treatment options. There is no known effective treatment that consistently yields disease control or survival. If the tumor is located in the rostral mandible and discovered early in the course of disease a mandibulectomy and/or radiation treatment might be considered. Radiation therapy in conjunction with surgery or used alone still results in local recurrence of the tumor. Chemotherapy alone or in combination with radiation therapy has done little to improve survival times in cats with squamous cell carcinoma. The best treatment for squamous cell carcinoma has yet to be determined. Unfortunately palliative care is the most common method of treatment due to poor prognosis and extensive tumor involvement at the time of diagnosis. Palliative treatment may include tube feeding, analgesics and anti-inflammatory drugs. Overall median survival time in cats with squamous cell carcinoma is 44 days. Cats with squamous cell carcinoma have a poor prognosis with a one year survival of less than 10%.

**Fibrosarcoma**

Oral fibrosarcoma is the second most common oral tumor in cats and does not have a site predilection. Age of affected cats ranges from 1 to 21 years with a mean of 10.3 years. These tumors are locally invasive and metastasis is rare. The tumor arises from the submucosal stroma and is accompanied by local tissue destruction and invasion of skeletal muscle and bone. The preferred treatment is surgical excision with wide margins. As with squamous cell carcinomas, surgical excision is usually not possible due to the advanced disease at the time of diagnosis. Palliative radiation can be considered.

**Osteosarcoma**

Feline osteosarcoma accounts for 2.4% of all oral tumors and occurs most commonly in older cats with a median age of 10.5 years. Mandibulectomy alone or in combination with radiation or chemotherapy was associated with a 1-3 year survival rate and progression free rate of 83%.

Treatment of fibrosarcoma and osteosarcoma with mandibulectomy showed more than 80% of cats with osteosarcoma and 66% of cats with oral fibrosarcoma were alive three years after surgery. Radiation was used in some of these cases with incomplete surgical margins. Remember to support cats with feeding tubes after mandibulectomy.

**Melanoma**

Oral melanoma is rare in cats (less than 3% of oral tumors). Metastatic disease is common in cats with oral melanoma. In a small study, median survival of cats with oral melanoma was less than 5 months and no cat lived longer than 8 months.

**Lymphoma**

Oral and tonsillar lymphoma has been reported in cats, with 11 (2.9%) of a total of 371 cats affected. The appearance was described as single or multiple raised submucosal masses composed of unencapsulated sheets of neoplastic lymphoid cells. Radiation treatment alone or in combination with chemotherapy has been used to treat cats with oral lymphoma.

**Salivary gland tumors**

Salivary adenocarcinomas originate from the major (parotid, mandibular, sublingual, zygomatic) or minor salivary glands. Minor salivary glands include the lingual molar salivary gland and other salivary glands that can be found in the lip, cheek palate, gingival, tongue and floor of the mouth. Salivary adenocarcinomas can be very invasive. Up to 80% of cats have lymph node metastasis at the time of diagnosis. Pulmonary metastasis is less common. Surgical excision is the treatment of choice. The tumors are often very invasive extending into surrounding skin and musculature. With surgical excision, regrowth and lymph node metastasis are common. Combination treatment with surgical excision, radiation treatment and chemotherapy is recommended.
Osteoma
Osteoma is an uncommon benign bone tumor in cats composed of mature compact or cancellous bone that generally grows continuously and at a slow rate. Osteomas occasionally occur in the oral and maxillofacial region. Treatment is recommended early in the course of the disease and involves debulking and recontouring of the affected area. When diagnosed at an advanced state of disease a more aggressive surgical resection may be required. There is debate regarding the etiology and pathogenesis of the osteoma. Some suggest that it is a true neoplasm whereas others classify it as a developmental anomaly triggered by infection or trauma and exacerbated by muscle traction.

Odontogenic tumors
Odontogenic tumors originate from the remnants of the embryonic tissues destined to develop into teeth and associated structures and account for 2.5% of all feline tumors. They are classified as inductive tumors when they retain the ability to induce reactive proliferation of connective tissue. Inductive odontogenic tumors include feline inductive odontogenic tumor (FIOT), dentinoma and ameloblastic, complex and compound odontomas. Non inductive tumors in cats include ameloblastomas and calcifying epithelial odontogenic tumors (CEOT).

Odontoma
An odontoma is an odontogenic tumor containing epithelial and mesenchymal cells which results in formation of all dental tissue types. The tumor is benign and slow growing but they can be expansile and can create a mass like effect in the oral tissues. Clinically an odontoma will appear as an unerupted tooth or a partially erupted tooth with an associated swelling. A compound odontoma contains rudimentary tooth like structures. An odontoma in which the conglomerate of dental tissues bears no resemblance to a tooth is called a complex odontoma. Treatment for an odontoma is removal of the mass and associated tooth like particles and curettage of the defect.

Dentigerous cyst
A dentigerous cyst is a benign, non neoplastic, well circumscribed, cystic lesion associated with an impacted tooth. The fluid filled cyst forms around the tooth crown and is attached to the neck of the unerupted tooth. The resulting lesion is an expansile lesion and can cause a significant bone loss and destruction. Dental radiographs show a unilocular radiolucent area associated with the crown of the unerupted tooth. During normal adult tooth development the inner and outer enamel epithelium are responsible for the production of enamel. After the enamel is formed these tissues fuse to become the reduced enamel epithelium which is a tight sac around the enamel. As the tooth erupts this tissue becomes the junctional epithelium. When tooth does not erupt normally, the ameloblasts persist and form a sac lined with epithelium which may lead to formation of a dentigerous cyst. Treatment for a dentigerous cyst is surgical removal of the tooth and associated cyst lining.

Feline inductive odontogenic tumor (FIOT)
Feline inductive fibroameloblastomas is a raised submucosal soft tissue mass typically located in the rostral maxilla in young cats 8-18 months of age. The tumor is locally invasive and metastasis has not been reported. Intraoral radiographs show bone lysis, production and expansion of the maxillary and mandibular bones. and areas of mineralization within the tumor. Wide surgical excision is the treatment of choice and complete excision is considered curative.

Amyloid producing odontogenic tumors (APOT)
Although previously referred to as a calcifying epithelial odontogenic tumors, it has been determined that the amyloid producing odontogenic tumor is not equivalent to the human calcifying epithelial odontogenic tumors. The amyloid producing odontogenic tumors appear as a gingival enlargement which grows by expansion. Clinically the tumors appear similar to a squamous cell carcinoma as they are friable, ulcerated and often bleed easily. Some APOTs are darkly pigmented. It is locally invasive but not metastatic. They occur most commonly in older male cats with a median age of 9 years. It often has a cystic appearance on radiographs. Wide surgical excision is recommended. Complete surgical excision is considered curative.

Peripheral odontogenic fibroma
Peripheral odontogenic fibromas now include tumors that were previously classified as fibromatous and ossifying epulides. Peripheral odontogenic fibromas are uncommon in the cat. They can be pedunculated or sessile and may contain osseous material. Complete excision is usually curative.
Non neoplastic proliferative oral lesions

Eosinophilic granuloma
Eosinophilic granuloma can be located on the hard palate, soft palate or base of the tongue. Eosinophilic granulomas are more commonly found in young cats, 2-6 years of age. The etiology is rarely determined and it is often considered idiopathic. Treatment is usually steroids, hypoallergenic diets, RT, surgery, immunomodulation or cryosurgery. The prognosis for complete recovery is fair.

Eosinophilic ulcer
Eosinophilic ulcer is typically a well circumscribed lesion with raised edges and ulceration most frequently located on the upper lip. It is found in cats of all ages and breed, with a higher incidence in middle aged female cats.

Pyogenic granuloma
Pyogenic granuloma is a benign solitary nodules resembling granulation tissue. They are raised, friable and easily bleed. They most commonly occur at the vestibular mucogingival tissues of the mandibular first molar teeth. A pyogenic granuloma can resemble a squamous cell carcinoma clinically.

It is important to keep in mind the less common malignant oral tumors, odontogenic tumors and non-neoplastic proliferative oral lesions in the differential diagnosis list for oral masses as they are often clinically indistinguishable from common malignant oral tumors. A complete evaluation of the patient and the tumor allows the clinician to determine the appropriate treatment recommendations for oral tumors in cats.