Nonosseous Tumors Invasive of Bone

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- Squamous Cell Carcinoma
- Malignant Melanomas
- Acanthomatous Epulis
- Oral Fibrosarcoma
- Synovial Sarcoma

Squamous Cell Carcinoma

Squamous cell carcinoma is of epidermal or epithelial origin and may arise anywhere on the skin or mucosal surface. The tumor is invasive of the underlying structures and destructive of bone, if present in these sites. In the dog two sites are of significance in this respect: the oral cavity in which the tumor invades maxillary or mandibular bone; and the squamous epithelium of the nailbed, in which the tumor destroys phalangeal bones.

SUBUNGUAL

We have studied a series of 234 primary squamous cell carcinomas in the dog and have found 27.5% arising in the subungual area. In a small number of animals these tumors may be found on several digits. Dogs with subungual squamous cell carcinoma range in age from 2 to 21 years, with a mean age of 10 years. No sex predilection is known. An increased incidence of tumors is found in poodles and Scottish terriers. No specific limb or digit is affected.

Clinical signs associated with the tumor are pain, swelling of the digit, ulceration of the skin in the ungual area, oozing of serosanguinous fluid or a purulent exudate from the nailbed, and, in many instances, loss of the nail. Long-standing cases show massive ulceration and necrosis of the digit involved. Treatment with antibiotics and antifungal agents fails to produce any remission of the clinical signs. Radiographic examination usually shows demineralization and erosion of the distal third phalanx. In longer-standing cases the entire third phalanx and a portion of the second phalanx may be absent. The amount of soft tissue swelling found radiographically is variable.

On gross examination of the digit there is loss of bony tissue, frequently loss of the nail, and infiltration of the destroyed portions of the phalanx by a whitish gray caseous material (Fig. 76-1). Occasional cases show extension of the tumor into the subcutaneous tissue and along the flexor tendons.

Histologic examination of the decalcified specimen shows an extensive destruction of the osseous tissue with occasional osteoclasts at the periphery of the bone. Invasion of the subungual tissue by cords of neoplastic squamous epithelial cells is found (Fig. 76-2). These cells vary in their degree of differentiation but most often form large keratin pearls. A host desmoplastic response may be seen in some cases. Release of keratin from the center of the keratin pearls into the adjacent tissue induces an acute inflammatory response in the area.

The majority of cases are cured by surgical excision of the affected digit. Occasional cases show metastasis to local lymph nodes, lungs, and other internal organs.
GINGIVAL
Squamous cell carcinoma is the most common tumor of the oral cavity. (10) The incidence of gingival squamous cell carcinoma is less than that of subungual origin. Of the 234 cases of primary squamous cell carcinoma that we studied, 18% were of gingival origin. These tumors may arise on any portion of the mandibular or maxillary gingiva. The age of affected animals ranges from 5 to 15 years, with an average age of 10.3 years. A greater number of females than males are affected. An increased incidence of gingival squamous cell carcinoma is found in Irish setters.

Squamous cell carcinomas may arise from any portion of the gingival tissue, but the majority are found in the rostral portion of the mandible and maxilla. (10) Most tumors are between 2 cm and 4 cm by the time they are presented for clinical examination (Fig. 76-3). Invasion of the underlying bone by tumor causes loss of teeth and in some cases a pathologic fracture of the bone. Excess saliva, bleeding, and a necrotic odor originating in the oral cavity are present in some cases.

Skull or occlusal radiographs of the affected area reveal marked osteolysis, but a few cases will show a sunburst type of osteoblastic reaction. (10)

Gross examination of the tumor shows extensive invasion of the underlying bone. The tumor mass may be exophytic, however, protruding into the oral cavity, with necrosis and infection of the superficial tissue.

Histologic examination of the tissues shows infiltration by cords of neoplastic squamous epithelial cells into the subgingival connective tissue and bone. Lysis of bone and replacement by fibrous connective tissue are often seen. The origin of the tumor from the gingival epithelium is often difficult to ascertain in cases that are ulcerated. The sheets or nests of neoplastic cells show evidence of individual cell keratinization or the formation of keratin pearls. The tumor cells are large, with large vesicular nuclei and an extensive amount of cytoplasm. Care must be taken in differentiating this tumor from fibromatous epulis of periodontal origin, acanthomatous type.

Because of the poor lymphatic drainage from the gum, (10) gingival squamous cell carcinomas rarely metastasize. (1)

Metastasis, when present, is to the regional lymph node. Recurrence of the tumor at the site of surgical excision is common owing to the invasive nature of the tumor and inadequate excision.

Malignant Melanomas

Malignant melanoma arises from the melanin-producing cells of the body, the precursors of which are of neural crest origin. Although melanomas may arise anywhere on the body, it is mostly those arising at a mucocutaneous junction, within the oral cavity and in the subungual area, that are considered malignant. (2) In the oral cavity and subungual area the melanocytic tumors are invasive and destructive of bone.

SUBUNGUAL
Although melanomas are common in the dog, subungual malignant melanomas are seen infrequently. Of the 134 cases reported by Bostock, (1) only 9% were of subungual origin. Affected dogs range in age from 7 to 14 years. No breed or sex predilection is known. (1)
Clinical signs associated with subungual malignant melanomas are similar to those described for squamous cell carcinoma, including loss of the nail, pain, swelling of the digit, and a purulent exudate from the affected area. The ulcerated skin may reveal a darkly pigmented mass in the underlying tissue. Radiographs show demineralization and erosion of the third phalanx and swelling of the surrounding soft tissues.

On gross examination of the digit, the pigmented tumor is seen to be infiltrative and destructive of the soft tissue and the third phalanx.

Histologic examination of the decalcified specimen shows loss of bone and invasion by neoplastic melanoma cells. The cells are fusiform or epithelioid and frequently contain a large amount of cytoplasmic melanin; hence, bleached sections are required to examine the morphology of the cells.

Surgical excision of the affected digit may be curative. One third of animals die from tumor metastasis within 2 years, with a median survival time of 72 weeks. Metastasis is by the lymphatics to local and regional lymph nodes and then to the lungs or directly to the lungs via the hematogenous route.

**ORAL**

Oral melanomas arise from the gingival or palatine epithelium and infiltrate the underlying bone. The majority are malignant. In one study, 22% of all primary oral tumors were malignant melanomas involving the gingival and hard palate, with the greatest number arising from the gingiva.

Malignant melanoma may arise from any site on the gingiva or hard palate, but greater numbers arise in the rostral mandibular area. Small breeds are affected more frequently than large breeds, and older dogs more commonly than young. The tumors may vary in size and color at the time of initial presentation (Fig. 76-4). Many appear black, but occasional cases are presented as red invasive masses with little pigment and are difficult to distinguish from squamous cell carcinomas and acanthomatous epulides. There is invasion of the underlying bone with loosening or loss of teeth. Occasionally pathologic fractures of the mandible are found. The tumor is usually ulcerated and may bulge into the oral cavity. Skull or occlusal radiographs of the affected area show osteolysis of the underlying bone in the majority of cases.

**Acanthomatous Epulis**

The fibromatous epulis of periodontal origin has been divided into three types: the fibrous type, the osseodentinuous type, and the acanthomatous type. Only the acanthomatous type is locally infiltrative and destructive of underlying mandibular or maxillary tissue. These tumors are relatively common in the dog, with 25.3% of oral tumors in one study found to be of periodontal origin. They are frequently misdiagnosed as adamantinomas or ameloblastomas.
The average age of dogs with acanthomatous epulides is 8 years, with a range of 1 to 16 years. No breed or sex predilection is known. Upper and lower jaws both are involved, primarily the rostral areas around the canine teeth. The tumor often appears as a pink, fleshy mass and may be covered by an intact mucous membrane or show extensive areas of ulceration (Fig. 76-6). Invasion may be visualized radiographically as an area of osteolysis. Bone invasion is not found with the fibrous or osseodentinous epulides.

Histologic examination of tissue from periodontal epulides frequently shows extrusion of cords and sheets of epithelial cells from the gingiva into the underlying periodontal stroma. Invasion of bone may be seen. The cords of cells have a peripheral layer of tall columnar cells with a palisaded appearance and loosely packed epithelial cells centrally, many with prominent epithelial bridges. Cystic degeneration of the epithelial cords may be found.

Acanthomatous epulides are locally invasive and destructive and frequently recur at the site of surgical excision as a result of incomplete removal. Regrowth may be very rapid, with recurrence in a matter of weeks. These tumors have not been found to metastasize. Radiation therapy is the best therapy available, but occasional cases show malignant transformation to invasive carcinomas at the site of irradiation (Fig. 76-7). (9)

Oral Fibrosarcoma

Oral fibrosarcoma arises from the subgingival fibrous connective tissue of the gingiva or palate. It is difficult to differentiate from the central fibrosarcoma of bone, which may arise from the maxilla or mandible and have a similar gross and histologic appearance. The tumor is relatively common and in one study accounted for 32.4% of the primary malignant tumors of the gingiva and hard palate. There is a higher incidence of oral fibrosarcoma in larger breed dogs. The tumor is also more common in males than in females and has a mean age of incidence of 7.6 years, with a range of 6 months to 15 years. (10)

The tumor arises most frequently from the maxillary gingiva and is locally invasive. The majority of tumors are larger than 2 cm at the time of initial examination. Larger masses may spread from the gingiva onto the hard and soft palate. Ulceration of the mucosa may be noted. Fibrosarcomas arising from the anterior maxilla often present with a turned up nose. Invasion of the underlying bone, which is seen as an osteolytic lesion radiographically, is found in two thirds of the cases. (10)

Early cases present as elevated oral masses covered by an intact, mostly nonpigmented mucosa and are located adjacent to the dental arcade. Withgrowth the tumors bulge into the oral cavity and generally have a smooth epithelial surface, but trauma to the tumor may produce ulceration and a superimposed inflammatory response (Fig. 76-8).

Histologic examination of representative samples of the tumor shows proliferation of fusiform cells with an interwoven pattern. The amount of collagen produced by the tumor cells and the degree of nuclear and cellular pleomorphism are variable.

Oral fibrosarcomas are locally infiltrative and destructive. In most cases the site and size of the tumor make them unamenable to total surgical excision. Metastasis by the lymphogenous route to the local lymph nodes or by the hematogenous route to the lungs is found in one third of the cases. (10)
Synovial Sarcoma

Synovial sarcoma is a rare tumor in the dog and represents about 2% of all primary and secondary bone tumors. The reports by Lui and co-workers and Lipowitz and co-workers are the only well-documented cases available.

Synovial sarcomas affect dogs ranging in age from 15 months to 12 years, with a mean age of 8 years. No breed or sex predilection has been noted. The tumor arises from the synovial lining of joints and is thus intimately associated with these structures. The stifle is most frequently involved, followed by the elbow, shoulder, carpal and phalangeal joints.

Clinical signs associated with synovial sarcomas include lameness, which can be localized to the affected joint where a mass may be palpable. The mass is firm, but small cystic structures may be present. The tumor ranges from 1 cm to 12 cm and increases in size rapidly. The overlying skin is uninvolved. The affected areas and masses are not painful to palpation or manipulation. The masses are freely mobile but often deeply attached to underlying structures. Anemia may be found in association with the tumor.

On radiographic examination a soft tissue mass will be seen in the area of the joint. Bone lysis involves either the diaphysis and the adjacent epiphyseal-metaphyseal area or the epiphyseal-metaphyseal area alone. In most cases bones on either side of the affected joint are involved. Cartilage destruction and an irregular periosteal reaction may be found.

Gross examination shows the tumors to be large, fleshy masses. Most are firm, but cysts containing a thick, myxomatous fluid may be found. Hemorrhage and necrosis may be present. There may also be invasion of the joint space and destruction of the adjacent bone.

Histologic examination reveals proliferation of epithelioid and spindle cells in varying proportions. Either component may predominate. Tumor giant cells and foreign body giant cells are frequently present. The formation of clefts lined by the neoplastic cells is seen within the tumor mass.

The tumor may recur at the site of excision as well as at the site of limb amputation. Metastasis to local lymph nodes, the lungs, and other internal organs sometimes occurs.

References


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