Embryonal Rhabdomyosarcoma of the Oral Cavity

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Abstract A 19 year old female presents to the emergency room with right facial enlargement. Clinical examination revealed a soft tissue mass of the right buccal mucosa. Treated initially as infection, the patient later turned to clinic with now rapidly enlarging and intermittently painful mass. Computed tomography with contrast showed a low attenuated buccal mass with mild enhancement lateral to the right caudal maxilla and superior mandible. Biopsy was performed and microscopic examination showed cells with moderate pleomorphism with numerous atypical mitotic figures and occasional elongated “strap” cells with eccentric nuclei. Fluorescence in situ hybridization analysis revealed no rearrangement of the FKHR gene. The diagnosis of embryonal rhabdomyosarcoma was rendered. The patient was referred to the local children’s hospital for definitive treatment.

Keywords Embryonal rhabdomyosarcoma · Oral cavity · Buccal mucosa · Histology · Desmin · Myogenin · MyoD1

History

A 19-year-old female initially presented to the emergency department with a complaint of swelling of the right face. Right facial enlargement was obvious and an intraoral

exam revealed a mass in the right buccal mucosa. The working diagnosis was infection. Incision and drainage was attempted, and she was prescribed antibiotics. At her follow up appointment, her symptoms had not resolved despite compliance with her medication. She was referred to otolaryngology, and presented to the clinic 2 weeks later, reporting that the mass had since doubled in size. Upon clinical examination, the patient had an ulcerated, right buccal mucosal mass extending posteriorly to the pterygomandibular raphe, anteriorly to Stenson’s duct, and medially to the buccal surfaces of the teeth. The mass was filling the vestibule and was beginning to interfere with mastication and speech. The patient also reported a history of minor, intermittent pain in the area of the lesion, as well as trismus. An excisional biopsy of the lesion was performed under general anesthesia.

Radiographic Features

Computed tomography (CT) with contrast showed a low attenuated buccal mass with mild enhancement lateral to the right caudal maxilla and superior mandible, measuring $2.8 \times 2.7 \times 4.3$ cm. The scan also showed some involvement of the right masticator space with low attenuation in the area of the lateral pterygoid muscle (Figs. 1, 2).

Diagnosis

Microscopic examination demonstrated densely packed sheets of small, round to elongated cells, without intervening fibrous stroma or fibrovascular cores. The cells, readily visible even on low power, showed variable amounts of eosinophilic cytoplasm and hyperchromatic

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Fig. 1 Axial CT scan with contrast showing posterior extent of a homogeneously enhancing buccal mass at level of the masseter and mandibular ramus. The adjacent fat planes (including the buccal fat pad) are not disrupted and the mass displays no erosion into the regional musculature or bone

Fig. 2 Coronal CT with contrast at the level of the posterior maxillary sinus/retromolar trigone showing a buccal mass that extends into the masseter posteriorly and buccinator muscle laterally. This image depicts mostly homogenous enhancement as compared to the adjacent muscle along with some air tracking. (Status post Incision and Drainage by ER physician)

nuclei (Fig. 3). Examination at high power revealed moderate pleomorphism with numerous atypical mitotic figures and occasional elongated “strap” cells with eccentric nuclei (Fig. 4). Immunohistochemical stains showed that the tissue was reactive to desmin, myogenin, and MyoD1 (Fig. 5). Fluorescence in situ hybridization analysis (FISH) revealed no rearrangement of the FKHR gene; this in conjunction with the histology was most supportive of the embryonal subtype of rhabdomyosarcoma.

Fig. 3 Low power hematoxylin and eosin image shows the tumor consists primarily of small round, polygonal tumor cells. Cells have variable amounts of eosinophilic cytoplasm and hyperchromatic nuclei

Discussion

Rhabdomyosarcoma (RMS), the most common soft tissue sarcoma of childhood, is a mesenchymal-derived malignant neoplasm. An estimated 40 % of all RMSs occur in the head and neck, and there is a slight male predominance [1]. Among head and neck RMSs, two-thirds occur in children (ages 0–19) and one-third occur in adults (age > 19). The most frequently involved site of head and neck RMS is the orbit, accounting for 25 % of cases. The embryonal subtype represents >50 % of all head and neck cases as well as the majority of pediatric cases. Alveolar RMS is the second most common subtype, followed by the pleomorphic

Fig. 4 A high power hematoxylin and eosin demonstrates many small round cells but also highlights the elongated tumor cells. These cells are often times referred to as strap cells. Note the pleomorphism and numerous mitotic figures

Fig. 5 MyoD1 shows nuclear reactivity

variant, accounting for the bulk of the remaining cases. In adult RMS, the distribution is shifted, with a greater propensity for alveolar or undifferentiated subtypes. Adult RMSs are also more likely to arise in sites outside the head and neck [1, 2]. Patients usually present with a rapidly growing lesion and functional symptoms related to the anatomic site of occurrence.

Computed tomography (CT) image findings of head and neck RMSs often show a poorly defined, homogeneous mass invading adjacent structures, including bone. Necrosis, hemorrhage, and calcification are uncommon radiologic findings. The masses are generally isointense to skeletal muscle on CT. Magnetic resonance (MR) imaging shows a homogeneous mass isointense or hyperintense to muscle on T1-weighted images and hyperintense to muscle and fat on T2-weighted images [3].

Histologically, embryonal RMS is characterized by varying degrees of rhabdomyoblastic differentiation. Cell types typically include small round, primitive-looking cells, spindled cells, strap cells, and large, ganglion-like rhabdomyoblasts. A range of differentiation is also seen, from poorly-differentiated to very well-differentiated, resembling a benign rhabdomyoma. The lesion is always mitotically active and often has myxoid change and necrosis. The botryoid variant is often submucosal, polypoid, and extensively myxoid. The spindle cell variant is often bland appearing with spindle cells in a fascicular or storiform pattern. The rare sclerosing variant is characterized by a sclerotic, osteochondroid-like stroma, microalveolar pattern, primitive round cells, and only occasional strap cells. RMS is best evaluated with a panel of immunohistochemical markers. Typical immunohistochemical reactivity includes desmin, muscle specific actin, myoglobin, and nuclear staining for MyoD1 and myogenin. MyoD1 and myogenin are sensitive and specific, but

staining may be focal. Myogenin may react variably, particularly in the embryonal subtype. Tumors are only rarely positive for synaptophysin, S-100, CD99 and cytokeratins [4–7].

Reported cytogenetic findings in embryonal RMS are variable and include trisomies of chromosomes 2, 8, and 13 and molecular studies commonly show allelic loss of 11p15. This is in contrast to alveolar RMS, which has consistent translocations that include t(2;13)(PAX3-FKHR) or t(1;13)(PAX7-FKHR). The FKHR rearrangement study is an essential part of the workup to delineate these two subtypes [1, 8].

Treatment of RMS may include any combination of complete excision of the mass, chemotherapy, and radiation and is based on guidelines from the Intergroup Rhabdomyosarcoma Study (IRS) grouping system, which places patients into one of four clinical groups. These groups are based on the histologic subtype, presence or absence of lymph node metastases, and presence or absence of positive margins following mass excision.

Prognosis varies by age, histologic subtype, and clinical stage. The embryonal form has a better prognosis than the alveolar form, with the classic embryonal variant having a 66 % 5-year survival rate while botryoid and well-differentiated spindled variants have a nearly 90 % 5-year survival. Although prognosis is better for embryonal as compared to the alveolar subtype across all ages, adults tend to fair much worse than children, regardless of subtype, as adult embryonal RMS still has a worse prognosis than childhood alveolar RMS [9, 10].

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Human and Animal Rights This article does not contain any studies with human participants or animals performed by any of the authors.

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