Imaging of Pediatric Salivary Glands

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KEYWORDS

• Pediatric salivary gland disease • Sialadenitis • Parotitis • Pediatric salivary gland tumor • Hemangioma • Ranula • First branchial cleft cyst • Juvenile recurrent parotitis

KEY POINTS

- The incidence of salivary gland diseases in the pediatric age group differs greatly from the adult population. Infectious/inflammatory and vascular etiologies are the most common pathologies.
- The most common inflammatory salivary disorders worldwide are mumps and juvenile recurrent parotitis.
- Less than 5% of salivary gland neoplasms occur in children, with a roughly even split of epithelial tumors between benign and malignant tumors.
- Hemangioma and benign mixed tumor account for nearly 90% of benign salivary gland tumors in children. Mucoepidermoid carcinoma is the most frequent pediatric salivary malignancy.
- Congenital anomalies include first branchial cleft cysts and glandular aplasia or dysplasia, which may occur in isolation or as part of a syndrome.

INTRODUCTION

Salivary gland diseases in children are relatively uncommon compared with the adult population, with a different incidence of distribution of pathologies. In the pediatric population, diseases of the salivary gland are more frequently inflammatory or vascular in etiology. Some diagnoses, such as congenital anomalies of the salivary glands, including hypoplasia and aplasia, branchial cleft remnant lesions, and vascular malformations, are obviously more commonly seen in the pediatric population. Neoplastic masses are especially uncommon in children, with less than 5% of all benign and malignant tumors of the parotid glands estimated to occur in people younger than 16 years of age.[1,2]

NORMAL ANATOMY AND IMAGING TECHNIQUE

Normal anatomy of the salivary glands and imaging techniques have been described elsewhere in this issue. The imaging workup of salivary pathology depends on institutional preferences, resource availability, and technical expertise.

Ultrasound imaging is an excellent choice for the initial evaluation of suspected parotid or submandibular space lesions in pediatric patients, providing a readily available, noninvasive, and nonionizing means to evaluate superficial structures with good resolution. Higher frequency transducers are preferable, with 5 to 12 MHz wide-band linear transducers typically used.[3] Color Doppler imaging assesses the vascularity

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of the gland and focal lesions. The normal salivary glands are homogenous in echotexture and hyperechogenic relative to adjacent muscles, with the degree of echogenicity of the parotid gland proportional to the amount of glandular fatty tissue, and not hypervascular on color Doppler imaging. Ultrasound imaging can assess gland size, distinguish cystic and solid masses, evaluate for ductal dilatation, and guide biopsy.

Cross-sectional imaging by computed tomography (CT) scanning and MR imaging provide excellent delineation of salivary gland masses. CT scanning is the most readily available imaging modality at most centers, and is not operator dependent. CT scanning and MR imaging are not limited in evaluation of deeper structures as with ultrasound examination, although CT scanning has the drawback of ionizing radiation exposure, and MR imaging may require sedation in younger children. CT scanning is an excellent modality to evaluate for the presence of air or calcifications. MR imaging provides superior soft tissue characterization and is the preferred imaging modality to evaluate a palpable mass. Echoplanar diffusion-weighted imaging can add additional information, with vascular and benign neoplastic lesions demonstrating higher apparent diffusion coefficient values than malignant tumors.[4] MR sialography uses heavily T2-weighted sequences (3-dimensional [3D] constructive interface in steady state, half Fourier acquisition single-shot turbo spin echo) to visualize the ductal system, and can be used in the evaluation of sialolithiasis and sialadenitis. MR sialography is noninvasive, and can evaluate up to the second-order ductal branches, but does not have as high of a spatial resolution as digital subtraction sialography.[5]

SALIVARY GLAND EMBRYOLOGY

The salivary glands develop as outgrowths of the oral epithelium that grow as solid cores of cells into the underlying mesenchyme. The parotid anlagen develop first at 4 weeks of gestation, followed by the submandibular and sublingual primordia at approximately 6 and 8 weeks of gestation, respectively. The cores undergo extensive branching, enlarge, and canalize to develop lumina. The enveloping mesenchyme divides the developing glands into lobules and forms a capsule. Minor salivary glands have a different embryogenesis, arising from mixed ectodermal and endodermal origins.[6,7]

The parotid glands are unique among the major salivary glands, because they contain intraglandular lymph nodes and lymphatic tissue, whereas the submandibular and sublingual glands do not. The parotid gland is the last of the salivary glands to encapsulate, occurring after development of the lymphatic system, resulting in entrapment of lymphatics within the glandular tissue.[6]

Accessory parotid tissue is most commonly located overlying the masseter muscle, and may also be found in the anterior and posterior triangles of the neck. Ectopic salivary gland tissue is commonly found in the parotid and periparotid lymph nodes, but is rarely reported in other locations, including the mandible, palatine and lingual tonsils, soft tissues of the neck, middle ear cavity, thyroid and parathyroid glands, cerebellopontine angle, and in a Rathke pouch remnant.[6]

CONGENITAL LESIONS

Aplasia and Hypoplasia

Absence of the major salivary glands is a rare anomaly that may affect single or multiple glands, unilaterally or bilaterally. The cause of salivary gland agenesis is unknown, but presumably related to a defect in early intrauterine development. Aplasias may occur as an isolated finding, or in association with other abnormalities, including ectodermal defects of the first branchial arch and malformations of the lacrimal apparatus and absence of the lacrimal puncta.[8]

Isolated major salivary gland aplasia can be asymptomatic, or may be associated with xerostomia and early dental caries, particularly with multiple gland aplasias. Radiographically, the contralateral salivary gland may be hypertrophied, and hypertrophy of the ipsilateral sublingual gland has also been reported, which can mimic a floor of the mouth mass[9] (**Fig. 1**).

Parotid and submandibular dysplasia and agenesis can be seen in association with Treacher–Collins syndrome (mandibulofacial dysostosis), an autosomal-dominant disorder characterized by mandibular/facial and zygomatic hypoplasias, ocular and otic abnormalities.[10] Lacrimoauriculodentodigital syndrome is characterized by hypoplasia or agenesis of the lacrimal system and salivary glands, deafness and ear abnormalities, and dental and digital anomalies[11] (**Fig. 2**).

First Branchial Cleft Cyst

First branchial cleft cysts (BCC) develop as a result of incomplete fusion of the cleft between the first and second branchial arches, and reflect duplication anomalies of the external auditory canal (EAC). These lesions are often asymptomatic until they present clinically as infections or repeated swelling in the periauricular soft tissues or parotid gland, or drainage into the EAC.[12] Radiographically, these cysts seem to be similar to other