Oncocytic neoplasms result from metabolically altered cells that accumulate abundant mitochondria within their cytoplasm to form oncocytes by the process of oncocytic metaplasia. These neoplasms are found rarely in the parotid gland. The finding of oncocytic metaplasia is extremely common and occurs in a multitude of organs, including the thyroid gland, parathyroid glands, and kidneys, in addition to salivary glands.

In the parotid gland, oncocytic metaplasia arises along a spectrum of related conditions, including oncocytic hyperplasia, benign oncocytoma, and, rarely, oncocytic carcinoma. Oncocytic hyperplasia may be found in microscopic foci or multiple macroscopic nodules, known as nodular oncocytic hyperplasia. Oncocytoma is a benign tumor comprising bland oncocytes, usually presenting as a single nodule.

To our knowledge, the imaging findings of oncocytic metaplasia of the salivary gland have only limited description in the literature. We present the CT and histopathologic findings of a case of oncocytoma arising in a background of nodular oncocytic hyperplasia of the parotid gland.

Case Report
A 61-year-old white man presented with a 3-year history of painless right parotid gland fullness. One week prior, he developed sudden constant dull aching pain radiating from the right parotid region. Physical examination revealed diffuse enlargement of the parotid gland with a soft nontender right retromandibular mass. Intraoral examination revealed diffuse enlargement of the parotid gland and account for <1% of salivary gland tumors. However, the finding of oncocytic metaplasia is extremely common and occurs in a multitude of organs, including the thyroid gland, parathyroid glands, and kidneys, in addition to salivary glands.

In the parotid gland, oncocytic metaplasia arises along a spectrum of related conditions, including oncocytic hyperplasia, benign oncocytoma, and, rarely, oncocytic carcinoma. Oncocytic hyperplasia may be found in microscopic foci or multiple macroscopic nodules, known as nodular oncocytic hyperplasia. Oncocytoma is a benign tumor comprising bland oncocytes, usually presenting as a single nodule.

To our knowledge, the imaging findings of oncocytic metaplasia of the salivary gland have only limited description in the literature. We present the CT and histopathologic findings of a case of oncocytoma arising in a background of nodular oncocytic hyperplasia of the parotid gland.

SUMMARY: Oncocytic neoplasms result from metabolically altered cells that accumulate abundant mitochondria within their cytoplasm by oncocytic metaplasia. In this report, the CT findings are described and correlated with the histopathologic features of a case of oncocytoma involving the parotid gland that arose in a background of nodular oncocytic hyperplasia. When imaging demonstrates multiple small nodules in the parotid gland with a large, solid, or cystic mass, the diagnosis of oncocytic neoplasia should be considered.

Parotid Gland Oncocytosis: CT Findings with Histopathologic Correlation

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Discussion
To our knowledge, few reports on the imaging of oncocytic neoplasms of the salivary glands have been published, owing to the rarity of the condition. Sakai et al reported an oncocytoma in the deep lobe of the parotid gland that was well-defined and solid on CT. It demonstrated decreased signal intensity on both T1- and T2-weighted MR images, attributed to the high cellularity and low free water content. According to the authors, Warthin tumor, which is a common benign parotid gland tumor in patients older than 60 years, can be differentiated from oncocytoma by its MR imaging appearance. Warthin tumors conversely demonstrate decreased signal intensity on T1-weighted images and increased signal intensity on T2-weighted images. Both Warthin tumors and oncocytomas show intense uptake of the nuclide on technetium-Tc99m pertechnetate radionuclide scans of the salivary glands.

The histomorphologic findings of oncocytes include an enlarged polygonal shape with granular intensely acidophilic cytoplasm, a round uniform nucleus with distinct nucleoli, and a low nucleus-cytoplasm ratio. These cytomorphologic features are associated with marked mitochondrial hyperplasia, pleomorphism, and a paucity of other organelles, as reported by Johns et al in ultrastructural studies. Mitochondrial dysfunction and defective cellular metabolism have been proposed as the basis for the characteristic findings of oncocytic mitochondrial hyperplasia and pleomorphism. Hamperl suggested that oncocytic metaplasia represents a final common pathway of cellular differentiation due to functional enzyme exhaustion or >1 mitochondrial enzyme.

Despite the nearly universal finding of oncocytic metaplasia in the salivary glands of patients 70 years of age or older, oncocytic neoplasms are rare in the salivary glands. The World Health Organization defines 3 categories of oncocytic neoplasms of the salivary gland. Oncocytoma, the most frequent form, is as a well-circumscribed benign tumor composed of monotonous sheets of oncocytes, frequently with a central scar. Nodular oncocytic hyperplasia (or oncocytosis), which was first described by Schwartz and Feldman, is a multifocal process, with diffuse replacement of the parotid gland with oncocytic lobules and intervening small foci of residual normal serous glands and ducts. Oncocytic carcinoma is the rarest of the oncocytic neoplasms, with only 36 cases reported in the English-language literature through 1999.

At 61 years of age, the patient in our report had both oncocytic hyperplasia and an oncocytoma in the same parotid gland. Moreover, oncocytic hyperplasia involved the surface and tail of the parotid gland and led to a pedunculated nodule that presented as a neck mass. The synchronous multiple morphologic variants of oncocytic neoplasms in a single parotid gland demonstrates an ill-defined mass with feeble enhancement (large arrow). Multiple small masses involving the right parotid tail (small arrows) are apparent, including a mass (large arrow) that measured 1.6 cm just below this level.
specimen have been reported by Capone et al.8 Their findings and ours support the theory that a common mitochondrial defect allows progression between the morphologic variants. Although that theory of parotid oncocytopathy is attractive, no molecular data have yet supported a link between the morphologic variants of oncocytic neoplasms.

Our case supports the recommendation that when multiple small nodules are found in the parotid gland with a large solid or cystic mass evident on CT or MR imaging, a diagnosis of nodular oncocytic hyperplasia and oncocytoma should be considered, particularly in patients 60 years of age or older. After parotidectomy for oncocytic hyperplasia, patients should be followed for recurrence arising from residual parotid tissue. If nodules are found on subsequent clinical examination or imaging, fine-needle aspiration biopsy can confirm oncocytic metaplasia by the presence of the bland oncocytoses.

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