

Nasal anomalies review with CT or MRI: from congenital to malignant.

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1. Learning Objectives

To describe imaging findings of a wide spectrum of uncommon nasal cavity masses evaluated at our institution by CT, CBCT and MR imaging, clinically and pathologically proven

2. Background

In this work we present a succinct review of disease illustrated by a retrospective case series of nasal cavity masses, evaluated at our institution between 2010 and 2013. Patients have been studied with different imaging modalities including multiraw computed tomography (CT), cone beam computed tomography (CBCT) and magnetic resonance imaging (MR) to illustrate the findings and to summarize the main diagnostic keypoints for the differential diagnosis of nasal masses. Clinicopathological correlation is also reported and imaging findings we present have been isthopathologically proven. Images aid in recognition and characterization of the lesions. Many different types of lesions may involve the nasal cavities and imaging studies, CBCT, CT and MR, provide anatomical details and could be helpful first in differentiating benign to malignant lesions and secondary in characterization of the lesion. Referring to non neoplastic lesions, rinoliths, piogenic granuloma and septal mucocele are reported. Referring to benign and borderline tumors osteoma, hamartoma, hemangioma, hemangiopericytoma, cemento-ossifying fibroma, antrochoanal polip and inverted papilloma are reported. Referring to malignant neoplasms intestinal type adenocarcinoma, esthesioneuroblastoma and Non-Hodgkin lymphoma are reported.

3. Imaging Findings or Procedure Details

| NASAL MASSES | CLASSIFICATION PATHOLOGY | | GENDER AGE FIGURE | | |
|-------------------|--------------------------|---------------------------|-------------------|----|-----------|
| Non Tumors | Infectious | Septal mucocele | M | 49 | Fig 1 a-i |
| | Non infectious | Pyogenic granuloma | F | 18 | Fig 2 a-d |
| | | Rinoliths | F | 26 | Fig 3 a-b |
| Tumors | Benign | Nasal hamartoma | M | 47 | Fig 4 a-f |
| | | Cemento-ossifying fibroma | F | 57 | Fig 5 a-b |
| | | Nasal hemangioma | M | 69 | Fig 6 a-d |

| | | | | |
|-----------|---|---|----|---------------|
| | Septal osteoma | F | 64 | Fig 7 a-c |
| | Inverted papilloma | F | 83 | Fig 8 a-f |
| | Antrochoanal polyp | M | 41 | Fig 9 a-e |
| | Hemangiopericytoma | F | 43 | Fig 10 a-g |
| Malignant | Esthesioneuroblastoma | F | 22 | Fig 11 a-f |
| | Intestinal type sinonasal adenocarcinoma (ITAC) | M | 67 | Fig 12 a-d |
| | Non Hodgkin Lymphoma | M | 45 | Fig 13 a-d |

Imaging Findings

Fig. 1. Male, 49 y. Nasal septum mucocele. **1a.** Endoscopic view of the mucocele (asterisk), located between nasal septum and middle turbinate, laterally displaced, in the left nasal cavity. **b-c-d.** Axial, sagittal, and coronal CBCT images. An ovalar mass with smooth margins, is visible within the nasal septum in the middle-upper third of nasal cavities, partially obstructed. The mass causes partial nasal obstruction of upper third of both nasal cavities. The septal bone is expanded and thinned. MRI: on axial FSE T1 (**1e**), axial T2 fat suppressed (**1f**), and sagittal FSE T2 (**1g**) images, a high intensity mass is observed. Enhancing of the peripheral wall is visible on axial (**1h**) and coronal (**1i**) contrast enhanced FSE T1 fat suppressed images.

Fig. 2. Female, 18 y. Pyogenic granuloma of left nasal cavity. **2a.** Anterior rhinoscopy of the left nasal cavity. A lobulated mass is visible in the left nasal cavity. **2b.** Axial CT image after i.v. contrast medium administration. An ovalar, lobulated, mass, with inhomogeneous enhancement, and enhancing peripheral rim, obstructing the left nasal cavity is appreciable. **2c.** Axial CT image, bone window. The mass causes lateral expansion of the medial wall of the left maxillary sinus. **2d.** Coronal CT image after i.v. contrast administration. The mass obstructs the inferior half of the left nasal cavity.

Fig. 3. Female, 26 y. Rinoliths in the right nasal cavity. Axial (**a**) and coronal (**b**) CT images, bone window. A calcified mass is seen in the right nasal cavity.

Fig. 4. Male, 47 y. Nasal septum hamartoma. Axial (**4a**), sagittal (**4b**) and coronal (**4c**) CBCT images demonstrated an ovalar mass with well defined margins, located in the upper anterior half of the nasal septum. On MRI the mass shows inhomogeneous intensity, with typical cystic hyperintense areas on

axial FSE T2 (**4d**) and STIR coronal (**4e**) images. (**4f**) Contrast enhanced axial fat suppressed FSE T1 image shows heterogenous enhancement of the mass, with unenhanced cystic areas.

Fig. 5. Female, 57. Post-surgical recurrence of cemento-ossifying fibroma involving the left nasal cavity. Axial (**5a**) and coronal (**5b**) CT images show a lobulated, partially calcified mass, surrounding the root of 26.

Fig. 6. Male, 69 y. Nasal haemangioma of the right nasal cavity. **6a.** Axial CT image. A well defined oval mass obstructs the posterior half of the right nasal cavity. **6 b-d.** On MR the mass shows high intensity on axial FSE (**6b**) and sagittal (**6c**) T2 images. Nasal septum is displaced to the left. On axial fat suppressed FSE T1 after i.v. administration of contrast medium (**6d**), the mass shows globular peripheral enhancement.

Fig. 7. Female, 64 y. Nasal septum osteoma. In the upper anterior half of the nasal septum an oval mass with smooth margins and bone density is visible on axial (**7a**), coronal (**7b**), and sagittal (**7c**) CT images.

Fig. 8. Female, 83 y. Inverted papilloma of the left nasal cavity. **8a.** Clinical endoscopic evaluation shows a lobulated mass in the left nasal cavity. **8b.** Axial CT, bone window. The mass is located in the posterior third of the left nasal cavity protruding through the left choana in the nasopharynx. On MRI the mass shows inhomogenous high intensity with hypointense stripes and foci on axial (**8c**) and coronal (**8d**) FSE T2 images. On contrast enhanced fat suppressed FSE T1 axial (**8e**) and coronal (**8f**) images the mass shows intense heterogenous enhancement with typical cerebriform pattern.

Fig. 9. Antrochoanal polyp of the left nasal cavity. Axial (**a**) and coronal (**b**) CT images with bone window. The left maxillary antrum is fully obstructed by a mass, that through an enlarged accessory ostium, goes in the left nasal cavity. MRI. On axial fat suppressed (**9c**) and coronal (**9d**) FSE T2 images the polyp is visible in the right maxillary sinus extending into the left nasal cavity. **9e.** Fat suppressed sagittal FSE T1 image after i.v. administration of contrast medium. The polyp extends from the nasal cavity in the nasopharynx.

Fig. 10. Bleeding hemangiopericytoma of the right nasal cavity. MRI. On coronal (**10a**) and axial (**10b**) FSE T2 images the right nasal cavity is occupied by a mass with heterogenous intensity, mainly medium-high with a hypointense component corresponding to hemorrhage. The mass displaces the medial maxillary sinus wall, obstructs the ostiomeatal complex with consequently right pansinusitis, and posteriorly extends towards the choana in the nasopharynx. On axial FSE T1 image (**10 c**) the hemorrhagic component is hyperintense. On contrast enhanced fat suppressed axial FSE T1 image (**10 d**) the mass shows heterogeneously intense enhancement.

Fig. 11. Female, 22 y. Esthesioneuroblastoma. On axial CT (**11a**) image with bone window a central mass in the nasal cavity is visible with prominent erosion of ethmoid and nasal bones. On contrast enhanced coronal CT image (**11b**) the mass shows intense and inhomogenous enhancement with erosion of the ethmoid roof. **c-d.** On MR FSE T2 axial (**c**) and (**d**) coronal images the mass shows low-intermediate signal intensity with spotted hyperintense foci. Transcompartmental extension of the mass with intracranial extension in the olfactory grooves is also visible. **11e.** On contrast enhanced fat suppressed MR FSE T1 sagittal image, the intracranial extension of the mass with enhancing meningeal fold, due to direct meningeal invasion, is observed.

Fig. 12. Male, 67 y. Intestinal type adenocarcinoma (ITAC) of the nasal cavity. MRI. axial (**12a**) and coronal (**12b**) FSE T2 images shows a lobulated mass obstructing the left nasal cavity, with expansion and erosion of contiguous bony structures, and that erodes medially the nasal septum invading

contralateral right nasal cavity. The mass obstructs the ostiomeatal complex with mucocele of the left maxillary antrum. Contrast enhanced fat suppressed FSE T1 axial (**12c**) and coronal (**12d**) images shows heterogenously scarce enhancement of the mass.

Fig. 13. Male, 45 y. Non Hodgkin lymphoma of the left nasal cavity. **13a.** Axial CT image with bone window shows a lobulated thickening of mucosal lining of lateral nasal wall involving the inferior turbinate and anterior and medial walls of the left maxillary sinus. MRI. On axial FSE T1 (**13b**) and fat suppressed T2 (**13c**) images, the lymphomatous tissue shows intermediate intensity and permeates the left inferior turbinate, the anterior and medial walls of the left maxillary sinus, and the alveolar maxillary process.

4. Conclusion

This review of uncommon nasal masses studied with different imaging modalities (CT, CBCT and MRI) should be useful in differential diagnosis of the wide spectrum of nasal tumors and non tumors masses.

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