

DENTO-MAXILLARY RADIOLOGY AND IMAGING

Course 10

SALIVARY GLANDS PATHOLOGY IMAGING

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10.1. RADIOIMAGING DIAGNOSTIC METHODS

ULTRASOUND EXAM

Being superficial localized structures salivary glands will be exam first of all by ultrasound echography with dedicated surface transducers.

Complete non-harmful (harmlessness), the ultrasound investigation has the ability of diagnostic assess of any regional pathologic entities (sialolithiasis, inflammations, tumors), with ab initio differentiation of cystic space occupying masses from solid space occupying masses.

X - RAY EXAM

Classic radiography detects radiopaque stones, being the immediate investigation in any salivary gland lithiasis suspicion.

Sialography have the advantage of contrast substance injection with unique possibility of excretory salivary gland system visualization, having absolute indications in salivary ducts pathology including chronic inflammations and systemic disease.

CT – SCAN

Is the imaging diagnosis method of choice in exploration of the inflammatory loco-regional glandular symptomatology, due to the specific performing capacity of calcium detection and so, eventually, the underlying sialolithiasis.

MRI

By natural signal contrast of soft tissues is by far the most performing imaging method of salivary glands pathology investigation.

MRI – exam has absolute indication in diagnosis and extension delimitation of tumoral benign or malignant masses and also, in inflammatory diseases exploration which evolve without sialolithiasis.

10.2. SIALOLITHIASIS

Generic define the presence of stones at the level of a salivary gland or in an excretory glandular canal.

It is mainly frequent in submandibular gland and excretory canal and rarer at parotid and sublingual glands level.

The stones of salivary gland and excretory canal may be radiolucent or radiopaque appearing by precipitation of calcium salts (calcium carbonate or calcium phosphate) around a lithogen centre compound of cells debris or mucine molecules.

SIALOLITHIASIS - RADIOOPAQUE STONES

Radiopaque stones are radiographic identified as round or ovalary shape radioopacities, relative homogenous, net outlined, localized in the projection zone of the involved anatomic structure:

- submandibular glandular lithiasis will always produce radioopacities in gland projection zone caudal to mandible or in its posterior region;
- submandibular canal lithiasis will also produce specific radioopacities in canal excretory projection zone, respectively in the oral cavity floor;
- parotid gland lithiasis will produce radioopacities in gland projection zone;
- parotid canal lithiasis will be identified as specific radioopacities in canal excretory projection zone caudal and parallel with zygomatic arch.

SIALOLITHIASIS - RADIOLUCENT STONES

Radiolucent stones are identified by sialography, an imaging method obtained by radioopaque liposoluble (lipiodol) substance injection after excretory orifices catheterizing and then x-ray image obtain in two perpendicular projections or if needed in others special adequate.

Sialography detects the site of obstruction, complete or incomplete determined stenosis and also the modification and complication lithiasis - induced.

10.3. REACTIVE SALIVARY GLANDS DISEASES

According to the content types of induced masses they may be delimited as:

- **REACTIVE DISEASES WITH FLUID CONTAINING SPACE OCCUPYING MASSES**

- **REACTIVE DISEASES WITH SOLID CONTAINING SPACE OCCUPYING MASSES**

REACTIVE DISEASES WITH FLUID CONTAINING SPACE OCCUPYING MASSES

Whatever histopathologic described forms are, fluid containing structures will always appear transsonic, net outlined, with posterior strengthening, at ultrasound exam,

CT- scan will attest the fluid content by fluid densities detection without contrast uptake, eventually only marginal uptake due to a surrounding epithelial layer.

MRI will confirm the fluid content by characteristic hyper T2, hypo T1 fluid signal, without contrast uptake, except the cases surrounded by an epithelial layer which will have marginal contrast uptake.

They may be classified upon the types, localization and etiopathogeny of fluid accumulations in:

- **MUCOCELE / MUCUS EXTRAVASATIONS PHENOMENON**
- **MUCUS RETENTION CYST**
- **RANULA**
- **MAXILLARY SINUS MUCOCELE**
- **MAXILLARY SINUS RETENTION CYST AND PSEUDOCYST**

MUCOCELE / MUCUS EXTRAVASATIONS PHENOMENON

Mucocele appeared by posttraumatic extravasations of secretions at the place of excretory canal lesion, with secondary loco-regional secretions accumulation and inflammatory reactions in surrounding parenchyma with granulation tissue in periphery.

They may involve in frequently descending order: vestibular surface of inferior lip, all oral mucosa, ventral tongue surface, oral cavity floor and retromolar.

MUCUS RETENTION CYST

Appear secondary to a canal obstruction with secretions accumulation without solution of continuity, the result being the regional development of a fluid containing formation surrounded by a epithelial thin wall.

Mainly after 50 years of age appearing with preponderant involvement of: soft palate, chin internal mucous surface, floor of the mouth and maxillary sinus.

RANULA

Generic name of space occupying fluid masses at the floor of the oral cavity appeared by posttraumatic extravasations of salivary glands secretions or by accumulation caused by excretory canals obstruction.

Usually are involved excretory canals of sublingual glands and rarely of submandibular glands.

Exuberant secretions accumulation may herniate through milohyoid muscles and by fasciae planes cleavage could be extended to the cervical level, rarely reaching even the mediastinum.

MAXILLARY SINUS MUCOCELE

Inflammatory, traumatic, tumoral or by cystic fibrosis obstruction of the sinus ostium, will cause intrasinus fluid accumulation which by slow expansion will produce nearby wall osteolysis with marginal periphery sclerosis and evolutive possibility to a superimposed infection and an abscess formation with a resulting mucocele.

Due to regional extension with secondary parietal destruction will always have surgical therapy indication (curettage and debridement) in order to drain and to evacuate the secretion.

MAXILLARY SINUS RETENTION CYST AND PSEUDOCYST

Appear by inflammatory or allergic obstruction of a seromucous antral gland with secondary ductal expansion, fluid accumulation and a regional cystic structure resulting, radioimaging detected as a net outlined mass, homogenous, without regional osteolysis.

Due to slow evolution, usually stable, without osseous destruction, do not need surgical ablation, only clinico-imaging follow - up.

REACTIVE DISEASES WITH SOLID CONTAINING SPACE OCCUPYING MASSES

All solid containing histological described morbid entities will have net benign lesional character clearly imaging detected:

- net outline,
- homogeneity,
- without regional infiltration or extension,
- homogenous contrast uptake.

According to their etiopathogeny they may be delimited as:

- NECROTIZING SIALOMETAPLASIA
- RADIATION - INDUCED SALIVARY GLANDS PATHOLOGY
- ADENOMATOID HYPERPLASIA

NECROTIZING SIALOMETAPLASIA

Follows a glandular tissue ischemia due to an internal iatrogenic traumatic factor or an external one which affect the regional arterial circulation, coronary reshuffle by squamous ductal metaplasia, always needing clinico-imaging exploration in order to malignant differentiation.

Necrotizing secondary process manifests as superficial ulcerations or internal fluid transformations.

The most frequently localization is at the junction level of the soft palate with the hard one.

RADIATION - INDUCED SALIVARY GLANDS PATHOLOGY

It's caused by secondary transformations of glandular parenchyma after therapeutic exposure to ionizing radiations.

It manifests in a variable time interval, as a decreasing salivary secretion due to destructive lesional modifications, initially of inflammatory type which later will organize as a loco-regional fibrosis with corollary glandular atrophy.

ADENOMATOID HYPERPLASIA

Appear as hyperplasic volume reshuffle of palatal salivary gland structure with benign character, without inflammatory implications.

10.4. INFECTIOUS DISEASES

According to etiopathogenic agent may be delimited as:

- VIRAL
- BACTERIAL
- SARCOIDOSIS

VIRAL DISEASES

Mumps, cytomegalic and also Coxsackie type A, echo, parainfluenza type I and II, all may cause acute inflammation of salivary glands with specific clinical features, evolution and epidemiology.

BACTERIAL SIALADENITIS

Bacterial infections always appear in conditions of salivary flux slowing, the adjuvant factors (electrolyte deficiency and imbalances, medicines, loco-regional traumas, distant primitive suppuration which secondary affect salivary glands due to hematogenous spread) being usually clinico-imaging detected and adequate treated.

Every inadequate or incomplete treated case will lead to a dragging evolution with local suppuration development and abscess and fistulas formation.

SARCOIDOSIS

Frequently attributed to a *Micobacteriae tuberculosis* infection, involve major salivary glands, especially parotid glands and also minor salivary glands, with detection of isolated or confluent granulomas.

Diagnosis is clinico-biology and imaging assess by polyorganic granulomatous inflammatory involvement detection (lungs, skin, eyes, liver, bones, digestive, ORL etc).

Multimodal imaging exploration detect typical inflammatory modifications of the salivary glands structures with specific lesional characters - regional inflammatory edema with: net outline, homogeneity, homogenous contrast

uptake, with or without suppurative evolution detected by abscess transformation (central fluid transformations and ring - shape contrast uptake)

10.5. METABOLIC DISEASES

They may determine volume augmentation of salivary glands, appearing by various metabolic mechanisms under various conditions such as: hepatic cirrhosis, chronic pancreatitis, diabetes mellitus, hypertension, obesity, dietary deficiency, hyperlipidemia, alcoholism, acromegaly (by hormone induction).

Characteristic are volume homogenous increase of salivary glands, especially of the parotid gland, imaging confirmed.

10.6. IMUNOLOGIC DISEASES

They recognized an immune etiopathogeny being described:

- **MIKULICZ'S DISEASE (BENIGN LYMPHOEPITHELIAL LESION)**
- **SJÖGREN'S SYNDROME**

MIKULICZ'S DISEASE (BENIGN LYMPHOEPITHELIAL LESION)

It's the result of an immune mediated process determining a benign lymphocytic infiltration of salivary glands, usually of the parotid gland only, with secondary imaging confirmed volume augmentation and bacterial superimposed infections which finally lead to lesions of nodular fibrosis.

Rarely were detected malignant intralesional transformations.

Hystologic appear lesions of monoclonal lymphocytic infiltrate type being closely related to malignant lymphoma of mucous digestive tissue (MALT), resulting the need or radical therapeutically attitude: surgical ablation or by radiotherapy.

SJÖGREN'S SYNDROME

Autoimmune disease with rheumatoid polyarthritis commune etiopathogeny, causing a benign lymphocytic infiltration of major salivary glands which slowly replace the normal glandular parenchyma.

Autoimmune process determine a chronic reactive glandular inflammation which affect exocrine salivary and lachrymal gland, producing primary Sjögren syndrome.

Secondary Sjögren syndrome is named the association between pathogen conjunctive tissular involvement and rheumatoid polyarthritis.

Result a decrease of salivary and lachrymal secretion with secondary mucosal dryness and deglutition, fonation, visual deficiencies associated with typical rheumatoid polyarthritis manifestations (polyarthralgias, pulmonary manifestations, miscellaneous systemic manifestations, etc.)

Technetium pertechnetate scintigraphy the most performing evaluate the functional glandular reserve.

Sialography detect glandular filling defects with point - ductal ectasies caused by glandular parenchyma destructions, the only normal resting the interlobular excretory canalicules.

Finally, appear regional canal ectasia and stenosis, with filling defects or cavitary destruction and more rare atrophic glandular modifications.

Ultrasound, CT - scan and MRI always detect the inhomogeneous character of glandular volume enlargement, determined by lymphocytic glandular infiltrations and intraglandular canal ectasia.

10.7. BENIGN TUMORS

Clearly imaging diagnosis assess by net benign lesional character detection:

- net outline,
- homogeneity,
- without regional infiltration or extension,
- homogenous contrast uptake.

According to histologic aspects there were described the following entities:

- PLEOMORPHIC ADENOMA / BENIGN MIXED TUMOR
- MONOMORPHIC ADENOMAS
- DUCTAL PAPILOMAS
- MESENCHYMAL BENIGN TUMORS

PLEOMORPHIC ADENOMA / BENIGN MIXED TUMOR

It's the most often benign tumor of salivary gland with mixed tissular origin: epithelial and myoepithelial.

More frequently in women usually appear as glandular volume enlargement, firm, encapsulated, painless, mobile, non-ulcerated more often with palatal localization.

Due to internal structural inhomogeneity, they are usually radioimaging detected as encapsulated and inhomogeneous formations, with inhomogeneous contrast uptake and loco-regional fibrosis and calcifications.

MONOMORPHIC ADENOMAS

Generic define glandular epithelial tumors coming from only one cell type proliferation and so with clearly only monomorphic histological character: basal cell adenoma, canalicular adenoma, myoepithelioma, sebaceous adenoma, oncocytoma, WARTHIN's tumor - papillary cystadenoma lymphomatosum.

WARTHIN's tumor and oncocytoma appear exclusive in parotid glands.

MONOMORPHIC ADENOMAS - papillary cystadenoma lymphomatosum, or WARTHIN's tumor, the second as frequency in parotid localization, is characterized by intratumoral presence of:

- cholesterol crystals,
- cystic transformations with proteinaceous content,

- parcelling fibrosis usually imaging detected as inhomogeneous formations with minor contrast uptake.

DUCTAL PAPILOMAS

Represent another category of benign epithelial tumors within excretory canals origin, with the following described histological forms: sialadenoma papilliferum, inverted ductal papilloma, intraductal papilloma.

MESENCHYMAL BENIGN TUMORS

Appear intra or extra salivary glands, nearby, proliferation of mesenchymal tissular elements being much rare than epithelial.

Depending on histological character we may find: hemangiomas, lipomas and neurogenic tumors, everyone with net, distinctive imaging characters.

10.8. MALIGNANT TUMORS

In an adult, the rule is that the larger the salivary gland, the lower the incidence that a mass within it will be malignant: a parotid mass has a rate of malignancy of about 15 - 20 %, the submandibular gland 40-50 % and the sublingual glands greater than 50 %.

The reverse is true in the pediatric population.

Also, if a tumor involves superficial lobe of parotid gland the tumor is usually benign; on the contrary, a tumor involving profound lobe of parotid gland, submandibular gland, sublingual glands and minor salivary glands have, statistically, the most probability to be malignant.

Imaging diagnosis by detection of typical characteristics of malignity:

- diffuse defined,
- internal inhomogeneity,
- invasive - infiltrative character with destruction and regional tissular involvement,
- malignant type contrast uptake due to malign specific internal vascular architecture: inhomogeneous, nodular, ring – shape in mosaic.

According to histologic aspects there were described the following entities:

- EPITHELIAL MALIGNANT TUMORS
- METASTASES
- MALIGNANT LYMPHOMAS
- MALIGNANT MESENCHYMAL TUMORS
- EPITHELIAL MALIGNANT TUMORS

Depending on histologic character, the most frequently diagnosed malignant tumors in salivary glands are the epithelial with the following cells variants:

- mucoepidermoid carcinoma,
- adenoid cystic carcinoma,
- acinic cell carcinoma,
- malignant mixed tumor,

- epimyoeipithelial carcinoma,
- salivary duct carcinoma,
- squamous cell carcinoma,
- polymorphous low-grade adenocarcinoma,
- basal cell adenocarcinoma,
- adenocarcinoma.

EPITHELIAL MALIGNANT TUMORS

The most frequent malignant parotid gland tumor is mucoepidermoid carcinoma, adenoid cystic carcinoma being the other usually diagnosed malignity but in the other salivary glands.

METASTASES

Much rarely appearing in salivary glands, especially by lymphatic spread from melanoma or skin carcinoma and unusually by hematogenous dissemination, from primitive carcinoma localized in: lungs, mammary glands, kidneys and gastro-enteric.

MALIGNANT LYMPHOMAS

Often involve salivary glands in association with a pre - existing autoimmune pathology, usually as secondary determinations, primitive localizations being rare.

MALIGNANT MESENCHYMAL TUMORS

Generic named sarcomas, have many hystologic varieties depending on tissular malignant origin type: rhabdomyosarcomas, fibrosarcomas, lipo - sarcomas, angiosarcomas, etc.

Imaging appear similar to malignant lymphomas as space replacing formations with certain malignant character, but without morphologic or lesional typical aspect, being detected with mixed various characteristics at: ultrasound exam, CT-scan or MRI.