**Salivary gland**

**As you know we have 3 pairs of major salivary glands and hundreds of minor salivary glands distributed in all oral submucosa.**

**You should revise the nerve supply, Site of drainage, types of saliva and the amount of saliva produced from each gland.**

**Saliva is a unique biological fluid composed of water, organic (carbohydrates and proteins) and inorganic substances (electrolytes)**

**It has a lot of functions:**

**1-Lubrication**

 **2-Ion reservoir buffering capacity (balance between demineralization and remineralization)**

**3- Antimicrobial function (antibodies and other antibacterial agents)**

**5- Help in digestion because it contain many enzymes like the amylase that’s responsible for digestion of starch**

**6-taste**

**7- It is responsible about the thirst and thirst reflex or water balance that means when the secretion of saliva decreases we have a state of dehydration the person will have a reflex to drink.**

**There are two types of saliva:**

* **Stimulated Saliva occur at meal time ( during function)**
* **Unstimulated salivary flow that occur in the normal state.**
* **The stimulated saliva mainly produced from the submandibular gland (about 65%).**
* **In case of unstimulated saliva the parotid gland contributes to 50%.**
* **And those two ( submandibular and parotid) are the main source of saliva , sublingual and minor salivary glands don’t produce that much and they produces 20% of salivary flow maximum**
* **The normal salivary flow rate is about 0.3-0.5 ml/min. about 500-600 ml/day (approximately ½ liter )**
* **And this range is unstimulated saliva and knowing this information is important to determine if patients really have xerostomia ( subjective and due to a real cause) or it’s something objective because stimulated salivary flow is variable from individual to individual , and from one type of stimulus to another and it might reach 2 ml/min**
* **Daily production of saliva : up to 500 ml per day**

**-The assessment of the salivary gland include as usual:**

**1- History**

**2- Examination**

**3- Investigation" specific to salivary gland as the sialometry, (measurement of salivary flow), sialochemistry (measurement of certain chemical in saliva for clinical purposes and we don’t use this method that much we use it mainly for research), salivary gland imaging (sialography and ultrasound) and biopsy”**

**In the examination as you know we examine:**

**We have to examine FOUR things and they are:**

**\*The gland itself (major glands) by inspection and manual palpation.**

**\*The duct and the duct opening especially in case of infection the duct may be red with pus production”.**

**\*The saliva itself (its quantity and quality)**

**Note: the first thing that we do when we want to examine salivary gland is inspection**

**- This is called the bimanual (by both hands) or bidigital palpation of the gland (by two fingers)**

**-, the parotid is usually examined from behind to check for any swelling or enlargement because it is difficult to inspect it from in front of the patient.**

**Sialometry:**

**Is the measurement of the salivary flow rate**

**There are two methods the first one is to measure the amount of saliva produced from all the glands of our body (most commonly used in clinics) and the second one can measure the amount of saliva produced from each gland itself by placing a cannula in the duct and measure the amount of saliva produced from each gland and it’s mainly used for research**

**They are Standardized measurements and they are done in certain times and not haphazardly**

**The whole saliva measurement id done by asking the patient not to swallow for a certain period of time 3 minutes for example and collect the saliva produced in a tube and measure it**

**Subjective xerostomia is mainly caused by psychogenic causes and not in purpose**

**-What is the difference between xerostomia and hyposalivation ?**

**Xerostomia is a subjective feeling, the patient says that he has xerostomia (complaint of the patient)**

**Hyposalivation is actual reduction in salivary secretion.**

**-if the patient has 2 mls of saliva in 10 min.**

**That means less than 0.3 ml/min so he has hyposalivation.**

**Salivary gland imaging:**

**Includes:**

**A-plain radiograph like occlusal x-ray and it can show if there’s a stone in the gland or in the duct and stones can be seen by OPG , MRI , CT-scan and the main difference between them is that the bone is white and soft tissues are darker ( black )in CT-scan and the opposite of this is observed in MRI.there’s no specific rules and indications to determine when we should exactly use MRI or CT-scan but a there’s a general rule that indicates the use of MRI for soft tissue assessment and CT-scan for bone assessment**

**-in MRI the more the water content is the more radiopaque the image will be**

**B-sialography: by injecting certain substances in the gland to view the structure and function (if retention happened to the injected material then the function is impaired indicating a hypofunction or obstruction**

**there is a similar test in GI by asking the patient to drink a substance called barium (barium swallow) this material is radiopaque and thick material inject a radiopaque substance (water-based or oil-based) in the duct of the gland and then we do the imaging by MRI or x-ray or CT-scan and it’s useful for examining the shape of the glands and ducts and sometimes it helps in examining the function and it can show if there’s hypofunction or obstruction in the canal.**

**Note: normal structure of the glands looks like a tree of Bunch of grapes**

**C-SCINTIGRAPHY**

**Note this type of imaging is used in bone tumors with metastasis and for thyroid and parathyroid diseases (if these glands are hyperfunctioning there will be an increase in the uptake of the radioactive material and this abnormality is mainly caused by tumors, the opposite will happen if there’s hypofunction indicating the presence of Sjogren’s syndrome and other autoimmune diseases**

**So we give the patient the material and we do the imaging over a certain period for time (every two minutes for example) and we observe any abnormality as mentioned above, the normal graph must have three phases:**

1. **Directly After injection (not uptaken completely by the gland )**
2. **After the gland absorbs the stain**
3. **After the gland gets rid of the stain**
* **In cases of hyperfunction we notice an abnormally decreased time scale so the gland takes the stain and gets rid of it quickly**
* **In cases of hypofunction the opposite will happen so the gland will take more time to reach to a certain phase and to move to the next one**

**D-Ultrasound: this method is safe in pregnant ladies because there is no x-rays used here (ultrasound is used to check the status of the fetus in the uterus)**

**And it used in case of the presence of a mass in the salivary gland and it determines the cause of this mass (is it a tumor or a cyst...) and these used we reduced the use of ultrasound due to the presence of MRI and CT scan because they give more details**

**-note: ultrasound imaging is the first line investigation in UK in cases of any neck swelling, because it’s cheap and easy and it doesn’t include radiological exposure. MRI ant CT-scan don’t have these features they are expensive and they might cause a delay in the diagnosis as they need appointments and stuff, ultrasound helps to determine the nature of swelling (is it a tumor, cyst,..) and we can do an ultrasound guided FNA by injecting a fine needle in the swelling and we do aspiration and then we send the fluid for cytology**

**Note: salivary glands stones are found sometimes incidentally in radiographs**

**The radiopaque stones exist in the highest levels in the submandibular glands because of the secretions that contain calcium and phosphorus 80%**

**Parotid glands has a radiopaque stones: 20-40%**

**E-Sialochemistry: measurement of the biochemical components of saliva and the use of this method is very limited in the clinics although there are some systemic diseases that’s diagnosed by the means of sialochemistry like: cystic fibrosis (measuring sodium and chloride levels)**

**This method is mainly used for research but there are some companies that work on expanding the use of this method in clinical diagnosis by improving a plates that measure certain chemicals in saliva as a markers for the presence of certain diseases like cancer or to modify drug levels which is especially important for cerebral palsy patients who have seizures as the treatment they are given epilepsy drugs and we use sialochemistry to check drug levels ( it’s hard to take blood sample from them each time so they take saliva and test it for drug levels)**

**And right now there are some clinics that use this technique especially with HPV that causes oropharngeal cancers**

**E-Salivary gland biopsy**

**Usually for minor salivary gland, we can use it in sjogren disease or sarcoidosis disease diagnosis**

**Rarely used in major salivary gland and not clinically applicable and the smallest biopsy of parotid gland is removal of superficial parotid. So we use other methods for diagnosis like FNA and ultrasound guided FNA as they are more applicable in clinics**

**Note: the same thing applies for thyroid gland; we use FNA and not biopsies**

**FNA is a simple procedure that includes aspiration of cells using a fine needle (not necessarily fluid) and those cells are observed and examined under the microscope and this is called cytology**

**Sometimes the mass is deep so we can’t see it so we should do ultrasound guided fine needle aspiration biopsy they usually image the lesion with ultrasound at the same time they enter the needle to know if the needle is inside the lesion or not and to make sure that the cells aspired are representative**

**We mentioned earlier that biopsies are taken from minor salivary gland because they are more superficial and accessible and this is useful in diagnosis of Sjogren’s syndrome which happens due to lymphocytic infiltration in glands and that’s why it’s considered a risk factor of lymphoma**