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**Management of teeth with vital pulps and open apices**

The first 15 minutes of this lecture was not recorded
so the first part is copied from the last year sheet ( between quotations )

 *“This lecture will talk about the first part of treatment of immature teeth with open apexes and vital pulp , next lecture will talk about the second part which is revascularization and regeneration .*

*Dental pulp is the most commonly injured and diseased tissues in the human body*

*In 2008 there was a meeting between the American association of endodotists and the American academy of pediatric dentistry to join their efforts and during it the underscored a shift toward a more contemporary biologic approach to pulp therapy , its different than what we do in the clinics*

*The completion of root development and the closure of the apex occurs 2-4 years after eruption of the tooth.*

*Any factor either mechanical, chemical or physical that can affect the pulp and causes pulpal disease or apical periodontitis is a threat to the integrity of the root*

*Practically all teeth exhibiting apical periodontitis exhibit root resorption*

*The less the maturity the involved tooth is the faster the resorption proceeds because of the larger diameter of the dentinal tubules in these teeth*

*These cases can be differentiated by the 1. shape and size of the canal system and the 2. appearance of the apex (thinner canal walls ,pointed or shorter apex and an open foramen depending on the stage of root formation)*

*The most common stimulation factor of root resorption is 1****. pulpal infection*** *(due to caries(mainly) or trauma )*

*In the apical area early pulpal death and loss of vitality will lead to a necrotic infected pulp that will provide the stimulus for periodontal inflammation and this will result in arrest of root formation and external root resorption .*

*Other causes are : 2****. Pressure*** *because of :*

*A.impacted or erupting teeth*

*B. orthodontic movement*

*C. trauma from occlusion*

*D.pathological tissue such as a cyst or neoplasm*

*Roots of teeth Show a remarkable resistance to systemic diseases that cause significant root resorption which can be seen in endocrine disturbances and in patients following radiation therapy*

*When the cause of resorption is pressure if the pressure (cause) is removed then resorption will be arrested*

*3.****Idiopathic resorption :****slow gradual shortening of the root and it may arrest spontaneously and the apex remains rounded*

*The dr showed pictures of resorption of no significant local or general cause can be identified*

*Although there is a report in literature that replanted teeth may remain in function for more than 40 years but ultimately these teeth may be lost because of progressive root resorption or problems associated with ankylosis especially in the growing children*

*The communication between the root canal space and periapical tissues represents a real challenge*

*The dr showed a picture :The apical diameter is wider than the coronal diameter so cleaning and shaping will be complicated by the fragile lateral dentinal walls that will not give much mechanical instrumentation and could be formed during mechanical filling*

*Also the vivo invironment in this stage will be challenge to disinfection , which is the most important thing in these cases*

*In obturation of these teeth also there is a risk of fracturing these teeth and this might in some cases require apical surgery and retrograde sealing of the canals , so we have major problems in the treatment of these teeth with open apex .*

*As you know diagnosis is the first step in treatment its important because it will affect prognosis and it will affect the whole treatment plan . in our case diagnosis is dependent on 2 factors : 1. the root development stage 2. The condition of the pulp (most important) wether its vital or non vital*

*The diagnostic data is collected from1. subjective symptoms , 2.clinical and radiographic examination and 3. performing diagnostic tests “*

During this process they are looking at a key piece of information and using any information we have, which means that our preoperative diagnosis of vitality and necrosis is only tentative because verification is made only when we access the teeth and after we inter the tooth.

Big leadsmentality : means thatpt usually presents with complex form that needs more than a simple test

The body can produce tremendous amount of noise that can confuse the diagnosis which happens to all of us

The straight forward diagnostic output becomes more difficult to interpret particularly in posterior teeth

Literature of diagnosis of pulpal status divide in area of permanent teeth of immature apexes

Diagnostic data is collected from thorough history of subjective symptoms not objective by clinical and radiographic examinations and also by performing diagnostic tests

Unfortunately, It was not possible to establish a correlation between the results of these individual tests and the histological diagnosis , perhaps combining of these results can lead us to the conclusion in our diagnosis

Apical root resorption is asymptomatic, symptoms may arise from apical inflammation, these pts reports after many years when pulpal necrosis caused apical periodontits or discoloration causing either pain or compromise esthetic this the only cause that can enforce the pt to come to our clinic , remember they don’t have symptoms

In the radiograph there is also a dilemma, cz it might normally show periapical zone of radiolucency of immature tooth with a healthy pulp, so how we can differentiate btw this finding and the radiolucency from pulpal necrosis??

In this case we reach diagnosis by fistula and tracing the sinus tract

Ice and ethyl chloride are uses to test vitality but unfortunately, these are of very limited value compared to other thermal tests as co2snow ,PDMtest, and others they used to be very inferior

The most used test for assessing the NV supply in the pulp of a traumatized tooth is electric pulp test

This test determine vitality VS non vitality but not health VS disease

After trauma the pulp is in the state of shock this state might take from 3-6 months

Vitality of the pulp is expressed by its circulation and not by its innervations

What happens is that even in an open or closed apex nerves might be damaged but blood supply is still intact so the pulp is healthy but un responsive, that’s why we don’t rely on the result of electric pulp testing until the period of resolution of the chock is passed, so we have to wait at least for 6 months to reach the final diagnostic results

Positive response from the first test is a goodprognostic sign, if it gives negative (not vital) we should wait months(1,2,3 months) to make sure the pulp is not vital

(so we wait until other symptoms of non vitality develop)

These tests with yes or No response which are subjective and varies from person to other lack objectivity and gives false positive or false negative

So to avoid mistakes there should be no rush in treatment undertaken on the basis of negative responses

Laser Doppler flowmetry is an excellent test to reduce tooth mortality, it has many advantages, its objective, directly measure the blood flow which indicates the real situation of the pulp and don’t rely on sensory nerve response, its completely painless and should rely on teeth with immature apices the only disadvantages are highly sophisticated and very expensive

Pulpitis is the inflammation of pulpal tissues..can be either reversible or irreversible, it might be symptomatic or asymptomatic (most important ) always we need a classification which is easy , simple to learn and teach . the classification we are learning is adopted by the American association of endodontic 2013 and this is the only accepted worldwide classification .

Asymptomatic irreversible pulpitis is a tricky situation , because the pulp is alive and don’t react normally to thermal stimuli whether hot or cold

But still it requires treatment decision , we don’t want tounnecessarily do a treatment but still we don’t want to ignore a situation that might get worse in the future (its called stress pulp syndrome (marwan abo ras ) )

Diagnostic course is not pure science because its not about the examining equipment ,diagnostic tool and instrument , but the diagnostician who will perform the test and reach a conclusion

The dentist should be equipped with art of lessening, , training, patience to reach a conclusion its not only the skills and the diagnostic tools

Treatments is mainly depend on :1- diagnosis of the condition of the pulp( pulpal status >> vital or not)

2- the root development stage

Treatment planning is part of dentist practice deal with acute and immediate and the long terms including

Many factors should be included in treatment planning: case selection, no . of trips required, risk of fracture, pulpal damage, restorability, financial restorations, dental argue , pt referral…. All these should be considered before treatment plan is put

Many remarkable changes happened in the field of endodontic s in the past10 years resulting in a shed from mechanically treatment (which is applied today) to a more biologically focused approach

But current protocols have not been modified on the basis of booming biological knowledge

Ideal clinical output >> for healing of a pulp wound , should be done by engineering a functional pulp tissue

 This regenerative approach should ield in growth of A

 New pulpal CT

What happens is that a complete replication of the original pulp tissue doesn't seem to take place till now ..what happens is the displacement by periodontal connective tissue (this is a very positive result) because it indicates that the intense bacterial contamination has been eliminated and this is our goal
this can accompany "dentine healing" which is hard tissue deposits on tubular dentine… this healing stops when healing is complete

at the beginning of the 21 century, we had better understanding of the pathlogy and pathophysiology and their power of healing that should be reflected on our clinical management to develop more biocompatible treatment modalities aiming to increase tooth longevity not success rate.
-in current endodontic status,pulpectomy(complete removal of pulp tissue) is always selected when the pulp just shows diagnostic or clinical signs of pulpitis. but whether it's reversible or not,doesn't represent the actual status of the pulp (example: when the coronal pulp is usually infected while the apical pulp remains vital with variant degree of inflammation)
why this is important?
because these clinically compromised dental pulps might still have stem cell potential that can be used as a resource of auto pulp regeneration

note: unfortunately, data in lecture indicates that the reason of the dental RCT is simply deep caries and pulp exposures almost always mean RCT
the fact that in current endodontic status, we don't care about the dental pulp and many of the pulps removed could have been saved through more conservative approaches

So,in pulpitis,the inflammatory reaction remains localized even after the bacteria invades the pulp space
as found in histological sections,only 1-2 mm of the abscess can be seen-

-So from a clinical point of view,
1- it's time to consider whether all diseased vital pulps require removal for optimal healing

2-where at least some pulp tissue appears vital specially in treated,immature and permanent teeth : all treatments should be oriented toward revitalization to form pulp dentine complex
The concept of revitalization-revascularization is not modern

-The recent approaches to pulpal treatments have taken two lines,the first followed the traditional line that tries to find improved synthetic materials that provide better seal… the second took a more biological approach of tissue regeneration and identification of biologically better approaches to deal with the diverse pulp situations>>> many approaches has taken place to solve this dilemma using less invasive pulp excavation approaches and convert the active pulp lesions into arrested ones
there are studies that confirms that the dental pulp can be repaired,either by it's self or after the application of bioactive materials

**bioactive materials** should have two identities (1- boicompatable…I can't hear the second one)

so the amputated pulp can be repaired as long as it's protected against ??

-the MTA or the mineral trioxide aggregate has been introduced to dentistry and it's a promising therapeutic cement that that has a history of clinical and experimental successes… it appears to perform better than any other material to which has been compared with >>> it produces dentine bridges…less inflammation …less hyperemia and less pulpal necrosis
-MTA is applied direcrly on the exposed pulp ( unlike other materials,MTA needs humidity to set)

-partial pulpotomy should be selected as an alternative to dirert pulp capping when the extent of inflammation is expected to be greater than normal( in traumatic exposures that lasted for more than 20 hours or mechanical exposures due to deep caries)
-whilethe amount of pulp tissue to be removed depends on clinical judgment but only the infected tissues should be removed( clinical criteria of infected tissue is bleeding and biological markers that give the infected tissue a specific color so we remove all the discolored tissue)

-the dr showed a case of partial pulpotomy:
radiograph>>pulp exposure>>partial pulpotomy>>recall >>complete root development and calcification and the tooth is asymptomatic

-complete pulpotomy have similar indications as partial pulpotomy.. The difference is that in the complete type,the whole coronal pulp is removed(more extensive inflammation)