Latest advances in endodontics

Lecture num. 26

Today we will talk about advances in:

1. Diagnostics
2. anesthesia
3. isolation
4. instrumentation
5. irrigation
6. obturation
7. case report

1. diagnostics :
2. imaging –digital radiography :
3. charge –couples device : sensor receives photon x-ray and transports it into a picture
4. photo-stimulable phosphor (PSP) plate : the image is stored in a phosphorus plate

Advantages of digital radiography compared with analogue:

1. reduced radiation exposure
2. much faster image production
3. no processing needed : reduced risk of processing errors
4. enhanced image manipulation and storage

disadvantages :

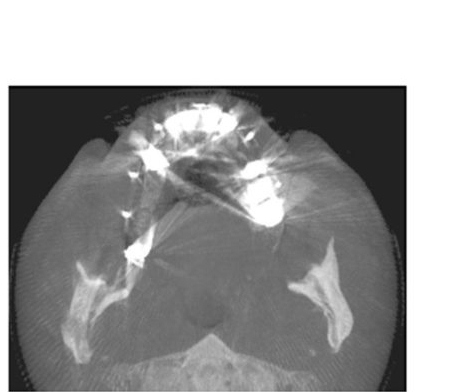
1. more expensive equipment
2. reduced resolution (still not as good as conventional)
3. may tempt dentists to take more radiographs

* **hand-held X-ray machine** : they look like a camera , perfectly safe , but some of these machines have major safety hazards , they have high radiation doses and they lack operator’s shielding. and the collimation is not that great .(to buy this device it has to be approved by the FDA.)
* **CBCT**: it gives a 3D images , can produce sections ( gives us either an overall images of one jaw or the two jaws , or we can do a limited volume and we will see 2 or 3 teeth )

Data in CBCT acquired in term of volume (Voxel : is very accurate , for example if we want to measure the distance between the alveolar crests and the ID canal CBCT is very helpful .)

(very helpful in implant planning )

Scatter : if we have something that is radio opaque ( like amalgam , posts, implant ) you can’t see it clear



Accuitomo: common CBCT device, very popular in endodontics . you can do limited volume and the dose is as low as 11 uSV

Diagnostics: B. magnification : microscopes gaining more popularity now a days

It gives magnification and good illumination

We can treat most cases without microscopes but if we want to dig deep in the canal to locate a perforation or broken instrument then we need source of magnification.

It also improves the body posture : helps us stay in an upright position

Loupes vs microscopes:

Weight limitation: after long time loupes with light ( heavy ) will cause strain in the neck

Nowadays we have loupes with 6X magnification but microscopes have up to 24X or even 30 X magnification

The best way to get evidence about the efficiency of any device is by

Systematic review 🡪 meta analysis 🡪 RCT

2 - local anesthesia :

Intra osseous anesthesia :

1.The stabident system

2. the X-tip system

the two systems have perforator, but after drilling in the buccal plate in the stabident system you take the perforator out and then try to locate the wall you need while in the X-tip you don’t remove the whole device , you just split the 2 pieces and the plastic unit remains inside the bone and then the needle is inserted through it. Because of that the X-tip system is easier.

* Quick sleeper : very recent system , that looks like the wand , it is computer controlled and deposit the local anesthesia in a steady rate , it has a perforator attached to it and it gives the anesthesia intraosseous ( so it do both , drill through the bone and deposits the LA

3-isolation:

Isolite : perforated plastic sheet ,( it is a bit harder than a sheet ) . it retracts the cheeks ,tongue and gives some sort of air way protection and provides suction at the same time.

Much more expensive than the rubber dam , some papers reported that patients prefer the isolite more than the rubber dam ( but these studies were done on pediatric patients

1. Instrumentation :
2. Single file system : may work with simple straight forward cases only .

* Every system has it’s limitation , so we prefer to use a combination of systems

Wave one and reciproc 🡪 most popular systems

One shape and micro mega not very good systems .

1. Self adjusting file : it works in a totally different way , it vibrates and irrigates . it is like using sand paper to clean the walls

It takes the shape of the canals

It is an excellent irrigation system but it doesn’t shape the canal

It has been taken from the markets because the junction between where they put the hypochlorite and the device itself is loose , and there were a few incidence where it split and splatters the patients .

1. XP – endo finisher : at room temperature it is straight , when you put it inside the canal and as soon as it worm up to body temperature it curves . it has a zero taper

* It gives you the best chance of contacting the canal walls in all dimensions .

1. XP-endo shaper : one file that shapes the canal

It has high elasticity and shape memory property

You need to prepare the canal to at least size 15 hand file , then with the XP endo shaper you end up with a size 30 and 0.04 preparation ( just with one file ) !!

* And because it is very thin , not that taper and very flexible 🡪 you get more room in the canal for debris to go out and it is very difficult to fracture .
* In rotary the movement of the debris is impeded by the file itself , while in the XP endo shaper there is a good volume of the canal that is not occupied by the file so debris can move freely ,plus the amount of stress on the walls of the canal and the file itself : in the rotary the file and the walls are stressed from 3 different locations while the XP only from one side .

1. Lasers: ( safe , non-ionizing )

It interacts with tissue and result in certain changes , these changes could be 1. Increase in the temperature 2.damaging 3. Activation of certain materials

1. Photo-aided disinfection : flooding the canal with photon sensitive material that is activated by the laser itself 🡪 so this improves your disinfection ability .
2. Photon-induced photo acoustic streaming

Drawbacks of laser : laser travels in straight line ( can’t be used in curved canals)

Due to temperature rise it may injure the PDL

* We use weak leasers in the canal

1. The apexum system : it is like a hook that fits on a slow speed hand piece .

The idea of the apexum is to wash out the granulation tissue and get rid of it , they claims that this will speed up the healing process.

* The first study was done on dogs , and they noticed faster healing
* On human , after 3-6 months 87% 🡪 95% of lesions were healed

( the paper wasn’t that good)

1. Irrigation : if we placed a needle inside the canal and irrigate the we are producing positive pressure , so we need the needle to reach certain depth . ( as close as possible to the apex ,without pushing the irrigant beyond the apex .
2. The endo-vac –system works on a negative pressure , so the idea is there is a syringe filled with hypochlorite and you flooded the canal with hypochlorite , there is another part ( like a cannula) goes all the way down to the apex ( the full working length , and start sucking the irrigant .

In the conventional way we may not reach the full working length , so we may leave some infection in the canal system

* The endo –vac system is Definitely safer .

1. Ultrasonic : activates the irrigants , this is very important because simply irrigating the infected canal is not enough you need to activate the irrigant
2. Sonic activation : ( the endo activator) : it doesn’t produce enough energy to activate the irrigant 🡪 waste of money and time .

\*\*\* A novel non instrumental technique for cleansing the root canal system :

They wanted to disinfect an infected root canal system without instrumentation , so they developed a machine that introduce the irrigant inside the canal and they move it in a certain way and hope to penetrate all part of the root canal system and clean it

* It remained as a concept

There is a paper that compares between the control technique ( they just instrument the canals normally ) and the machine technique , with different concentration of hypochlorite .

At 3% hypochlorite 🡪the machine almost consistently got a better disinfection than the control.

\*\* gentle wave system :

* If there is an area with deep caries the gentle wave system will not work ( you need to seal the tooth ) 🡪 it has to be a closed system

\*\* they compared the conventional instrumentation and the gentle wave :

* The first paper 🡪 it was about tissue dissolution

They put pieces of long muscle in cubes and they irrigated either conventionally or with the gentle wave , they found almost an 8 times increase in tissue dissolution rates with the gentle wave system ( but this study was in vitro)

Second paper 🡪 six month healing rates after endodontic treatment using the novel gentle wave : drawback 🡪 they considered healing and healed cases as a success while we know that healing is survival not success , and there were no control in this paper .

Third paper 🡪 twelve months healing rates after endodontic : drawbacks : they also considered the healing and healed cases as a success , there were no control group and most of the teeth treated were vital .

Forth paper 🡪 evaluation of root canal debridement of human molar using the gentle wave system : they left one canal without treatment , the other canal that treat it with gentle wave and the last one with conventional instrumentation , they found the presence of debris when using the gentle wave in apical and middle third was minimal , but they haven’t said anything about the debris in the coronal third which may got some differences .

Table’s Note : maybe the differences in the volume of the hypochlorite used explains the massive differences between the 2 methods not the method itself .

1. Obturation :

Thermafill 🡪 is the worst obturation material, because when you want to retreat the canals the plastic core if very hard to remove .

Calcium silicate sealers ( MTA) 🡪 they push the body to heal and deposit hard tissue

* MTA do seal better than gutta percha , but they are irreversible , once they sit they become like concrete you can’t remove them and it is very expensive .

Total fill 🡪 true calcium silicate sealer

MTA fill apex 🡪 resin sealer with calcium silicate

1. Periapical surgery using cad/cam guidance : for certain tooth you can take different sections and plan your surgery 🡪 surgical stents that tell you exactly where you need to drill , in which direction and for how deep in order to cut the apex of the root . But what about the retrograde cavity preparation which is the most difficult part of apicoectomy.

\*\* guided auto transplantation :

a 11 years old boy who had a facial trauma and he lost his two centrals and they couldn’t find them .

treatment options :

1. Repositioning of the 2 centrals were out of question
2. Implants , bridge ? 🡪 the patient is still young

The patient came back with some bone loss and some soft tissue recession .

They decided to auto transplant his 2 second premolars into the anterior maxillary incisors ( the 2 premolars were still unerupted ) .

The most decisive factor is extra oral/out of the socket time 🡪 the most critical factor .

So they took CBCT 🡪 they identified the teeth they want to work on 🡪 they virtually placed them in the socket 🡪 they created a surgical stent ( now they know exactly where they need to drill and what size they need to drill ) 🡪 they created a replica of the teeth they wanted to auto transplant and they tried them 🡪 they extracted the premolars 🡪 put them in their place 🡪 suture them ( no need for splinting) 🡪 veneers

\*\* pulp regeneration :

Teeth with open apex and radiolucency 🡪 we have 3 options

1. Calcium hydroxide apexification : it is time consuming , keep applying calcium hydroxide and removing more tooth structure 🡪 this will result in thin roots and more susceptible for fracture
2. Disinfect 🡪 calcium hydroxide for 4 weeks 🡪MTA ( but still it will result in thin roots )
3. Regeneration : disinfect the pulp 🡪 provoke bleeding in that area ( the bleeding will work as a scaffold 🡪 apply MTA

The dr . asked us to read more about pulp regeneration ☺

Good luck ☺

Sorry for any mistake