

Sheet no: 21.

Refer to slide no: 21 hardcopy only. (Vital pulp therapy).

Date: 21/3/2016.

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﴿ولا تحسبن الله غافلا عما يعمل الظالمون إنما يؤخرهم ليوم تشخص فيه
الأيصار﴾ (سورة إبراهيم)

<https://www.youtube.com/watch?v=w5VOwOXQHQg>

≡ YouTube JO



FORGOTTEN? Syria's Children of war

THIS SHEET CONTAIN EXTRA INFORMATION. YOU SHOULD READ THE SLIDS .

Doctor listed many studies in this lecture which is clinical studies. He explained them but I prefer to share the study with you, so you will find in this sheet (copy-paste) from website or image talked about the study . Please read them carefully. They are helpful. Amazing and exciting studies.

The vital pulp :

Vital pulp therapy started from kakehashi study.

study in 1965 by kakeshahi he brought two group of rats (conventional & gnotobiotic "under strict conditions this group has no bacteria at all.") what he did ? He did pulp exposure in those rats AND left them open to oral environment.

I inserted the full story of study. Read it. dr asked about it last year.

<http://www.evidencebasedendo.com/index.cfm?fuseaction=pub.article&aid=208>

Authors: Kakehashi S, Stanley HR, Fitzgerald RJ.

Title: The effects of surgical exposures of dental pulps in germ-free and conventional laboratory rats.

Journal: Oral Surg Oral Med Oral Pathol

Date: Sep 1965

Category: Endodontic Microbiology * Evidence-based Ranking: 5

Purpose/Objectives: To observe the pathologic changes resulting from untreated experimental pulp exposures in germ-free rats as compared with conventional rats with a normally complex microflora. Materials & Methods: Thirty-six 7-week-old Fisher rats were divided into 21 germ-free animals and 15 conventional control animals. A ½ -round carbide bur was used to drill a hole through the occlusal enamel and dentin of the maxillary right first molar to expose the pulp. No attempt was made to restore or seal the exposure which allowed food, debris and microorganisms (in the conventional rats) to become impacted into the pulpal tissues. **The animals were then sacrificed at intervals from 1 to 42 days post-op. The tissues were serially cut in a mesiodistal plane, stained and studied microscopically. Results: Conventional (control) rats: All occlusal cavities were packed with food and debris. Specimens taken on the eighth day showed vital pulp tissue remaining in the apical half of the roots only.** Remaining coronal portions of the pulp were necrotic and purulent. Colonies of microorganisms were usually seen. All specimens taken after eight days showed complete pulpal necrosis with chronic inflammatory tissue and abscess formation in the apical areas. Abscesses were also seen at accessory foramina. There was no evidence of pulpal repair in any of the cases. **Germ-free rats: No completely devitalized pulp was observed in any of the test animals. Pulpal inflammation resulting from the exposure was minimal in every specimen.** Not a single apical abscess was found. Dentinal bridging was evident at 14 days. Older specimens showed matrix formation completely bridging or sealing the exposure. In every animal, the pulp tissue remained vital beneath the newly formed reparative dentinal bridge. Periodontal responses in cases of perforation were similar in both groups – periodontal lesions and pockets were seen. In the germ-free rats, cases of perforation that permitted embedding of food and debris into the periodontal tissues resulted in root resorption while the pulpal tissues remained vital. As the root resorbed, new bone was deposited to compensate for the reduction in root size. **Author's Conclusions: The presence or absence of a microbial flora is the major determinant in the healing of exposed rodent pulps.**

Validity of Conclusions: Conclusions are valid.

**** If you expose the pulp under aseptic conditions and you seal it probably (prevent infection) the pulp should heal itself.

Vital pulp therapy:

Group of procedures that try to preserve the healthy pulp and prevent any further damage.

- Pulp has a massive potential to heal.

It includes:

- 1- Indirect pulp protection.
 - 2- Direct pulp protection.
 - 3- Pulpotomy.
 - 4- Regenerative.
-

Benefits:

- 1- To allow root development in immature teeth: **Pulp** exposed because of carious lesion, but we notice an open apex (roots very thin), very difficult to do RCT.
 - 2- To maintain sensory function
 - 3- To maintain secondary and tertiary dentin.
-

Reaction of the pulp dentine complex to caries.

We have 3 basic reaction to protect the pulp.

- 1- Narrowing the dentin tubule by depositing of sclerotic dentin, and make it difficult to entering bacteria. That happens because increase the permeability of dentinal tubules. Because as we know the diameter of dentinal tubule is wider, a few mms compared to enamel? Therefore, the deep the cavity the more the permeable dentine is.
- 2- Deposition of tertiary dentine.
- 3- Inflammation: pulpitis is defense mechanism.

We need to be able to reach this diagnosis; otherwise, you do not have any right to kill vital pulp.

Therefore, we will talk about caries:

Enamel caries; dr did not mention it because we talked about it in cons lecs.

Dentinal caries:

- 1- Zone of destruction: very soft yellowish liquefied necrotic layer, no sensation and it is damaged. you can remove it with excavator .
- 2- Zone of bacterial invasion: the layer is caries infected. So when we remove caries, we should remove this layer.
- 3- Zone of demineralization: here no bacteria present.

- 4- Sclerotic zone: this slows down the acid advance and gives some sort of pulp protection. Seen in x-ray as radioopaque.
- 5- Then we have tertiary dentine.

Now we will talk about defense mechanism, which is inflammation and immune response.

Inflammation: pulp reacts by inflammation by giving more blood supply, more white blood cells. As long as this inflammation is mild and minimal, we call it **"reversible pulpitis"**. As we remove the stimulus, the pulp can recover spontaneously.

How can we reach the diagnosis? What is the cut point?

We concern about history, is there any history of pain? How does this pain describe? Is it spontaneous? Spontaneous means sth more aggressive. What do about tests? Electrical and cold test?

Is there any pain once applied cold test? If yes, how much time does it long? If the pain stays then this is lingering sensation and this is suggested irreversible pulpitis.

There is a good correlation between histology and clinical picture, but sometime the pulp is irreversibly damaged but no clinical sign this is **asymptomatic reversible pulpitis**. How could we reach such diagnosis? We will talk about this later.

Now if you want to perform VPT.

- 1- Make sure pulp is vital
- 2- No symptoms for irreversible pulpitis.
- 3- X-ray examination (no periapical radiolucency or widening in pdl).

Favorable outcome depend on :

- 1- Removal of stimulus
- 2- You need to stimulate the pulp tissue (by using biocompatible material e.g. mta, biodentine...)
- 3- Prevent future micro leakage. If you go vpt you should have a definitive restoration. (e.g. no gaps)

Stepwise excavation technique definition The stepwise method is a **"two-step" incomplete caries removal approach where the carious dentin tissue is incompletely removed at the first step and carious dentin is left in proximity to the pulp under a temporary filling** (Schwendicke et al., 2013). In the stepwise caries removal technique, only part or all the soft and infected carious tissue is removed at the first visit during the acute phase. In the second step (second visit) 6 to 12 months later, a re-entry caries removal procedure is accomplished, complete removal of all carious tissue is performed and a definitive restoration is placed (Schwendicke et al., 2013). The purpose of this procedure is to arrest the carious lesion progression in order to allow the formation of tertiary dentin before final excavation, which makes the dentin tissue next to the pulp thicker and the pulp exposure less likely (Kidd 2004).

- 1- **Indirect pulp capping** : One or two stage .

You should remove the caries completely. Affected caries can be left. Restore with composite

** Recent study said that stepwise technique is not necessary.

Read the slide

2- Direct pulp capping :

You think of VPT as progressive step for preserving what left from the pulp.

- 1- Try not to reach the pulp with some caries. (ما فهمت الكلمات بالزبط 17:15)
- 2- Remove everything plus exposed pulp

By definition: it is placement of material on exposed pulp to facilitate formation of tertiary dentine.

Prognosis:

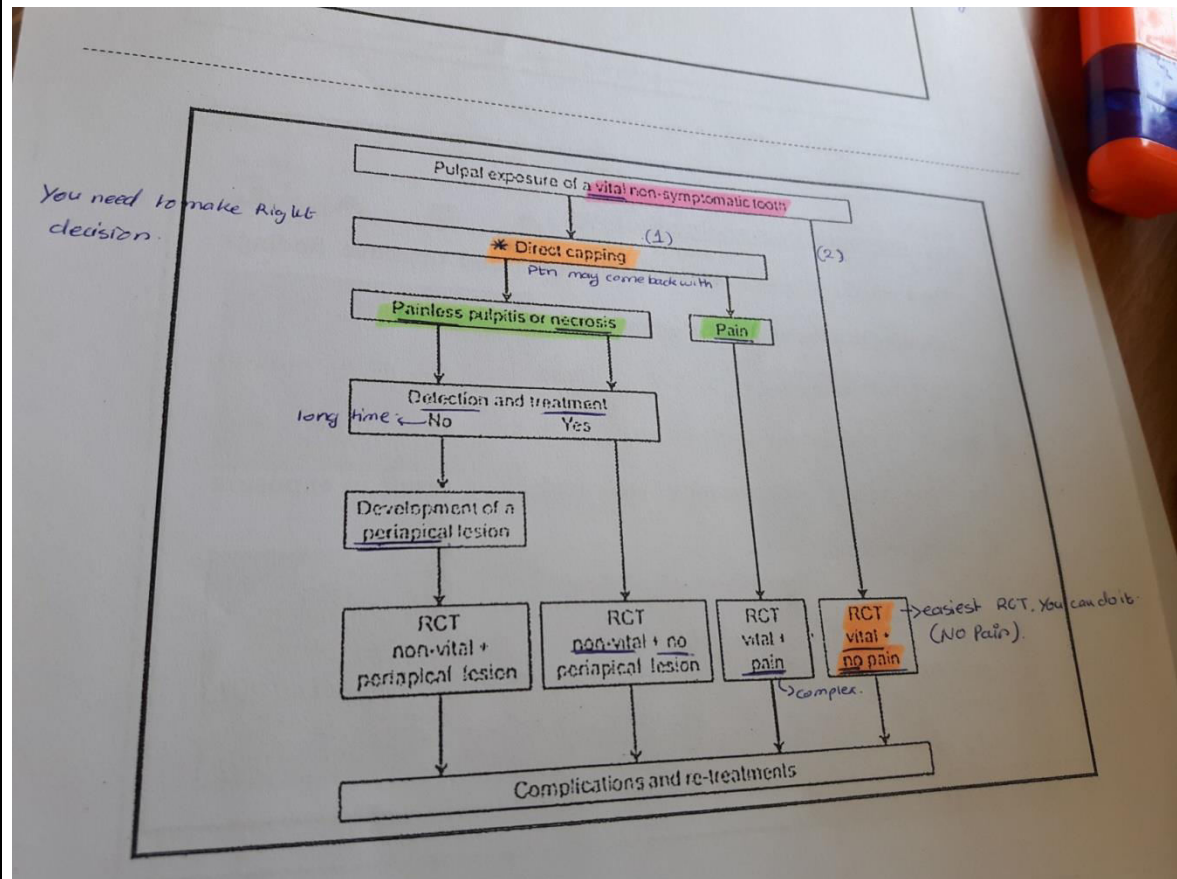
- 1- **The length of the time the pulp has been affected:** In our clinic, it is difficult to know.
- 2- **Level of bacterial infection**
- 3- **Histological status of pulp**
- 4- **The size of breach :**
- 5- **Achievable homeostasis:** the most important! Because sometime when pulp is irreversibly damaged, and no symptoms present , it will bleed a lot, so there is some sort of bleeding that is not control.

Pulp exposure when caries excavation >> what is the best management? DPC vs RCT

There is no best answer.

THE OUTCOME OF DIRECT PULP CAPPING IS:

- 1- **UNEVEANTFUL HEALING**
- 2- **PAIN / IRREVERSIBLE PULPITES (HERE THE CASE THAT YOU HAVE WAS ASYMPTOMATIC IRREVESIBLE PULPITES)**
- 3- **NECROSIS, INFECTION.**



THIS IS IMPORTANT CHART.

You need to make right decision.

You don't know histological status of the pulp until you section it and put under microscope . If the pulp is inflamed and you see inflamed tissue. IF YOU SEE microabcess then the pulp is irreversibly damaged. If ptn come to me with no symptoms and I do all my examination. (Percussion, palpation. pulp test) no suggestion to irreversible pulpitis then I should preserve the pulp .

This is mean that I am not wrong when I do pulp capping and ptn come back with necrotic pulp.

If I do 10-pulp cap, I would accept one of them to come back to me with irreversible pulpits/ necrosis, This is better than you do RCT على اي حالة .

We do not know what happen exactly when we make pulp cap and ptn come back with necrotic pulp. sometime it is sort of irritation the pulp.

Calcium hydroxide was the best choice for pulp cap. Then put glass inomer or zinc oxide eugenol.

- a- Does not seal (microleakage!)
- b- it resorbed
- c- however it induce some sort of dentinogenesis.

Traditional thought consider carious pulp exposure a contraindication for VPT because of associated microorganism and the infection present in the cavity so they don't like to perform VPT except for iatrogenic pulp exposure or traumatic pulp exposure . Seltzer and bender 1958 worked on this subject. That was in 1958 , dentistry has changed!

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Asymptomatic irreversible pulpitis:

Defintion by AAE : as slide

- **No clinical symptoms.**
- Respond normally.
- May had trauma or deep caries. (You remove caries> expose pulp> inflamed pulp> but no symptoms.)

Next slide: AAPD said sth related to this subject: Clinical diagnosis of reversible pulpitis. (Read the slide)

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Case :

In 2008 >> study on direct pulp capping with mta on cariously exposed pulp. (remove caries by dies and he achieve hemostasis , he put mta , a thick layer of mta. And this is what he get(look at slide and the inserted image-_- :P).

Study of 40 people who is between 17-45.

I found the full story in readbyqxd.com by *Journal of the American Dental Association* and I like to share it here.

***Dr explained it as this exactly.*

Direct pulp capping with mineral trioxide aggregate: an observational study

George Bogen, Jay S Kim, Leif K Bakland

Journal of the American Dental Association 2008, 139 (3): 305-15; quiz 305-15



BACKGROUND: Pulp capping in carious teeth has been considered unpredictable and therefore contraindicated. A recently developed material, mineral trioxide aggregate (MTA), resists bacterial leakage and may provide protection for the pulp, allowing repair and continued pulp vitality in teeth when used in combination with a sealed restoration.

METHODS: Forty patients aged 7 to 45 years accepted pulp-capping treatment when they received a diagnosis no more severe than reversible pulpitis after undergoing cold testing and radiographic examination. The primary author removed caries using a caries detector dye and sodium hypochlorite solution for hemostasis and placed MTA over the exposures and all surrounding dentin. The operator then restored the teeth provisionally with unbonded Clearfil Photocore (Kuraray Medical, Okayama, Japan). During a second visit, the operator restored the teeth with bonded composite after sensibility testing and confirmed MTA curing. At recall appointments, patients were evaluated for reparative dentin formation, pulpal calcification, continued normal root development and evidence of pathosis.

RESULTS: Over an observation period of nine years, the authors followed 49 of 53 teeth and found that 97.96 percent had favorable outcomes on the basis of radiographic appearance, subjective symptoms and cold testing. All teeth in younger patients (15/15) that initially had open apices showed completed root formation (apexogenesis).

CONCLUSIONS: MTA can be a reliable pulp-capping material on direct carious exposures in permanent teeth when a two-visit treatment protocol is observed.

PRACTICE IMPLICATIONS: Vital pulp therapy using MTA is a treatment option for teeth diagnosed with a condition no more severe than reversible pulpitis.

97.9% success rate.

When you get rid of pulp it should irreversibly damaged or necrotic

randomized controlled study to differentiate the use of using MTA and ENDOCEM.

- 1- All patients above 19 years old which means permanent teeth, and mature apex.
- 2- Followed by short period of time
- 3- High success rate.
- 4- Conclusion: direct pulp capping reliable treatment for pulp exposure in adult teeth.
- 5- To get favorable prognosis:
 - Aseptic technique (always rubber dam) .
 - Remove the caries infected dentine layer.
 - Control pulp hemorrhage. If you can make a homeostasis by using sodium hypochlorite within 5 minute, it does not matter the superficial part of pulp because it became necrotic, because it will neutralize, and the underneath layer will stimulate the differentiation of stem cells 😊

***Dentist use different haemostatic agent as formacresol which dr don't like it . he use naocl which more better.*

4- *You need sth bioactive such MTA , biodentine*

5- *Achieve proper seal.*

Pulpotomy:

Next step after direct pulp capping. So you expose the pulp (which the superficial layer is inflamed or necrotic) so Before you get rid of pulp. try to see what happen with radicular pulp.

Pulpotomy can done by two ways (either partial or complete)

The idea is pulp necrosis happen in progressive stages(layers), microabcess formation layer underneath it there is inflammation layer. Management is removing of the inflamed coronal portion of the pulp.

You use high-speed diamond finishing bur.

Partial Pulpotomy (not to remove the whole pulp) and the direct pulp capping can be viewed as similar procedure.

Study :

17 ptns wide range of ages . premolar and molar teeth . Treated with Pulpotomy and MTA.

Success rate is high and No evidence of irreversible pulpitis.

Survival rate was 82% (high :☺)

2 out of 17 ptn only required RCT for pain control.

[Int Endod J.](#) 2013 Jan;46(1):79-87. doi: 10.1111/j.1365-2591.2012.02113.x. Epub 2012 Aug 20.

Should pulp chamber pulpotomy be seen as a permanent treatment? Some preliminary thoughts.

[Simon S¹](#), [Perard M](#), [Zanini M](#), [Smith AJ](#), [Charpentier E](#), [Djole SX](#), [Lumley PJ](#).

Author information

Abstract

AIM:

To investigate the benefits of pulpotomy (to the level of the floor of the pulp chamber) as an endodontic treatment for teeth with vital pulps.

METHODOLOGY:

Seventeen patients, aged 7-54 years (mean of 37.2 year), were treated by pulpotomy and filling with ProRoot MTA(®) in premolar or molar teeth with vital pulps and without clinical evidence of irreversible pulpitis. The patients were then followed up for 12 to 24 months and the teeth then assessed by clinical and radiographic examination. Statistical analysis was performed with Kaplan-Meier survival probability statistics to estimate the survival of the treated teeth.

RESULTS:

At 24 months, the survival rate without any complementary treatment was estimated to be 82%. Two of the 17 treated teeth required root canal treatment for pain control and one for prosthetic reasons.

CONCLUSIONS:

Under the conditions of this study, pulpotomy offered a viable alternative to root canal treatment for teeth with vital pulps in the short term. However, there is insufficient clinical evidence to consider this technique for the treatment of every permanent tooth. Nevertheless, it should be considered as a potential alternative approach to be further developed for future applications.

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Another study which compare Pulpotomy using a calcium mixture cement vs RCT on postoperative pain.

They found that Pulpotomy is more effective in controlling symptoms of irreversible pulpitis

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So pulp exposure during caries excavation > then you have 2 choices DIRECT PULP CAPPING AND DIRRECT RESTORATION. OR RCT AND CAST RESTORATIO.

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Interesting study 😊

- Direct pulp capping is much cheaper
- The main result of the study was
 - DPC RETAINED FOR ALONG PERIOD OF TIME AND LESS COST.
 - BOTH TREATMENT IS SUITABLE TO TREAT PULP EXPOSURE IN ASYPTOMATIC PULPITIS
 - DPC IS EFFECTIVE IN POSTERIOR TEETH AND OCCLUSAL SITE BUT NOT IN ANTERIOR TEETH AND PROXIMAL SITE.

Direct pulp capping after a carious exposure versus root canal treatment: a cost-effectiveness analysis.

[Schwendicke F¹](#), [Stolpe M²](#).

Author information

Abstract

INTRODUCTION:

Excavation of deep caries often leads to pulpal exposure even in teeth with sensible, nonsymptomatic pulps. Although direct pulp capping (DPC) aims to maintain pulpal health, it frequently requires follow-up treatments like root canal treatment (RCT), which could have been performed immediately after the exposure, with possibly improved outcomes. We quantified and compared the long-term cost-effectiveness of both strategies.

METHODS:

A Markov model was constructed following a molar with an occlusally located exposure of a sensible, nonsymptomatic pulp in a 20-year-old male patient over his lifetime. Transition probabilities or hazard functions were estimated based on systematically and nonsystematically assessed literature. Costs were estimated based on German health care, and cost-effectiveness was analyzed using Monte Carlo microsimulations.

RESULTS:

Despite requiring follow-up treatments significantly earlier, teeth treated by DPC were retained for long periods of time (52 years) at significantly reduced lifetime costs (545 vs 701 Euro) compared with teeth treated by RCT. For teeth with proximal instead of occlusal exposures or teeth in patients >50 years of age, this cost-effectiveness ranking was reversed. Although sensitivity analyses found substantial uncertainty regarding the effectiveness of both strategies, DPC was usually found to be less costly than RCT.

CONCLUSIONS:

We found both DPC and RCT suitable to treat exposed vital, nonsymptomatic pulps. DPC was more cost-effective in younger patients and for occlusal exposure sites, whereas RCT was more effective in older patients or teeth with proximal exposures. These findings might change depending on the health care system and underlying literature-based probabilities.

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INDICATION AND CONTRAINDICTION : AS SLIDE

**** large carious teeth >> this what they say ,dr don't know what the large and what is not. Dr do for all carious leasion.**

**** hemorrhage : irreversible pulpitis.**

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How to monitor?

AFTER 4-6 weeks if there is any symptom do RCT.

CHECK PERIAPICAL STATUS OF THE TOOTH

READ Slide

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DR HERE DISCUSS CASE DONE BY HIM .

REMEMBER TO USE RUBBER DAM AS POSSIBLE AS YPU CAN . THIS HELP YOU TO BE IN ASPTIC MANNER AND HELP YOU TO GET A GOOD PROGNOSIS.

Read slides.

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Very useful link .

<http://www.oralhealthgroup.com/features/modern-conservative-approach-to-treat-deep-caries-lesions/>

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نأسف على التقصير في هذا الشيت!