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MDRCBB 30th Anniversary Global Symposium

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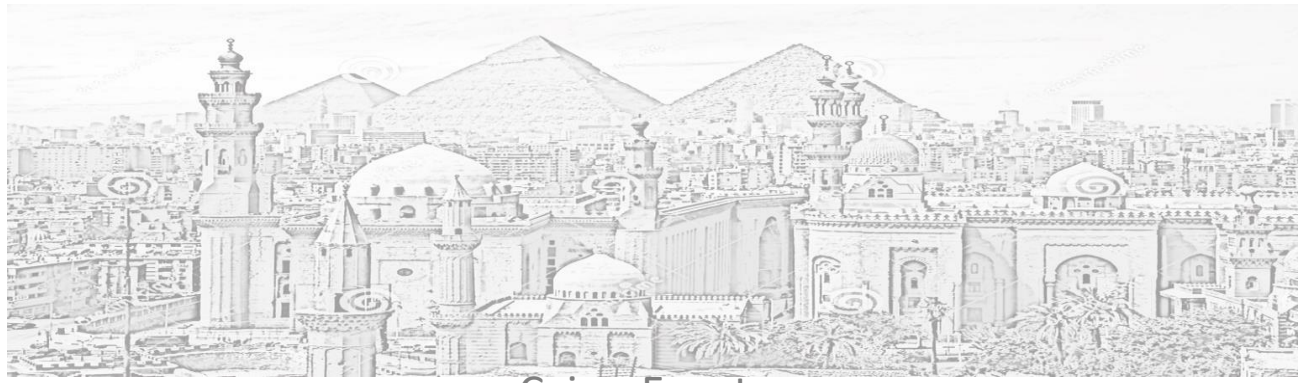
Enamel Remineralization: Assessment using Micro-CT and OCT



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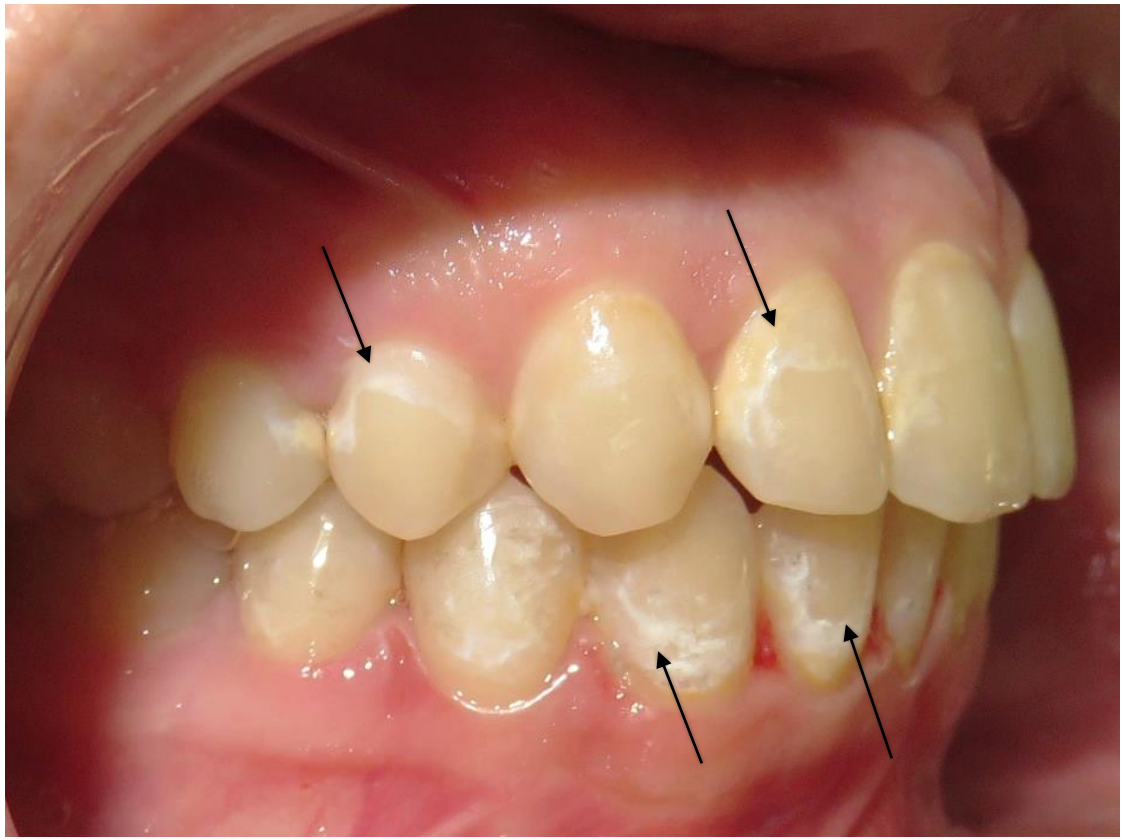
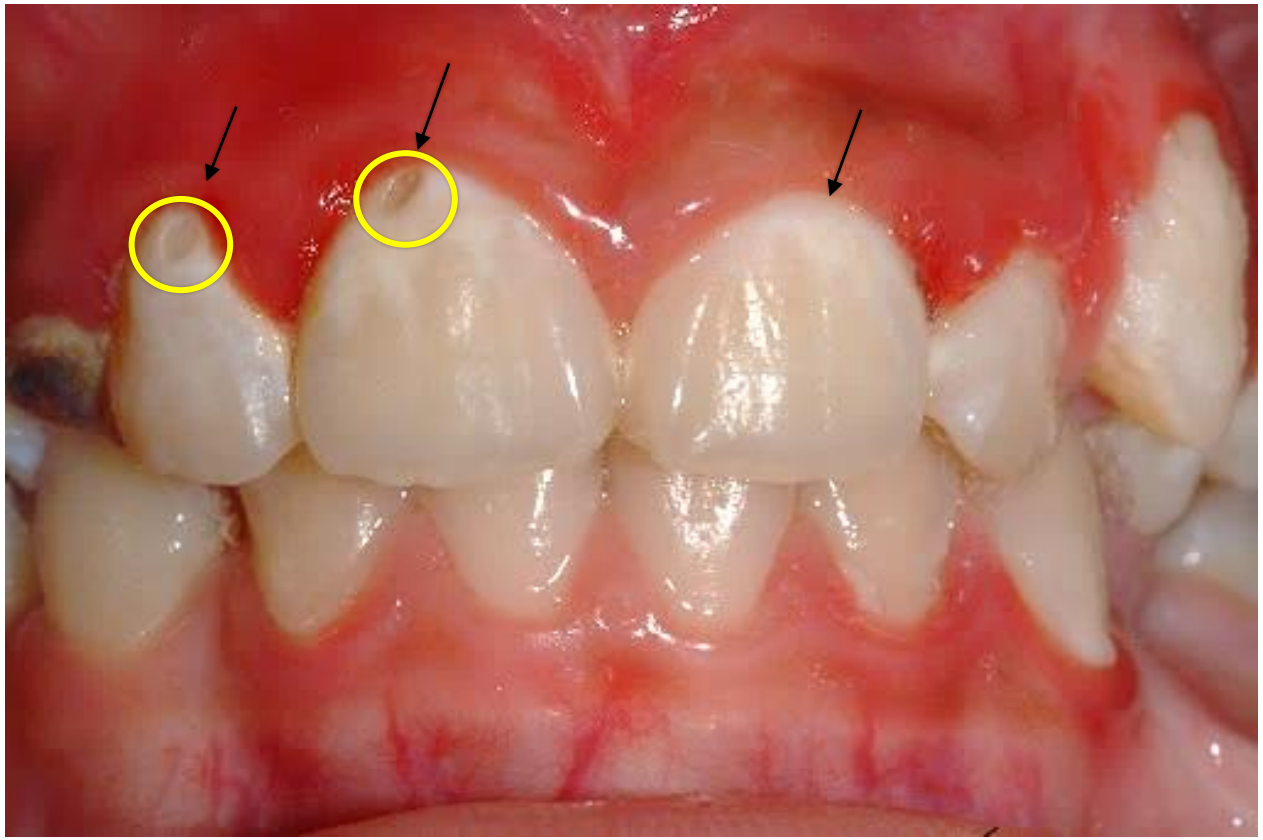
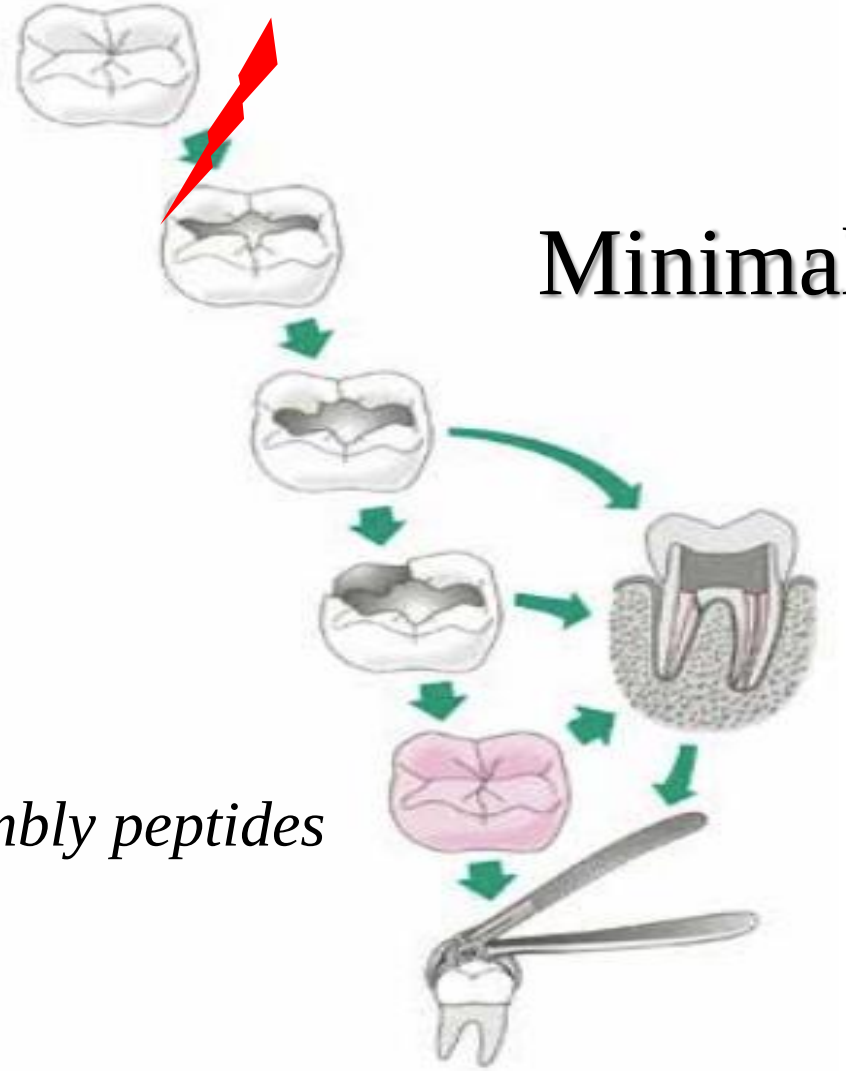




The Tooth Restorative Cycle



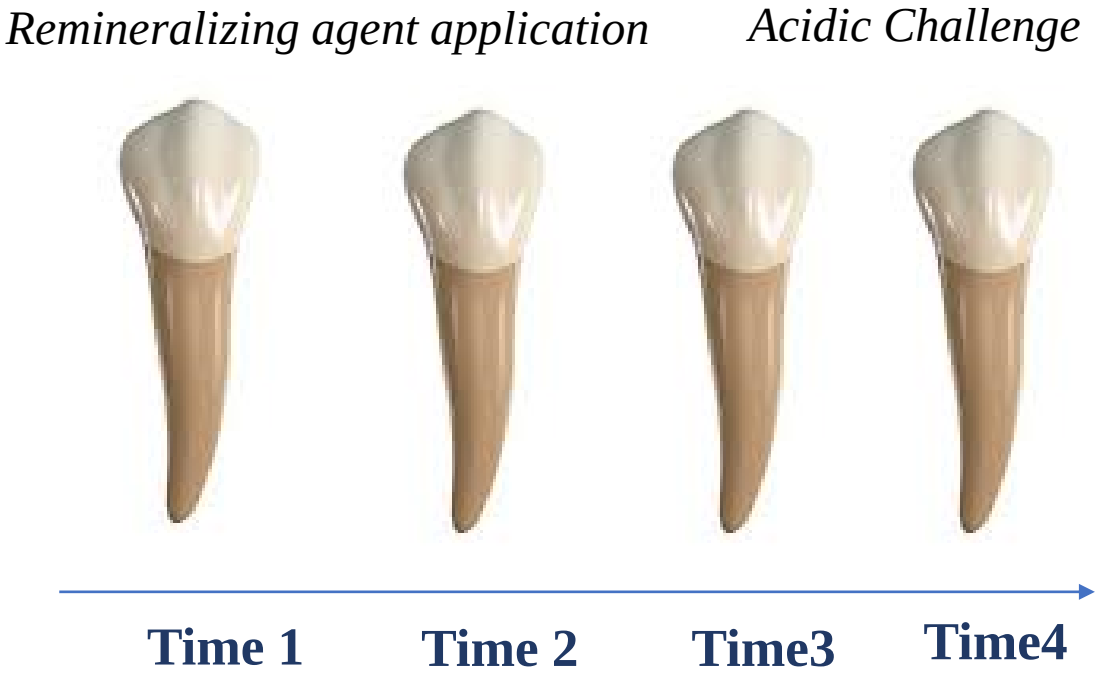
Minimal intervention

- *Fluoride Based*
- *Calcium phosphate system*
- *Biomimetic Approach, Self assembly peptides*
- *Herbal products*

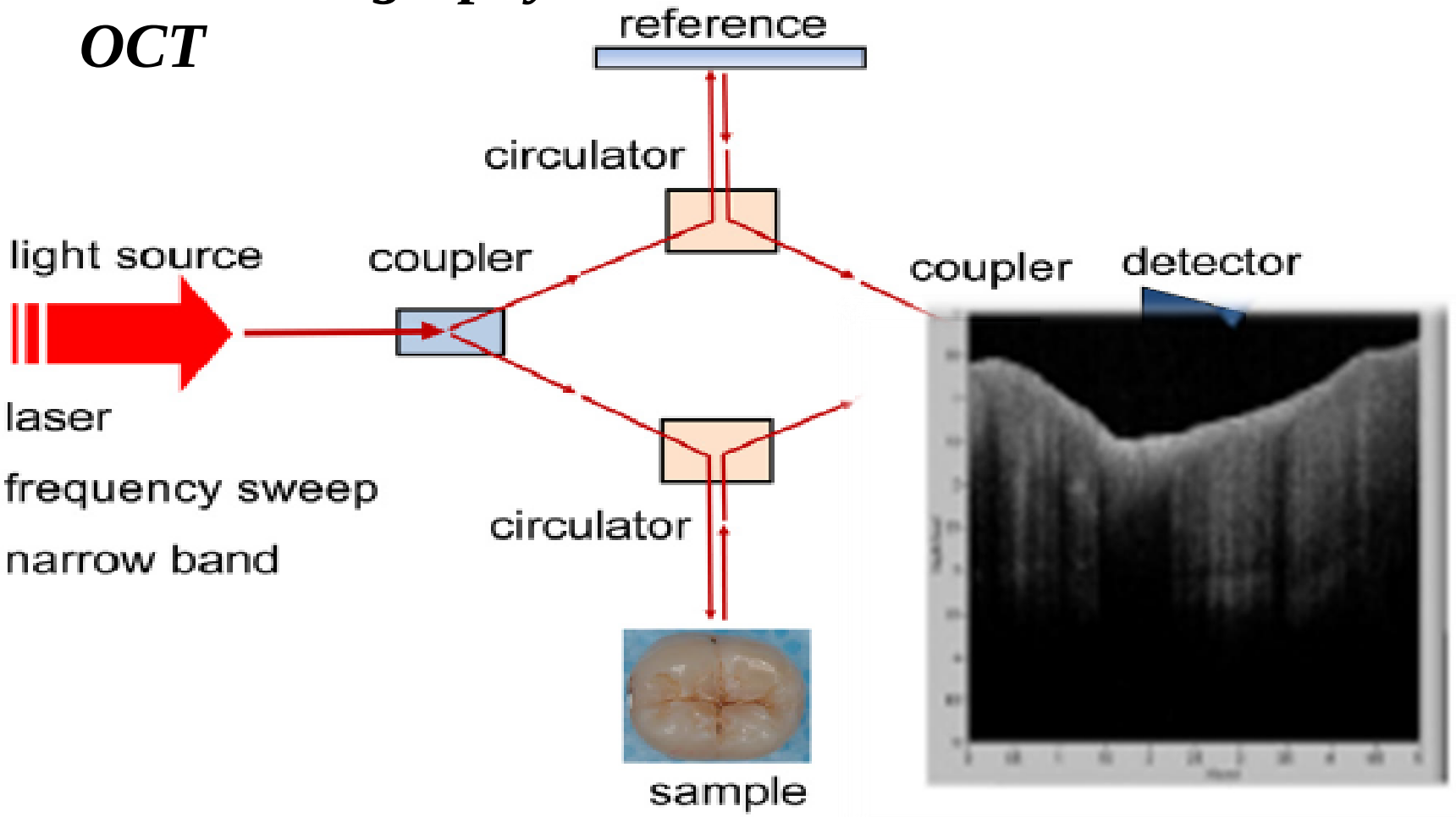
NON-Destructive techniques

Optical Coherence Tomography
OCT

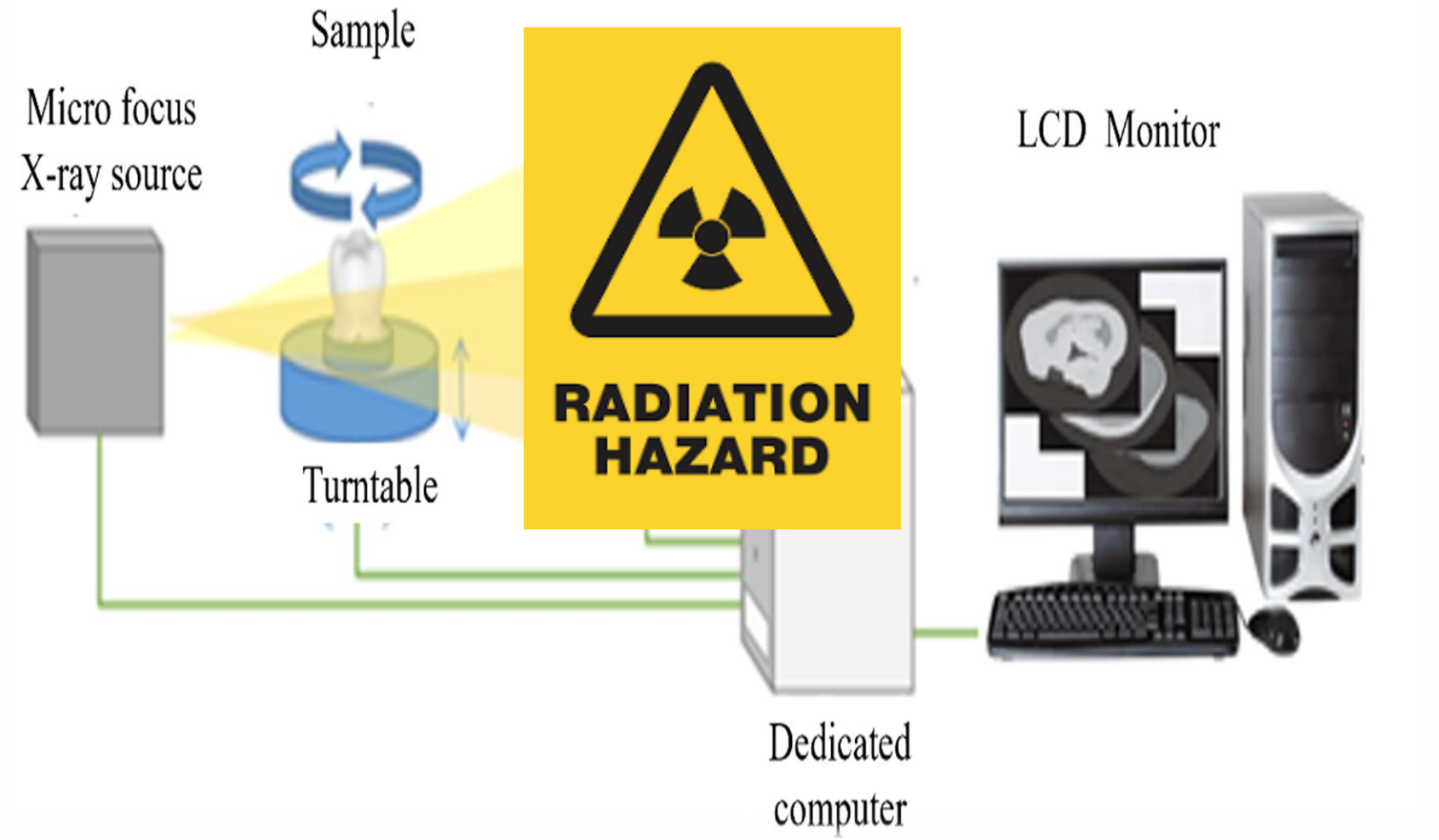
Micro-Computed Tomography
Micro-CT

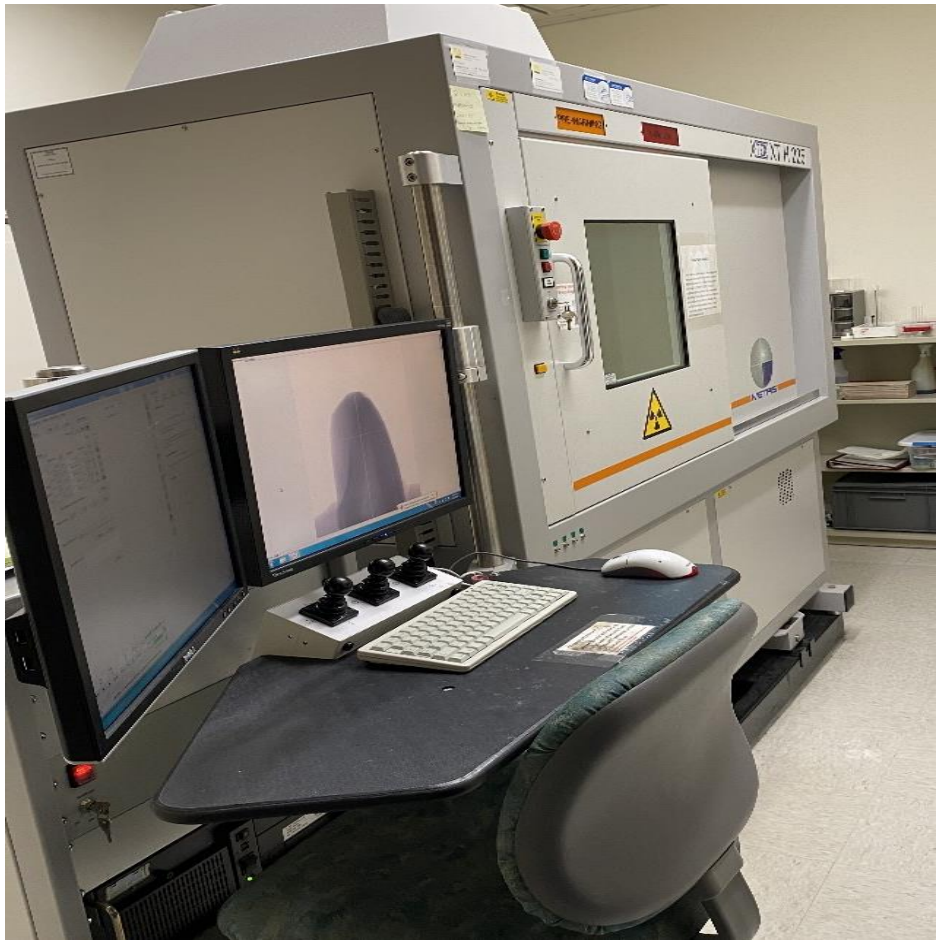


Optical Coherence Tomography
OCT

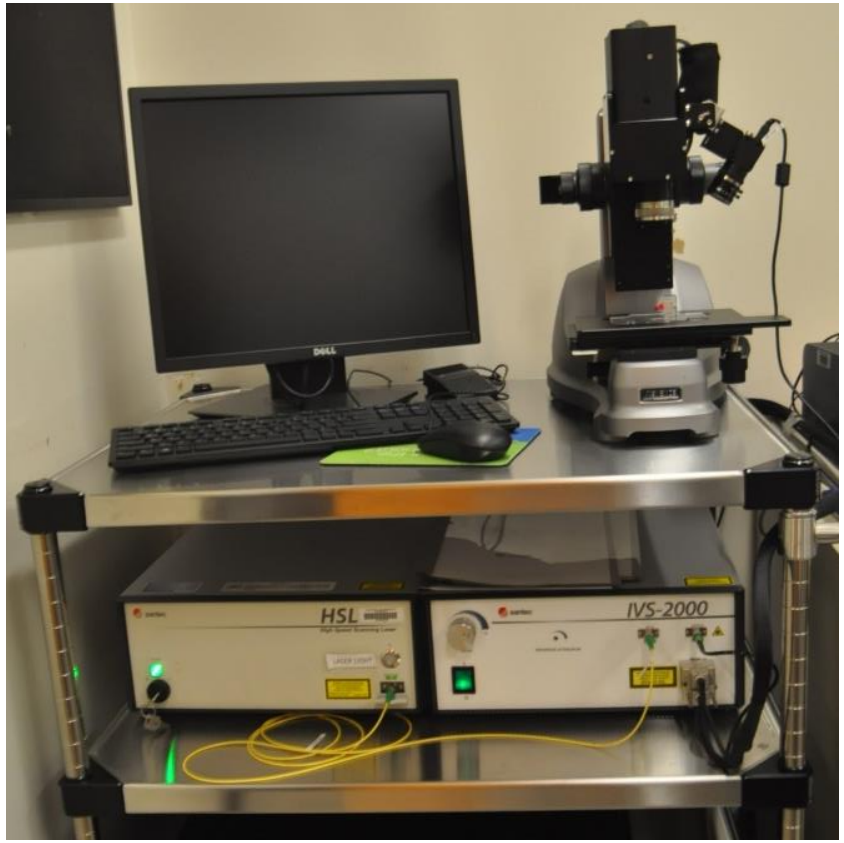


Micro-Computed Tomography
Micro-CT





Micro-Computed Tomography

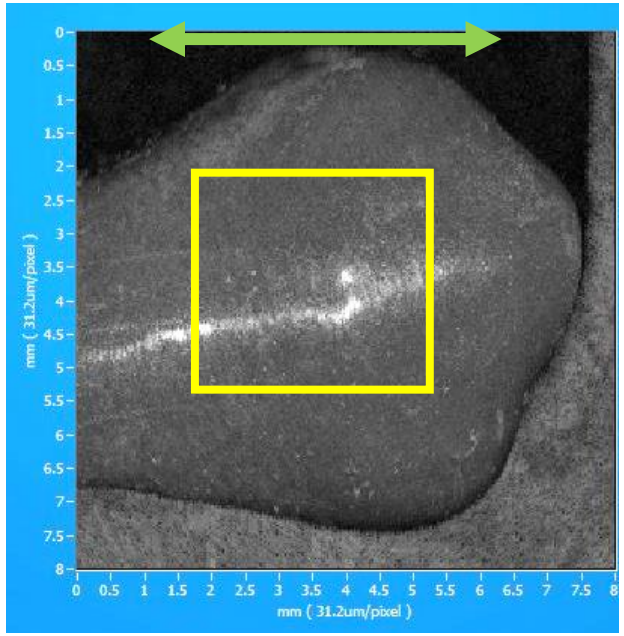


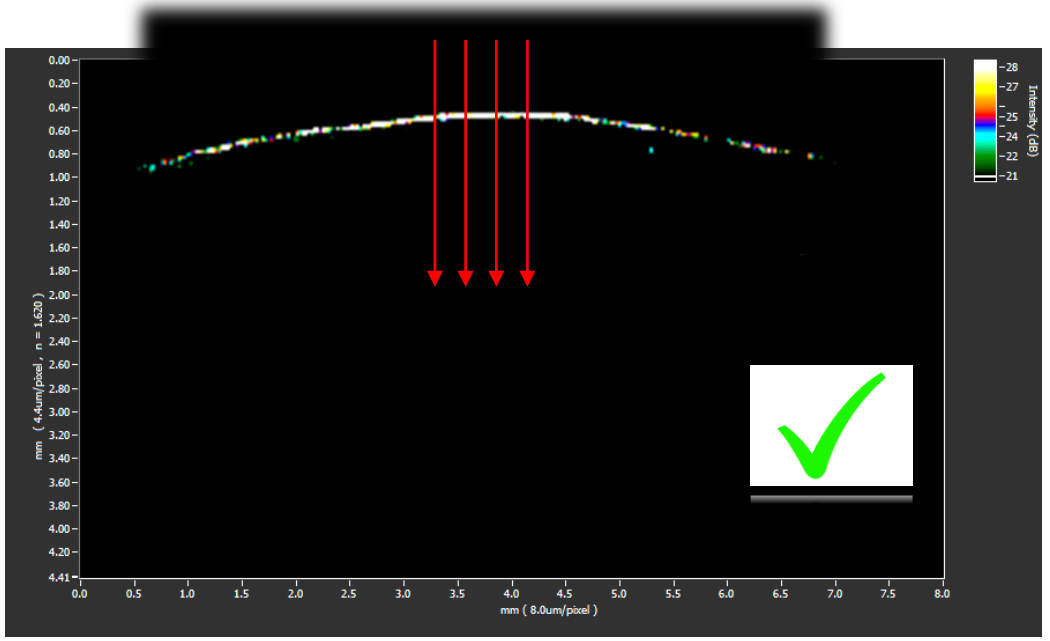
Optical Coherence Tomography

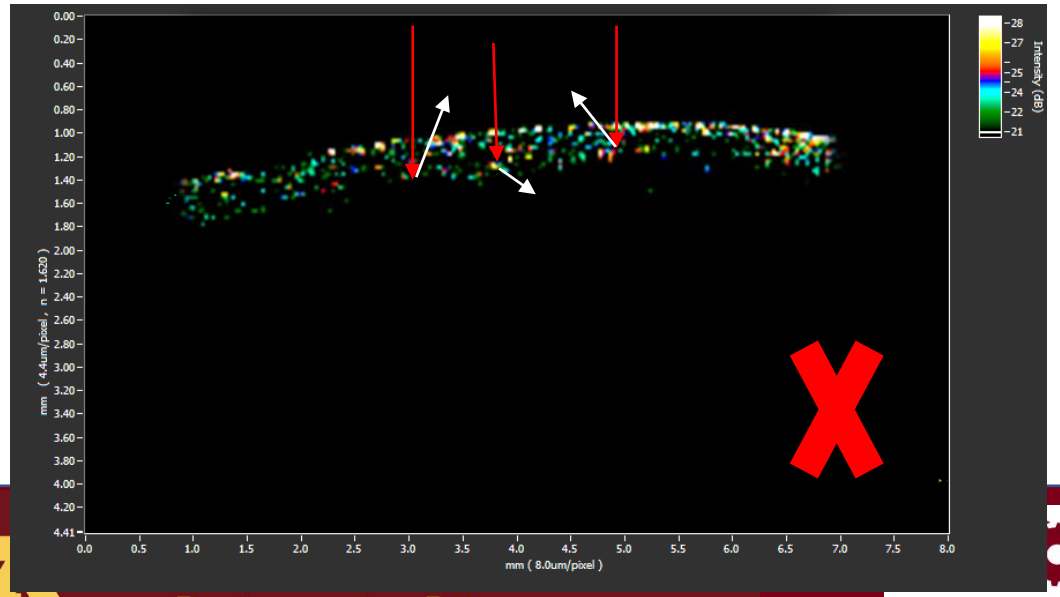
Experiment work Flow

1-Samples Screening

Preview

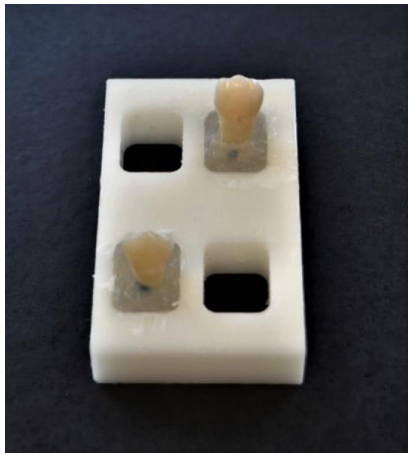


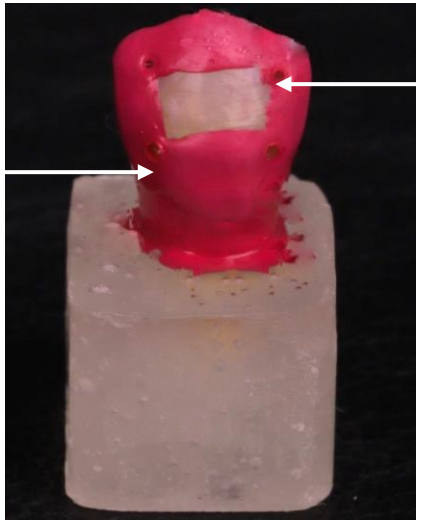




2-Samples Preparation

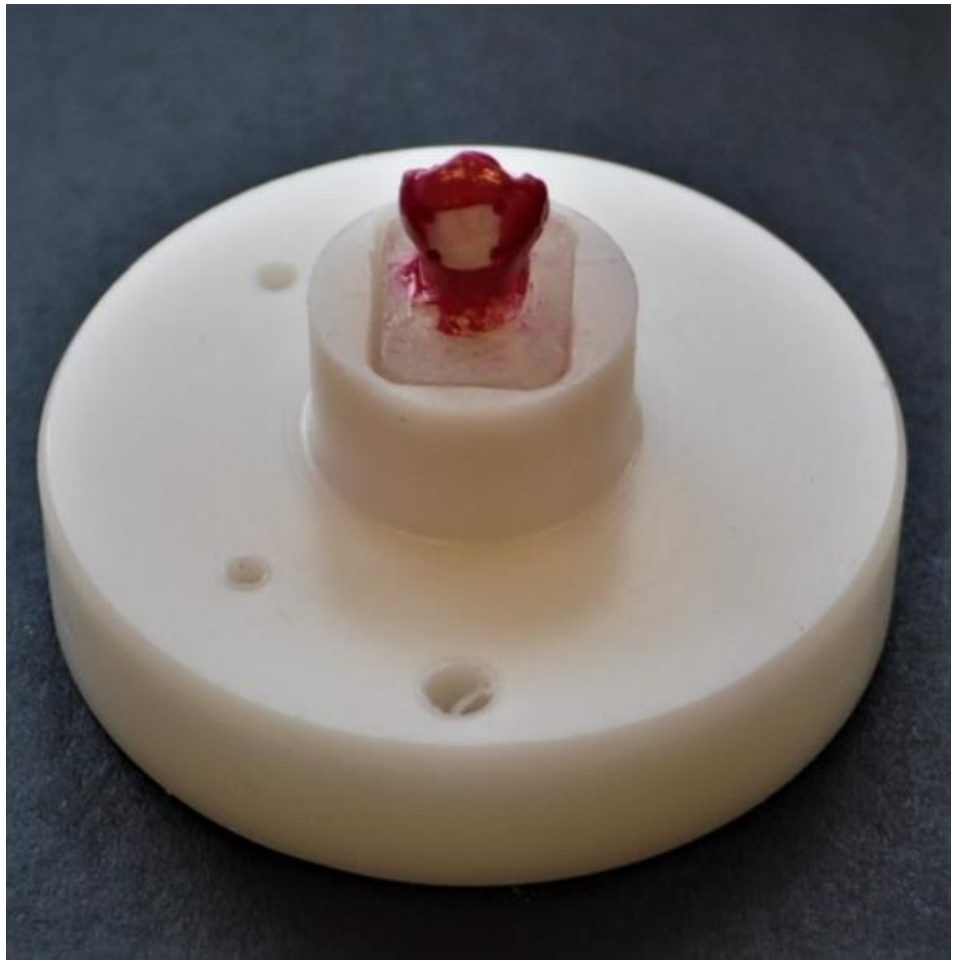
Sample Cutting

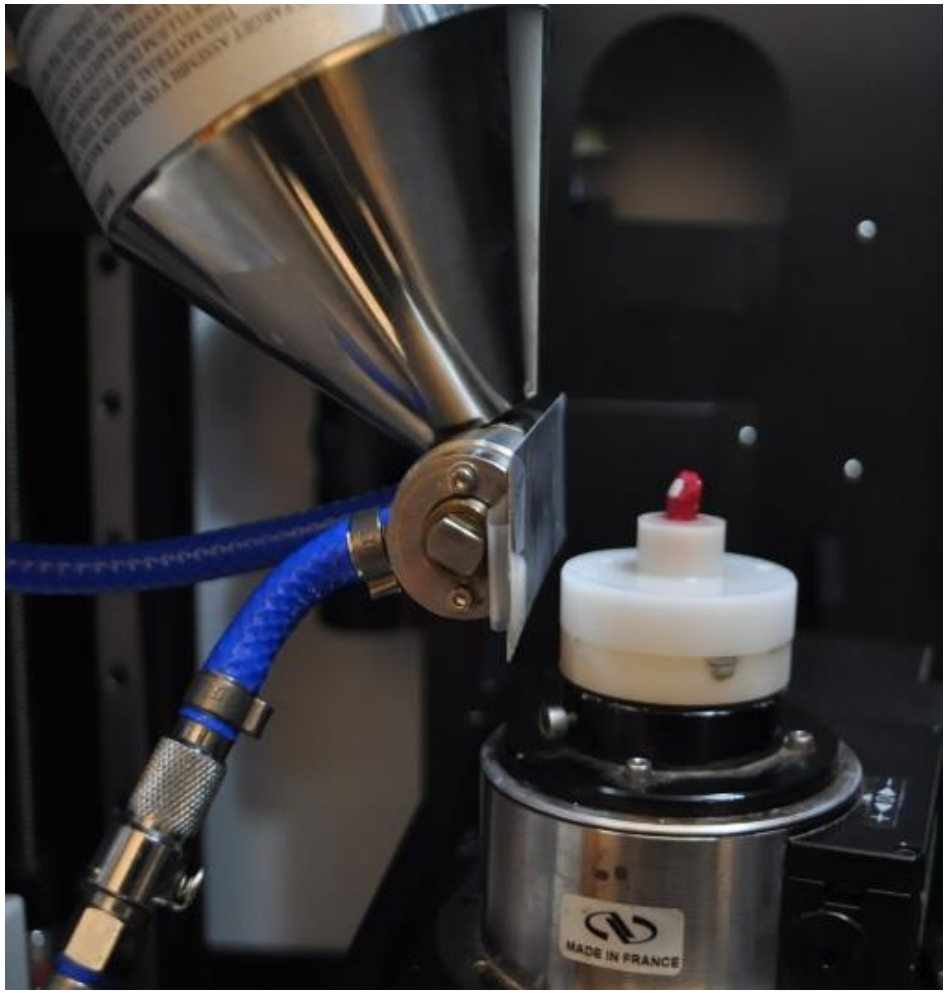




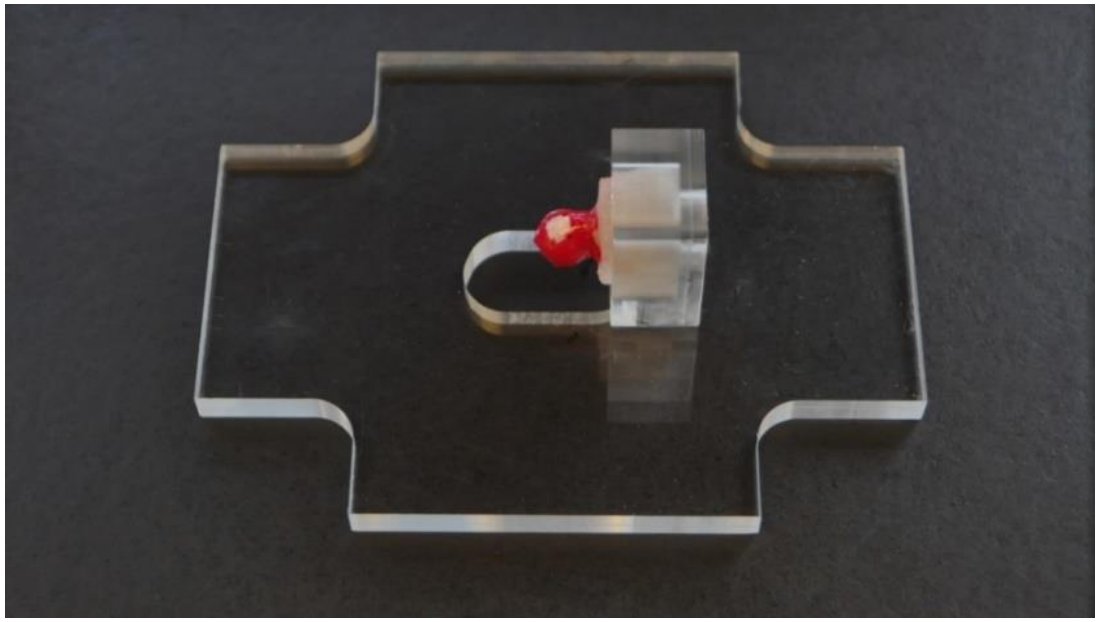
Sample Mounting

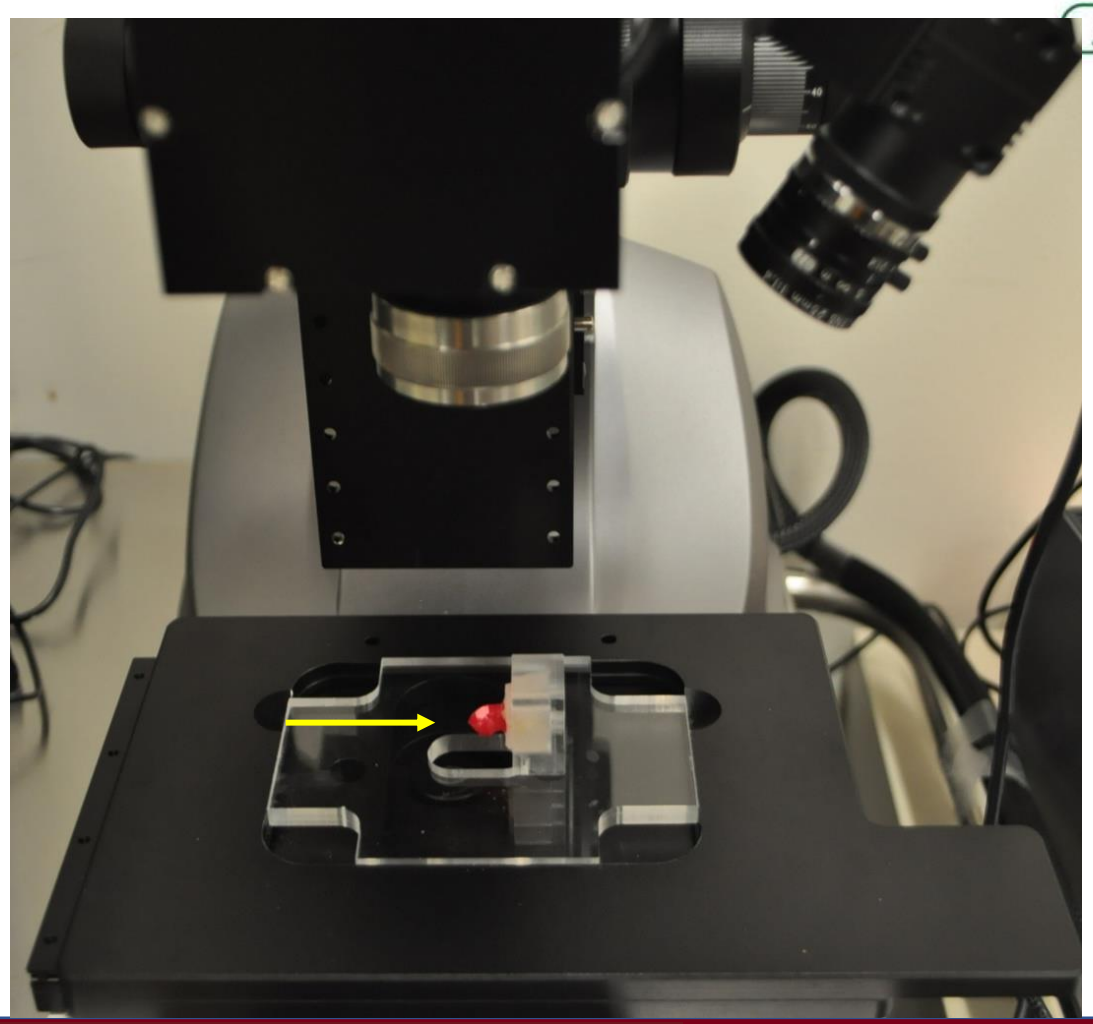
Sample position in the Micro-Ct chamber

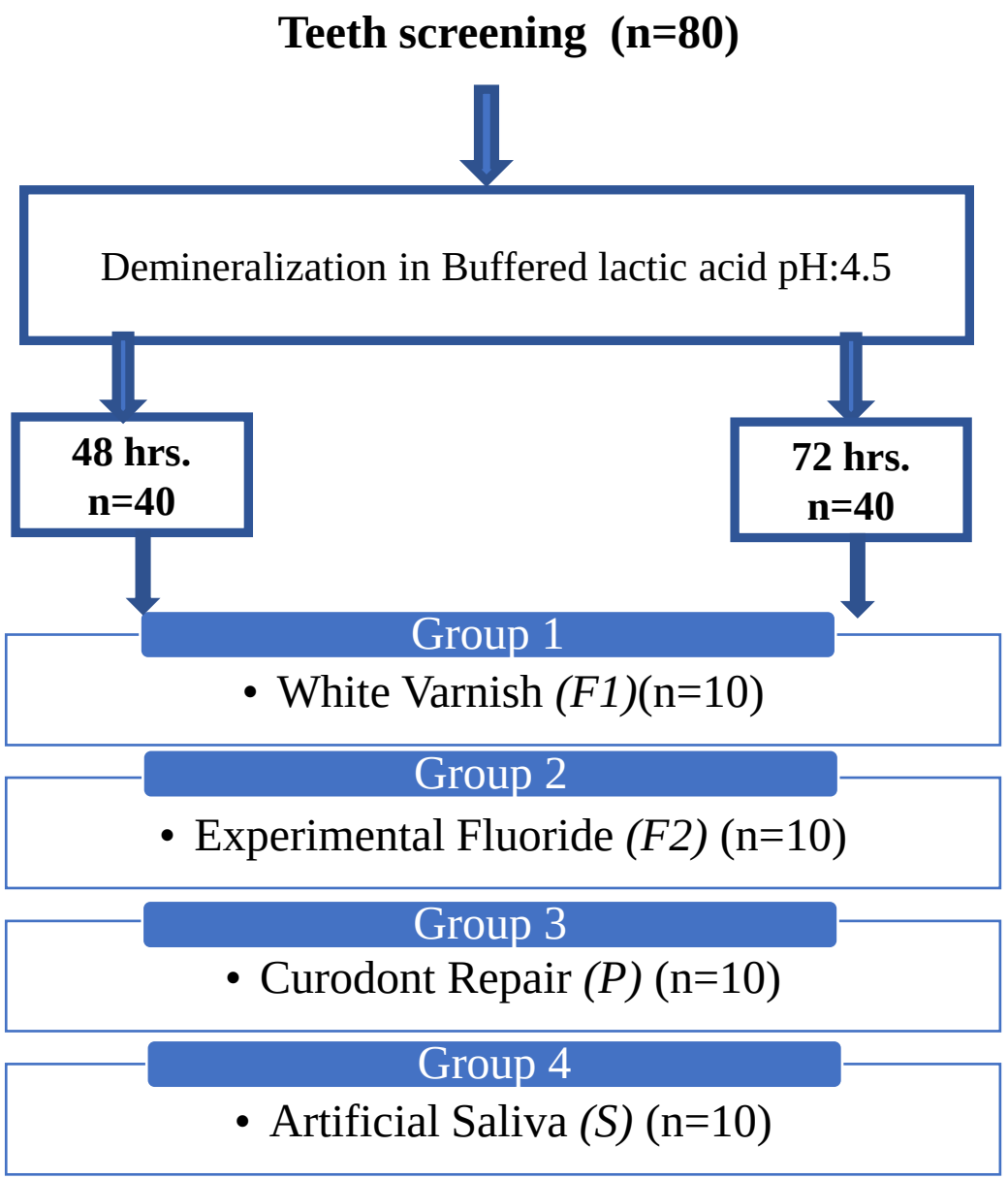




Sample position in on the OCT stage

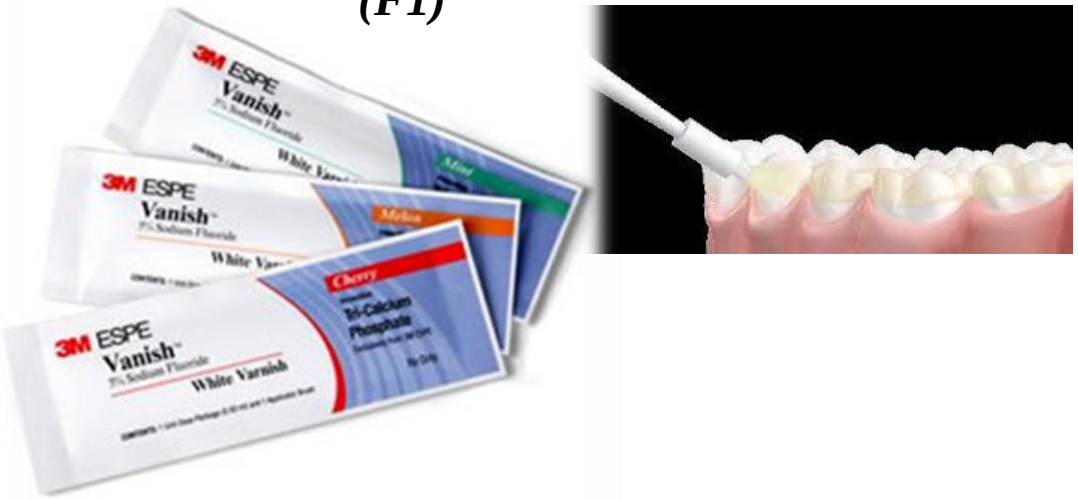





Teeth screening (n=80)
Demineralization in Buffered lactic acid pH:4.5
48 hrs.
n=40
72 hrs.
n=40
Group 1
• White Varnish (F1)(n=10)
Group 2
• Experimental Fluoride (F2) (n=10)
Group 3
• Curodont Repair (P) (n=10)
Group 4
• Artificial Saliva (S) (n=10)

Remineralizing agents

Vanish™ 5% Sodium Fluoride White Varnish. (F1)



Experimental Fluoride coating (F2)

Curodont™ Repair Fluoride Plus (P)

Artificial Saliva (S)

Macknight-Hane & Whitford (1992).

5-pH Cycling

Application of remineralizing agent

24hrs. storage in Artificial saliva

↓

OCT scan (24hrs.)

6 pH-Cycles

↓

Micro-Ct & OCT scan (6th C)

3 pH-Cycles

↓

OCT scan (9thC)

3 pH-Cycles

↓

Micro-Ct & OCT scan (12th C)

3hrs. Acid Challenge

↓

Micro-Ct & OCT scan (DMII)

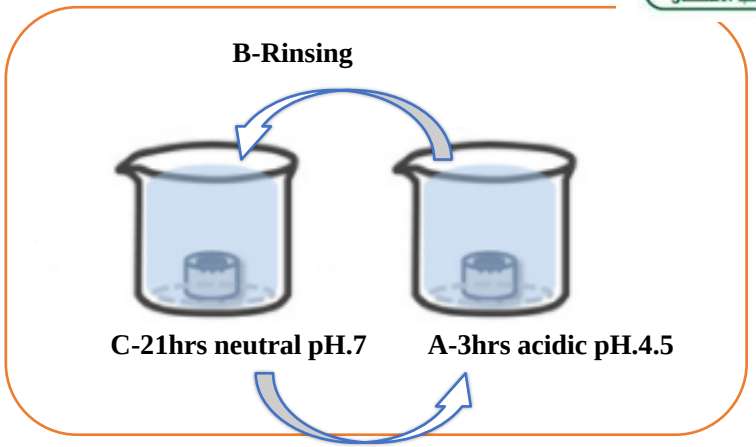
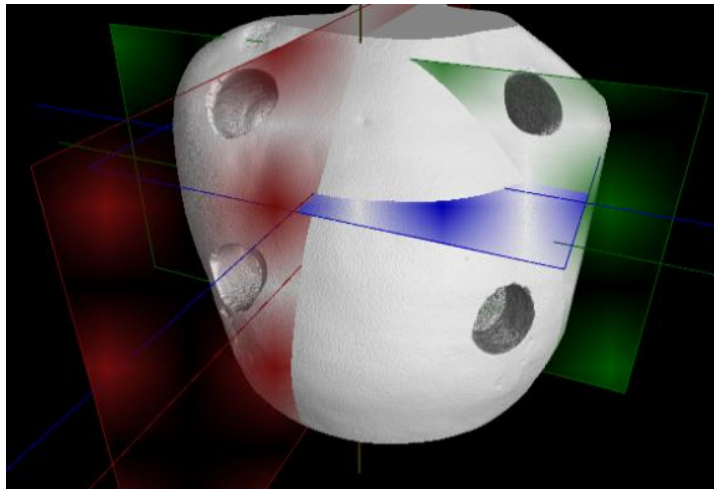
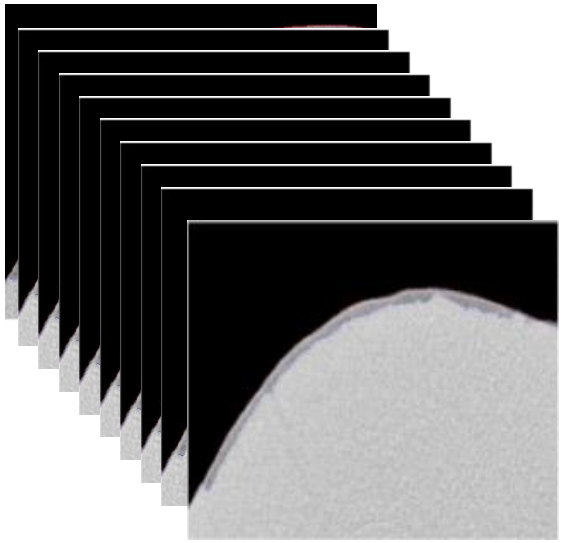


Image Processing and Analysis

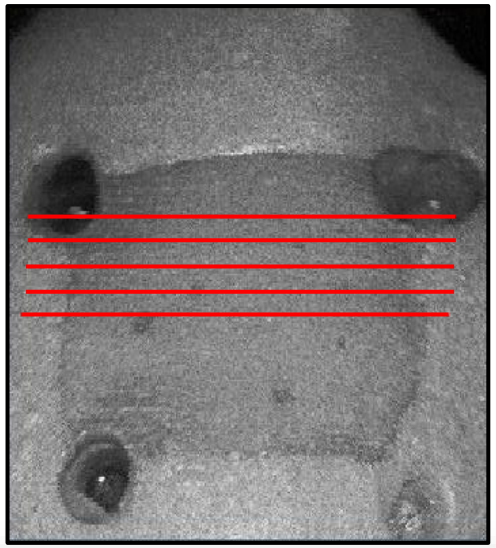
Micro-Ct

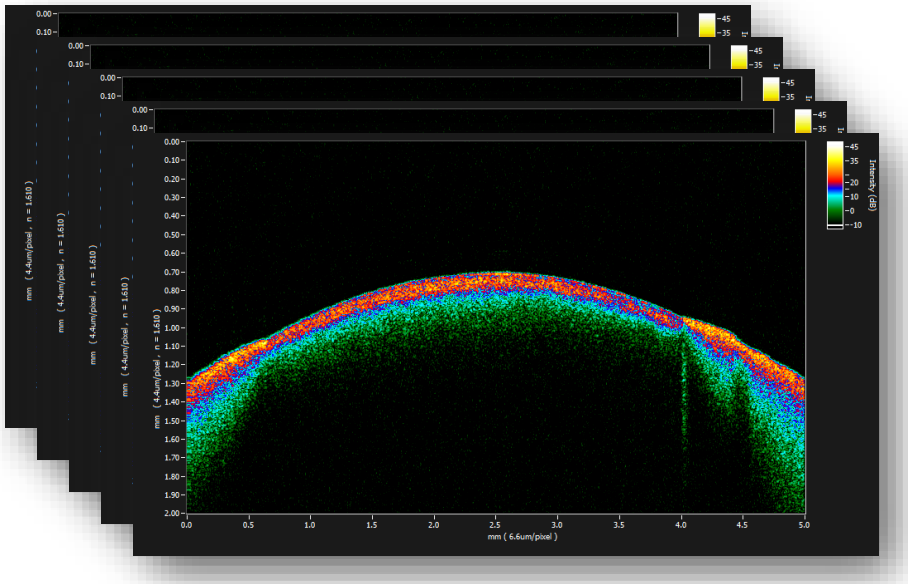




10 X 5 = 50 frames /Sample

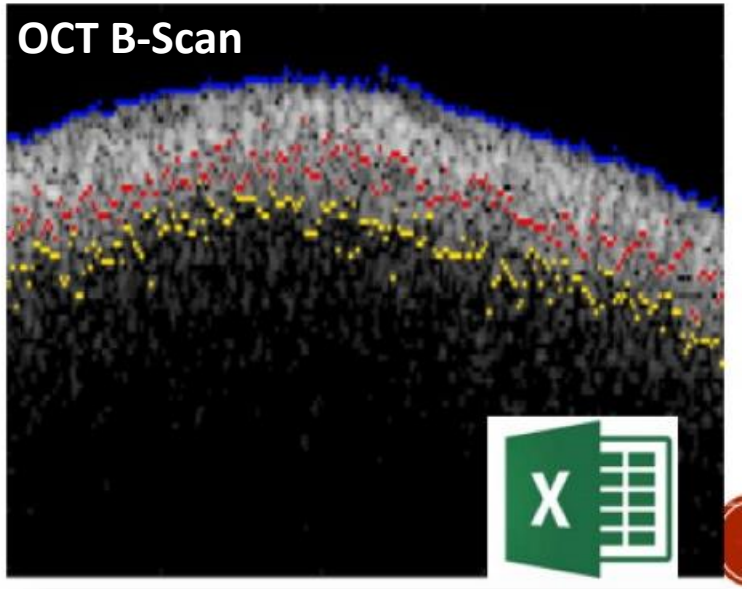
OCT





5X 7 = 35 frames /Sample

Data Computation and Values Exportation



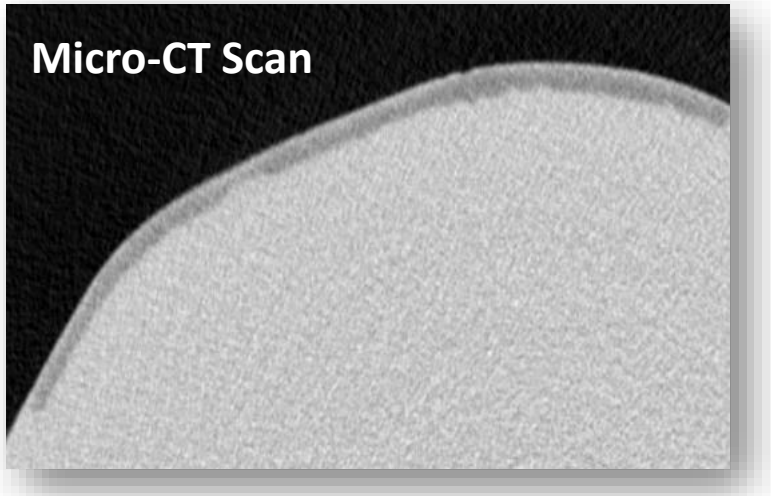


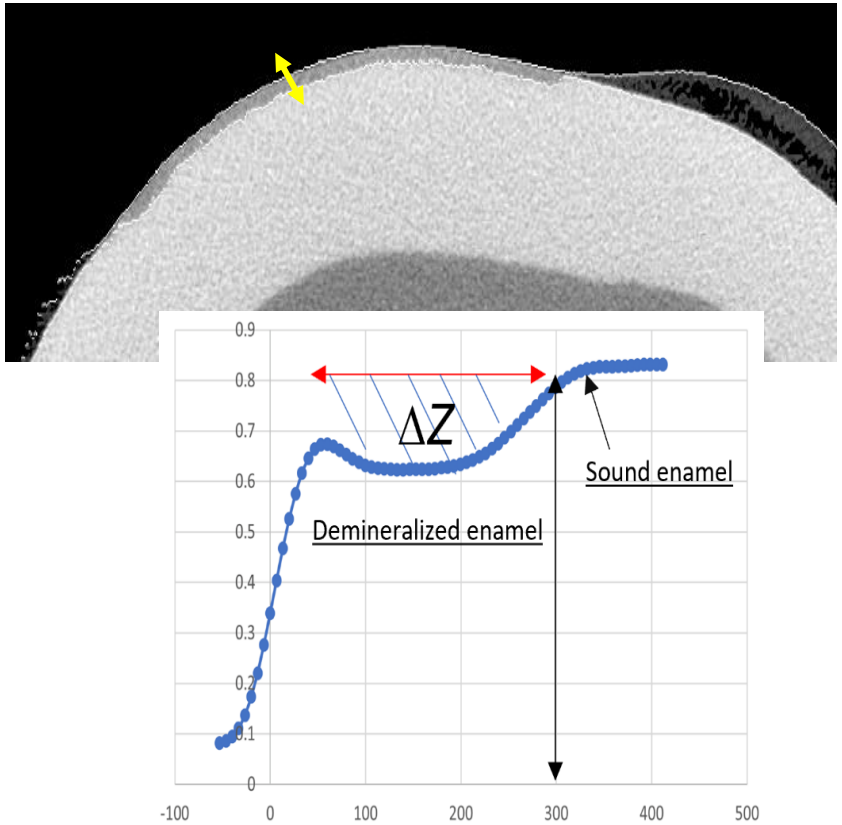
Image processing with Coding

MATLAB

Outcome measures to be evaluated in this study:

Micro-CT

Lesion Depth (LD_{MCT})

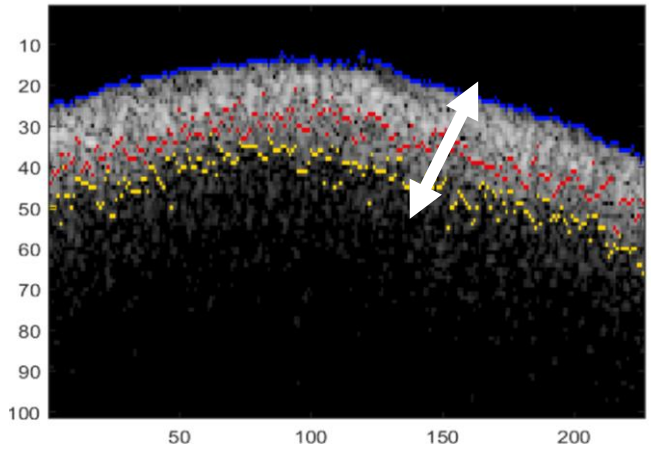


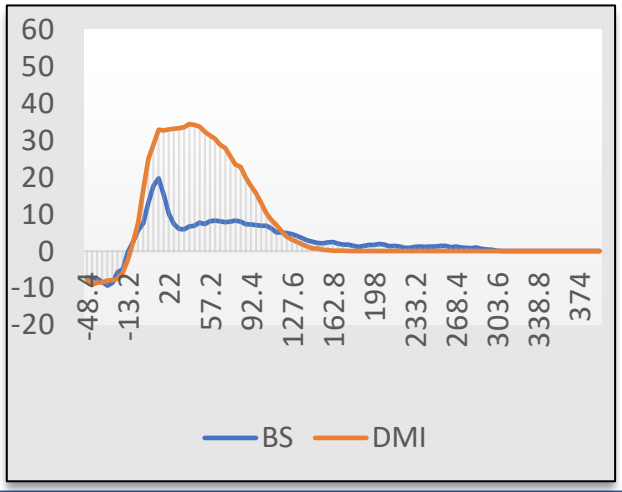
Mean mineral density , represented by ΔZ ;
Mineral density increase as ΔZ decrease

Outcome measures to be evaluated in this study:

OCT

Interprismatic demineralization (***IPD$_{OCT}$***)



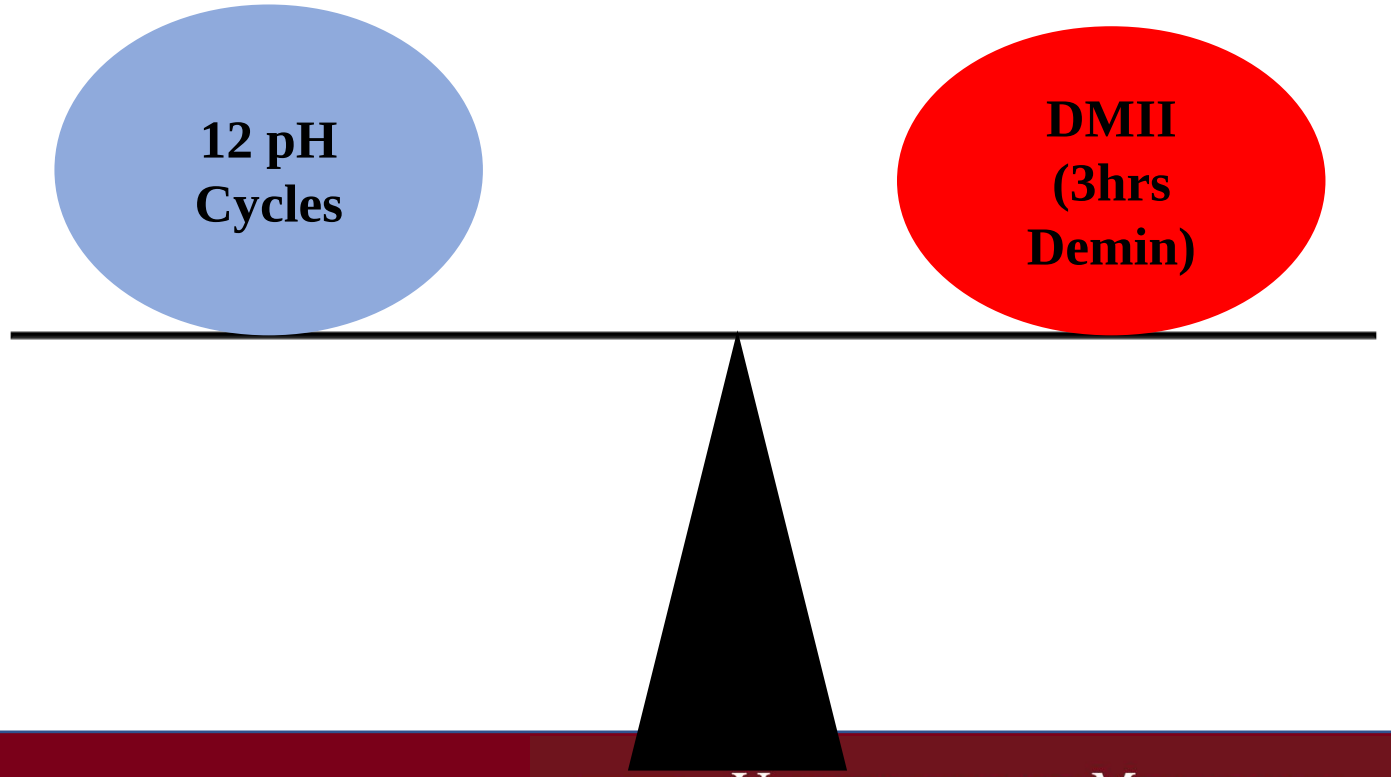


Mean lesion porosity represented by Integrated reflectivity (IR) Mean lesion porosity increase as IR increase

Effect of the presence of hyper-mineralized surface layer

	$LD_{\_MCT}$ Reduction (%)	ΔZ Reduction (%)	IPD Reduction (%)	$IR_{20\text{-}100}$ Reduction (%)
	48 VS 72	48 VS 72	48 VS 72	48 VS 72
Artificial Saliva (*S*)	X	X	√	X
White Varnish (F1)	√	X	X	X
Experimental fluoride (F2)	X	X	X	X
Curodont (*P*)	X	√	√	X

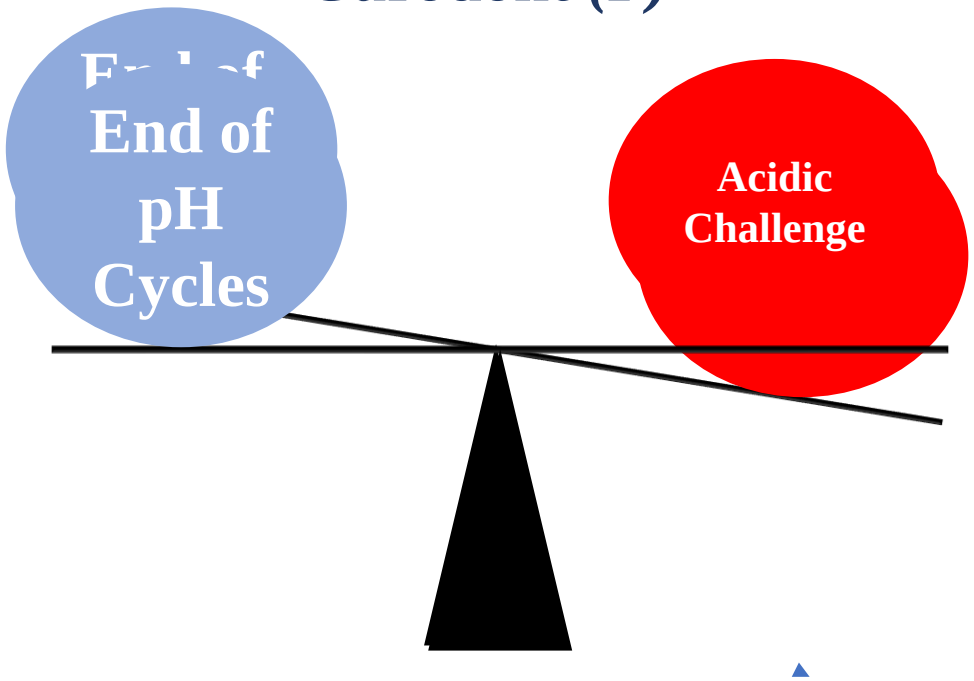
Assessment of demineralization resistance to acidic challenge



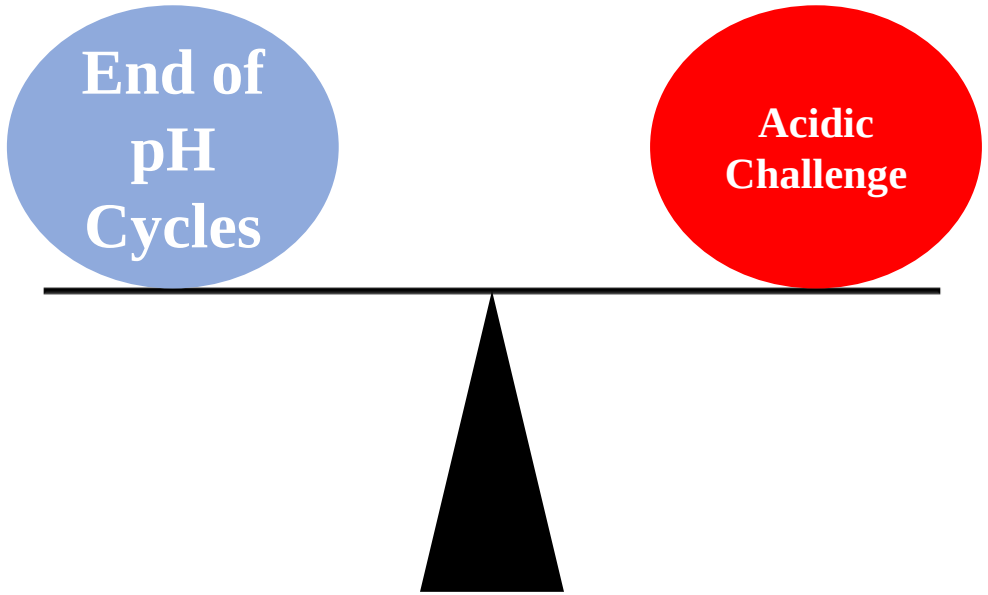
Artificial saliva *(S)*

White Varnish (*F1*)

Curodont *(P)*



Experimental Fluoride *(F2)*

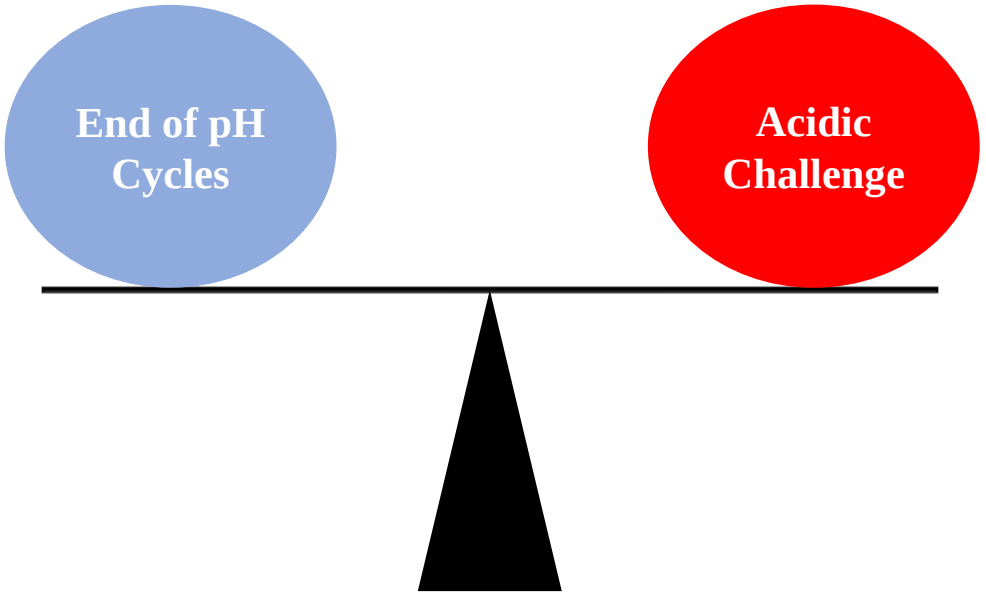


Artificial saliva *(S)*

White Varnish (*F1*)

Experimental Fluoride *(F2)*

Curodont *(P)*



Conclusions

1. ***The hyper mineralized surface layer on the white spot lesion influences the efficacy of remineralizing agents with different degrees.***

2. ***There is a direct correlation between OCT and Micro-Ct in white spot lesions detection.***

OCT helps in the qualitative assessment of mineralized enamel surface, and differentiation between active and inactive lesions.

3. ***Both self-assembly peptide and low fluoride content-based agents have deeper and faster penetration to the body of the lesion. than the high fluoride content-based agent.***


Thank You