ADVANCES IN DENTAL RESEARCH WITH OOF

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Overview

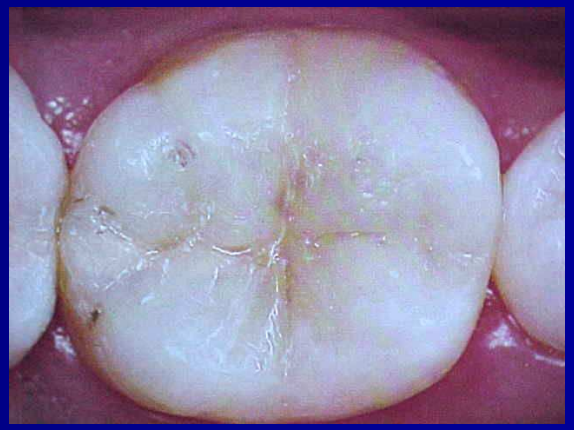
- Finite element analysis has been utilized in Dentstry for many years
- 1,086 papers at this moment (www.scirus.com)

- But the same problem:

The modeling...

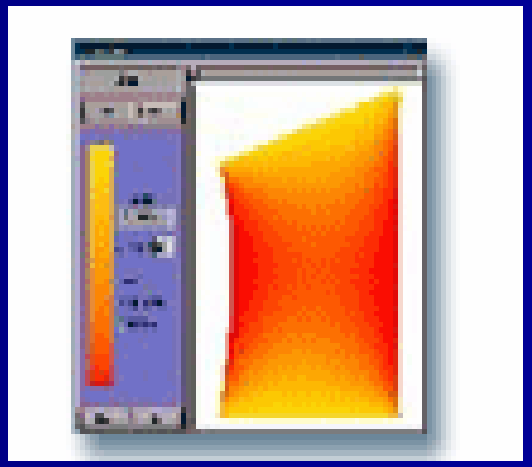
Nature: 10

Humain: 5



OOF: advantages

- Real image analysis
- Easy to use
- News perspectives to study



www.ctcms.nist.gov/oof

OOF: disadvantages

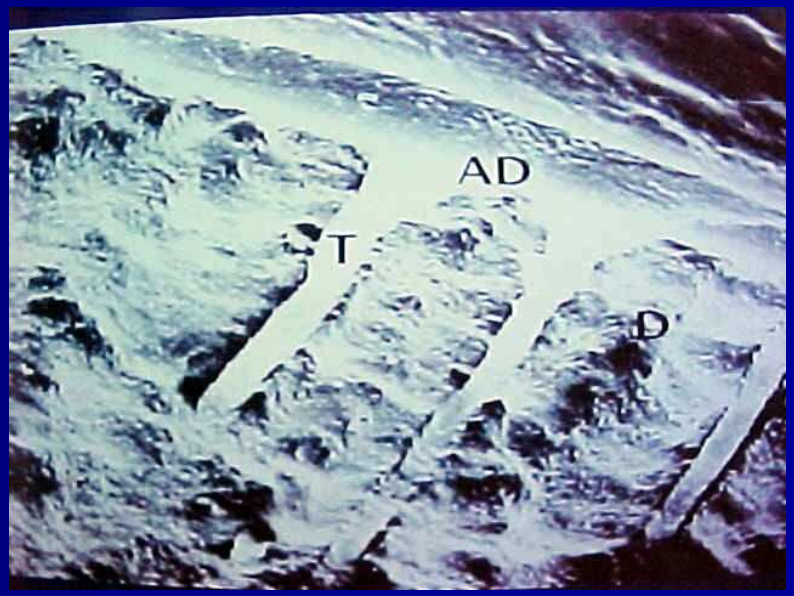
- Are there??

OOF in Dentstry:
Past, Present & Future

The “Past”

- Study of Hybrid Layer

(but... What´s “hybrid layer”?)



Understanding the hybrid layer

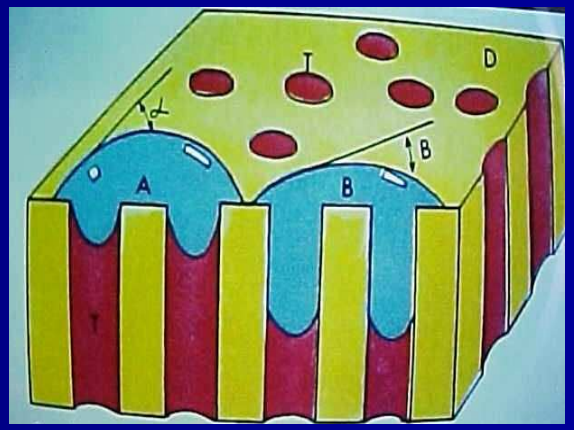
- Sequence of dental restoration:

Clinical case:

Fracture of incisors

- To conclude this case, the teeth was etched with 35% phosphoric acid for 15 s, rinsed with tap water for 15 s and the incisors was slightly air-dried for 5 s.
- So, we have a teeth with many porous (by SEM)

- A fluid resin called “adhesive” is aplicaded on the teeth, and the adhesive will invaded the porous of the teeth



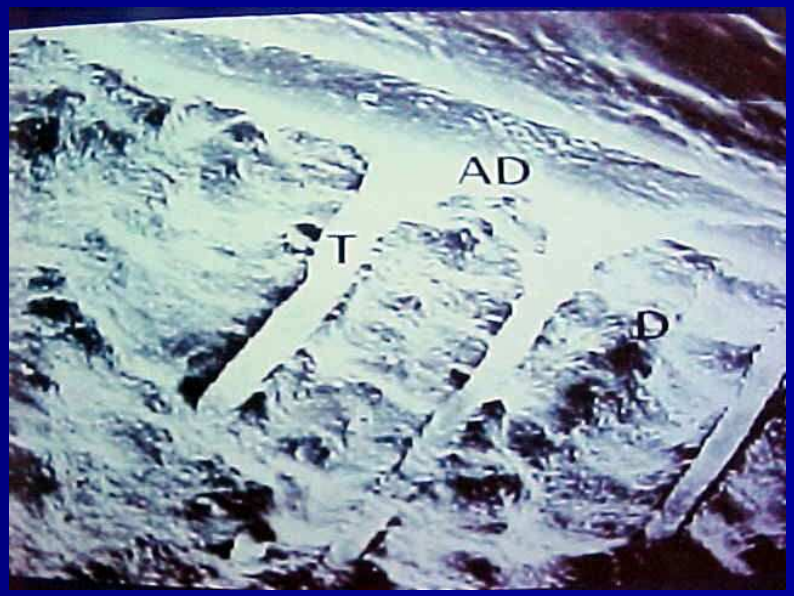
- With the light-curing unit, the adhesive will be cured by 30 – 40 seconds

- Now, we have the hybrid layer, the most important step on the aesthetic dental restoration

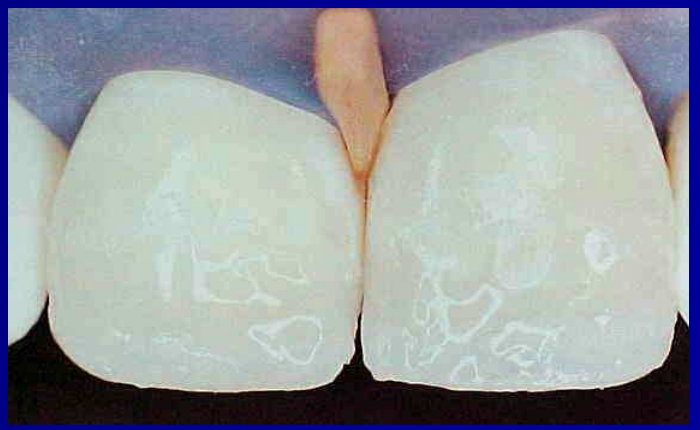
(AD = adhesive

T = dentin tubulal

D = dentin)



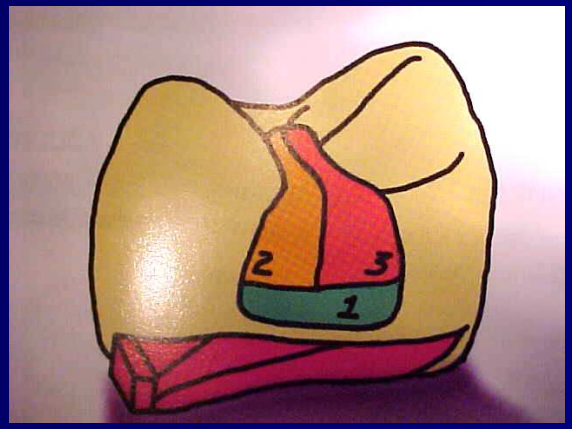
Then the dental restoration can be concluded...

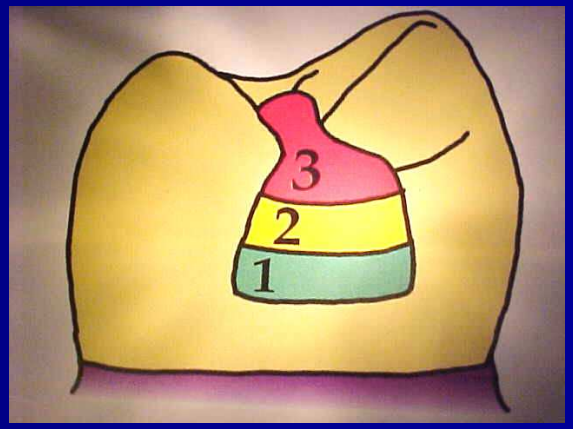


(All these steps don´t be so simple, of course)

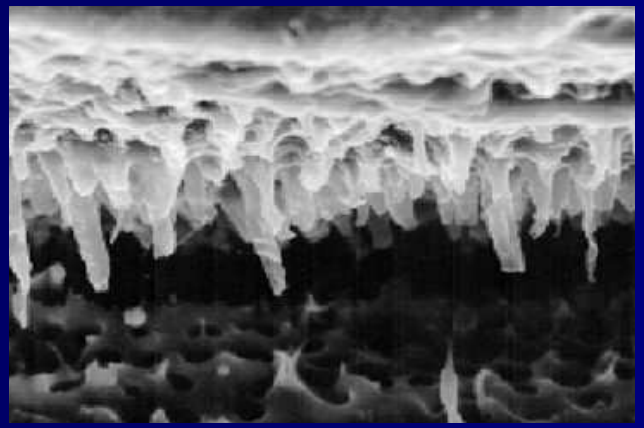
Ok, but there are different light-curing units...

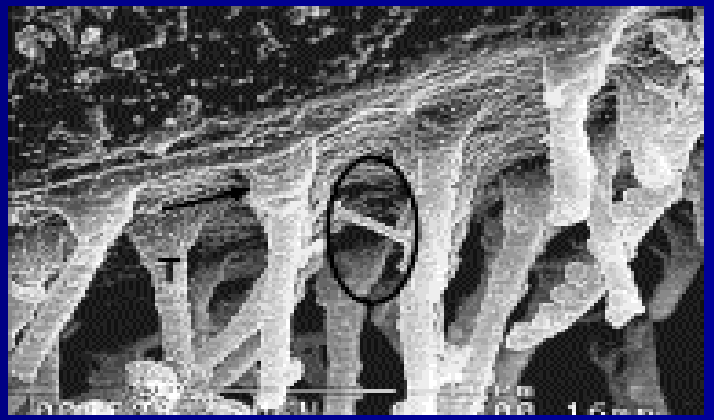
... and different techniques of restoration.....



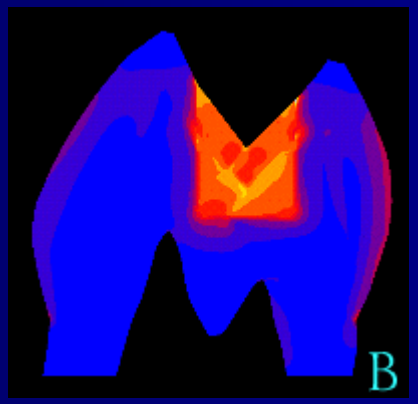


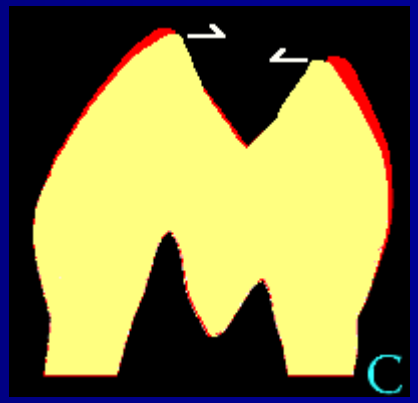
... and, to finish, there are different hybrid layers obtained with different adhesives...

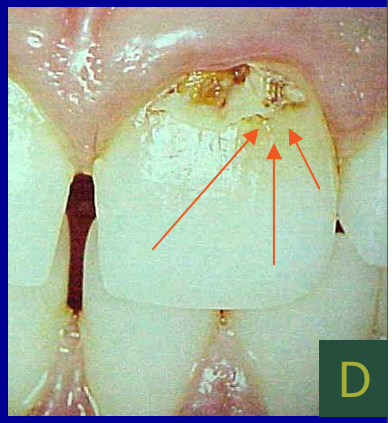




Because of this, the strong internal stress (A,B) can make a deflection of dental structures (C) and the marginal integrity of the restoration will be failure in a short time (D)

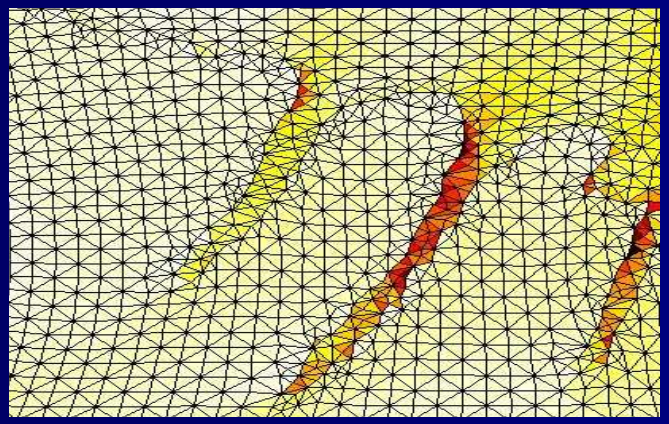






Versluis, A; Tantbirojn, D; Douglas, WH. *Do dental composites always shrink toward the light?* **Journal of Dental Research**, 77: 1435-1445, 1998.

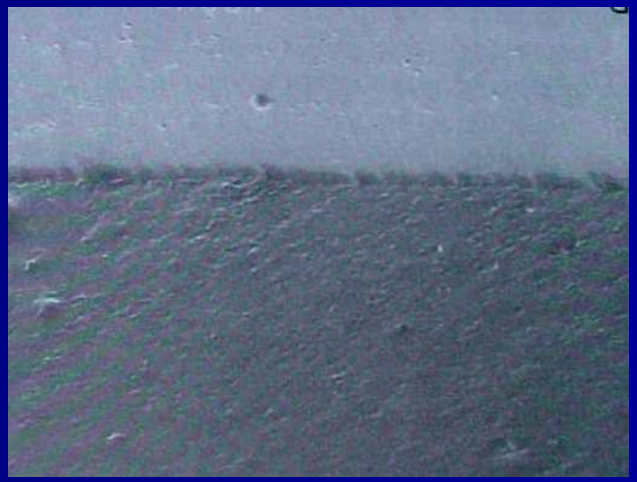
With OOF, we study the stress of different hybrid layers in mechanical tests, and we make a clinical study (2 years, April, 2005- April, 2007, 31 patients, 58 teeth), and we will compare the results obtained with OOF and the clinical performance of the dental restorations. The partial results (6 months and 1 year) showed a fantastic relation of stress level and clinical performance.



The “present”

- Study of interface of total ceramic dental prothesis

(Again... What is this?)

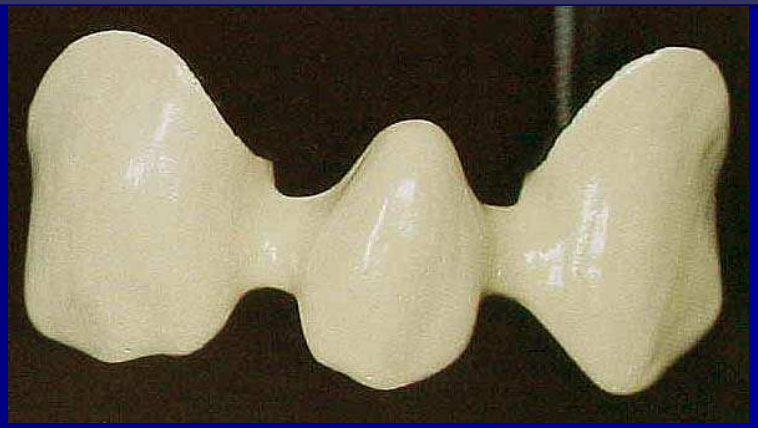


Example

- Tradicional metal-ceramics prothesis has been changed for total ceramic restorations

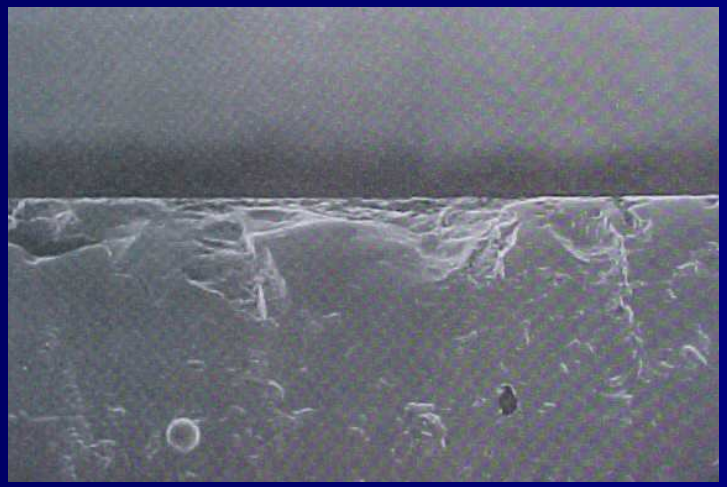
- Zirconia, alumina-zirconia and alumina based ceramics retired the metal of dental prothesis in the “new” Dentstry
- The feldspatic porcelain (called veneer porcelain) is the same of the metal-ceramic prothesis

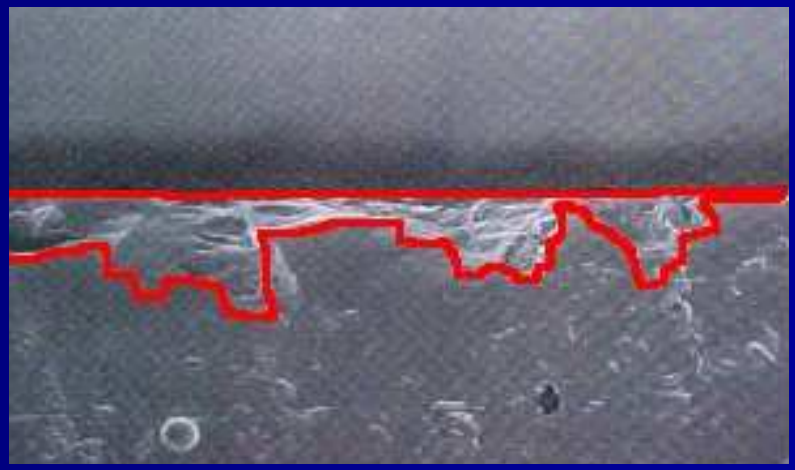
Zirconia (core porcelain)



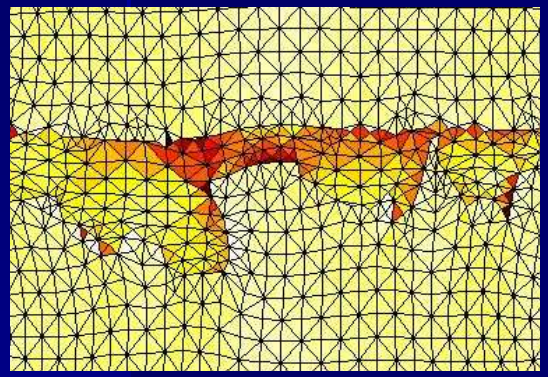
Feldpatic porcelain (veneer porcelain)

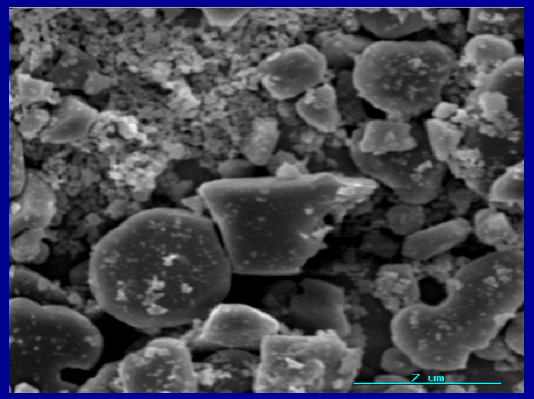
- But the new interface veneer-porcelain & core-porcelain is very critical (failures)





- With OOF, we study this interface and we have now more information about this. So, we are working to development a new total ceramic system, with a better interface core-veneer porcelain. Let´s see...





The “future”
(My perspectives & my wishes)

- That OOF open Jpeg, Tiff and others simple image formats... But don´t worry, it´s only law of minor work...

- OOF run on Microsoft Windows

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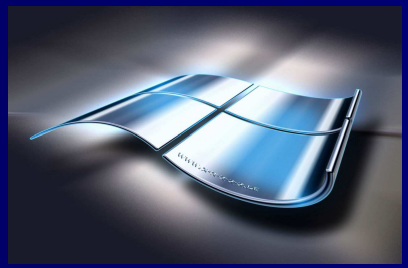

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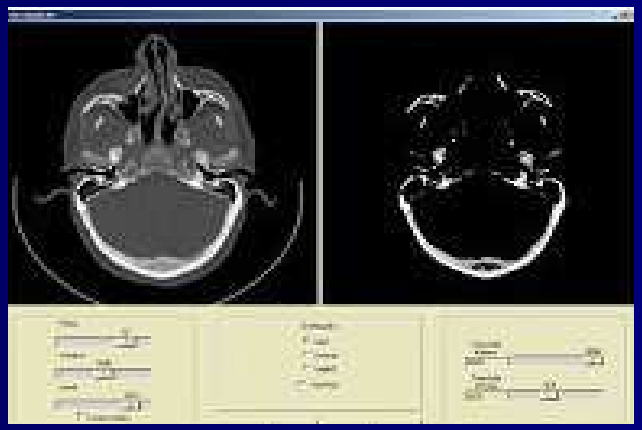
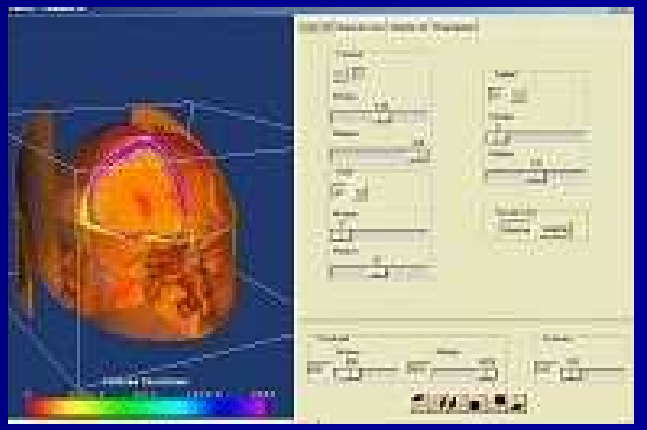
More people, more researches, more results...

- Open DICOM files (traditional files of tomography and resonance magnetic) like the free brazilian software for modeling called InVesalius

http://www.cenpra.gov.br/promed/software.htm





Thanks...

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- Sorriso Modelo Dental Clinic, Sao Paulo, Brazil, for the clinical study about hybrid layer
- Departament of Materials, National Institute of Spatial Research (INPE), Sao Jose dos Campos, Brazil, for the studies and the development of the new ceramic system

and

- OOF Team (OOF Project is amazing, really...) CONGRATULATIONS!!!!