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Soft tissue is (still) the issue!

Implant Dentistry is pivoting from Osseointegration to Soft-tissue integration

With osseointegration now predictable up to 99%, the main challenges for long term success come from the soft tissues

Undertstanding the interplay of Biology and Technology in peri-implant soft tissue is the key for designing proper interventions and maintaining long term success

The aim of these series is to present the major concepts in a clear and concise manner and initiate a discussion with students and colleagues.





...in this post:

Implant Science Made Simple - www.mattheos.net

The Supracrestal Complex World's most common Cyborg The top 5 threats

Meet the Cyborg: The Supracrestal Complex !

After discussing the "Biologic Width" and the "Supracrestal Tissue", we have now layed the ground to intorduce the full picture and discuss the interrelations of biology and technology...

So let me present you in this post the world's most common Cyborg and how to best keep it happy..!

A **cyborg** (<u>/'saɪbɔ:rg/</u>), short for "**cyb**ernetic **org**anism", is a being with both <u>organic</u> and <u>biomechatronic</u> parts. The term was coined in 1960 by Manfred Clynes and Nathan S. Kline.^[1]

Those of us growing up in the 90s were fascinated by hybrid creatures such as the Robocop and the Terminator. My all-time favourite Cyborg was actually the Japanese "Ghost in the shell". But we don't need to go that far to meet the Cyborg. Indeed, one of the most successful Cyborgs is within our daily practice and millions are added each year..! Meet the Supracrestal Complex: world's most widespread Cyborg! An organ supporting crucial function and aesthetics, thanks to joined effiorts of human tissue and metal precision constructions..!

A true Cyborg Tissue..!

Our Cyborg is actually tiny, no more than 200 square mm. But in this tiny space, it packs 3 out of the 4 tissues of the human body, at least 3 mechanical constructions, more than 300 types of human cells and countless numbers of bacterial species. Possible one of the most complex man-made ecosystems, the Supracrestal Complex is the tiny space defined by the cortical Marginal Bone (apicaly) and the first couple of mm of the implant prosthesis exposed in the oral environment (coronally). Rather than "supracrestal tissues" (only human tissue), or





"Supracrestal Attachment" (true attachment is only the junctional epithelium), Supracrestal complex includes all 3 key players: Human Tissue, Mechanical parts and Bacteria. More than anything else, this tiny little space will be the most critical determinant of long term success or failure in Implant Dentistry.

The cohabitation equation

I picture the Supracrestal Complex like a 4 storey apartment block, somewhere in the upmarket suburbs of a tropical city.

- <u>In the Ground floor</u> lives a married couple, Mr and Mrs Osseointegration. The husband is a rough Titanium surface, -plain or with microgroovesand the wife is crestal bone. Their two children -the Abutment and the Screw- live well protected in their home connection.

<u>In the first floor</u> lives another couple,
Mr. Connective Tissue and Ms
Abutmnent. They are not married, but

"Supracrestal complex includes all 3 key players: Human tissue, Mechanical parts and

Bacteria."

live happily together in a partnership they call "*Adhesion*". Despite pressure from their families, they do not seem inclined to formalise their long relationship.

<u>- In the third floor,</u> we have another married couple, Mr and Mrs Attachment. The wife is a Junctional Epithelium and the husband is a smooth surface Abutment or Prosthesis.

- <u>In the Penthouse</u>, lives a seasoned bachelor, Mr. Sulcus. He is a nice guy, hard working and has many friends, but he is a bit flirty and prone to adventures.

The other tenants are often concerned seeing strangers coming in and out of the penthouse and are afraid that Mr Sulcus can someday get everyone in trouble.

- *Finally, there is the roof.* Although no humans live on the roof, it is anything but lifeless. It is exposed to daily rains and strong sunshine and frequented by pigeons, parrots, cats and others who can make a horrible mess if they are left to nest and poo unchecked.

This cohabitation is not a static image, but something like a TV soap opera, which has already had more seasons than the Australian "Neighbours" (where Kylie Minogue met Jason Donovan - as those from Australia over 40 would remember).



At times they all live happily together, but in some episodes all it takes is a problem in one household, a glitch in some couple and the whole building can turn into a messy drama, making headlines and spiking the tv viewers numbers.

Unfortunately, in the case of the Supracrestal Complex, the drama results commonly in failure and inflammation and the only thing that spikes is trouble, for ourselves and our patients...

Top Five ways to damage the Supracrestal Complex!

As 90% of the long term complications are actually initiated within the Supracrestal Complex, it is imperative to look deeply into each of these characters, understand what they need and identify the possible risks, as well as the interactions that can contain or spread the problem..! Starting from the top, let's countdown the 5 most punishable crimes against the peace and quiet of the tenants in the Supracrestal complex !

Nr. 1: Keep the roof clean!

Imagine a house with a large roof, with no access for the cleaners, blocked drainage, where the rainwater piles and the pigeons nest. Soon the piles of birdpooo will emerge through the pools of rainwater, Mosquitos will join the party and birds will thrive, but the human tenants will be driven away.



In the supracrestal complex, the roof is the crucial couple of millimetres of the prosthesis slightly above and slightly below the margin of the soft tissues. This is the surface of the prosthesis which first meets the soft tissues and it is crucial because this is where the Biofilm forms. If this is uncleanable, inflammation of the supracrestal complex is only a matter of (short) time.



Nr. 2: Mind the gap!

Every technical constructions has gaps between its components. Implant, abutment, screws, prosthesis, they all come with certain gaps, sometimes acting protectively and sometimes to the detriment of the complex.

They can be "microgaps" of 1-2 µm or "megagaps" of 100 µm, they can be deep near the bone, or high up in the sulcus, sugingival or supragingival. Knowing which gaps to accept and which to avoid is essential, as this is a risk that can be minimised through the correct design of the prosthesis and selection of implant and prosthetic components!

Nr. 2: Size matters!

The Supracrestal complex is defined by the soft tissues and as such , the vertical height, the width (thickness) and overall morphology / consistency of the soft tissues is critical for the final long term success of our outcomes! A critical pre-assessment therefore includes the questions:



- what are the essential soft tissue outcomes for long term health?

 how likely are we with our intervention to ensure the soft tissue outcomes we need?

 how to design our intervention so as to achieve this in the most simple and predictable way?

Nr. 4: Position yourself for success!

The correct 3-Dimentional implant position is essential for everything else to work Compromised implant 3D position is the "root of all evil" leading a chain reaction of compromise in the restorative design and finally maintainability.



Knowing the limitations from the beginning and decide the strategy that will allow us the perfect placement is an art and a science combined.

Nr. 5: Stay in Shape!

The "emergence profile" is a key for long term success and its optimal shape and size is crucial. Depth or height, Concavity or Convexity, angles of



emergence, these are all design features we need to plan in advance, before the implant is even placed. Otherwise, compromise and trouble is inevitable.

As all these parametres are both critical but also highly interconnected, they are certainly worth more discussion. So for now I will stop here, but I will be back soon with a more detailed look at each of these Top 5 threats for our implants long term success!

Coming Next:

The roof, the roof is on fire!... (or how to prevent the most common threat of them all!)