Advanced Periodontal Surgical Therapy

Setting Restorative Cases Up for Success

Sam Malkinson

DMD, Cert Perio, FRCDC, Diplomate of the American Board of Periodontology and Dental Implant Surgery

Thompson Okanagan Dental Society Meeting 2023

October 20, 2023

TODS

THOMPSON OKANAGAN DENTAL SOCIETY

Disclaimer

My presence here has been kindly sponsored by Crest + OralB, and Nobel BioCare.

Sam Malkinson

Contact Info

- Cell (I love texting): 514.794.1072
- Office: 514.344.4455
- Email: sam.malkinson@mcgill.ca
- Website: www.malkinson-perio.com

Overview

1. Introduction
2. Clinical Crown Lengthening
3. Ridge Preservation
4. Post-operative Care

Overview

1. Introduction

Case 1

- A patient walks into your office with the following situation….

Case 1

Case 1

- What is(are) your diagnosis(es)?
- What treatment options are available to the patient?
- What treatment option would YOU guide her toward?

CCL vs. Implant vs. FPD

(sounds a lot like):

vs.

vs.

- Is this the right way to think about the situation?

The First Question

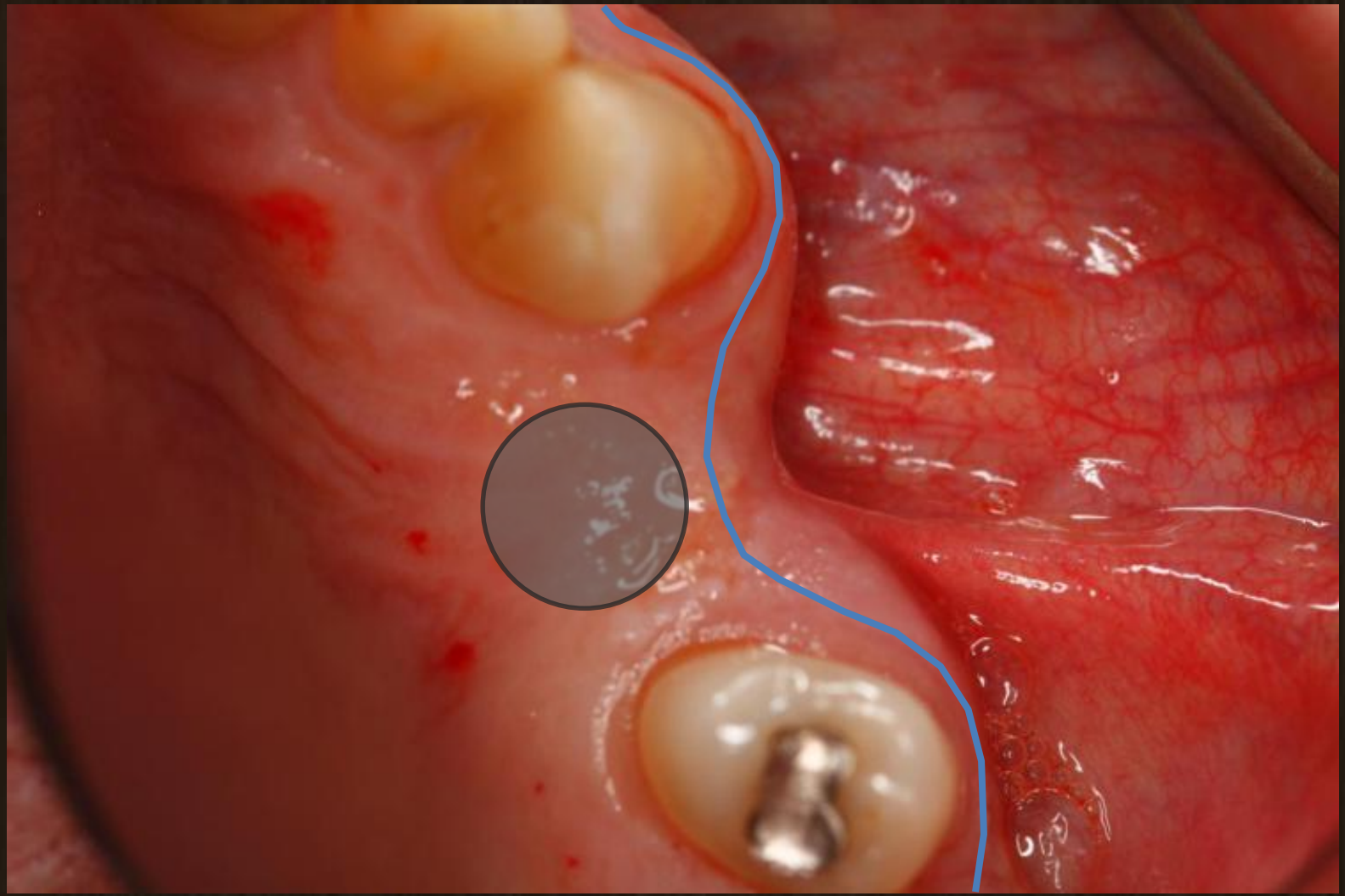
- Do I want to/can I keep the tooth?
- Crown lengthening rarely exists in a vacuum
- More often, a tooth may ALSO need:
  - Endo tx/retx/apicoectomy
  - A core and possibly a post to retain it
  - A crown to protect the cusps of the tooth

The First Question

- Only after you've established that you **CAN'T/DON'T WANT TO** keep the tooth should the other options enter into the conversation

Case 2

- A 55 y.o. male patient presents to your office for a new patient exam. Among his other problems, you notice that 24 is missing. The patient expresses his desire to have it replaced with an implant, which he has learned about on the Internet. There's only one problem, though….



Now it's a Ridge Augmentation….

- Treating this situation is not the end of the world, but it's more expensive for the patient, and slows down treatment
- The real question ought to be, 'Could this situation have been prevented?'

Overview

1. Introduction
2. Clinical Crown Lengthening

Objectives

By the end of this part, you should:

- Know the indications for clinical crown lengthening
- Know the contraindications for crown lengthening, and how to avoid them
- Become aware of the surgical steps involved in crown lengthening

Overview

1. Indications for crown lengthening
2. The technique
3. Contraindications for crown lengthening
4. Competitive options
5. Cases

Overview

1. Indications for crown lengthening

Indications - CCL

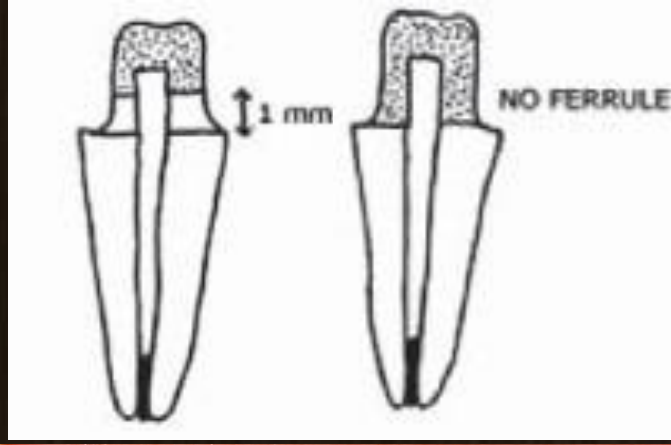
1. Inadequate axial wall height of preparation
2. Inadequate ferrule of preparation
3. Invasion of ~~biologic width~~ supracrestal attached tissues[1] of a restorative margin
4. Inaccessible restorative margin
5. A combination of the above

Case 3

Case 3

- Dx: inadequate axial wall height of preparation 3.4 and 3.5

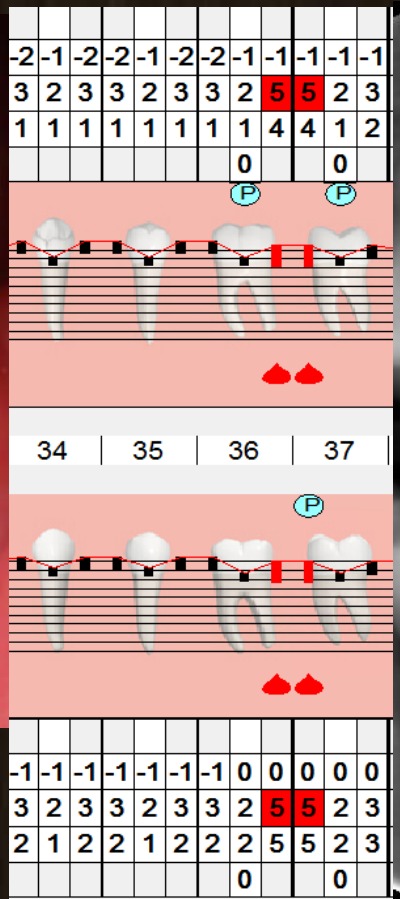
Case 4



Case 4

- Dx: Inadequate ferrule 1.3

Case 5


-2 -1 -2 -2 -1 -2 -2 -1 -1 -1 -1 -1
3 2 3 3 2 3 3 2 5 5 2 3
1 1 1 1 1 1 1 1 4 4 1 2
0 0
P P
34 35 36 37
P
-1 -1 -1 -1 -1 -1 -1 0 0 0 0 0
3 2 3 3 2 3 3 2 5 5 2 3
2 1 2 2 1 2 2 2 5 5 2 3
0 0

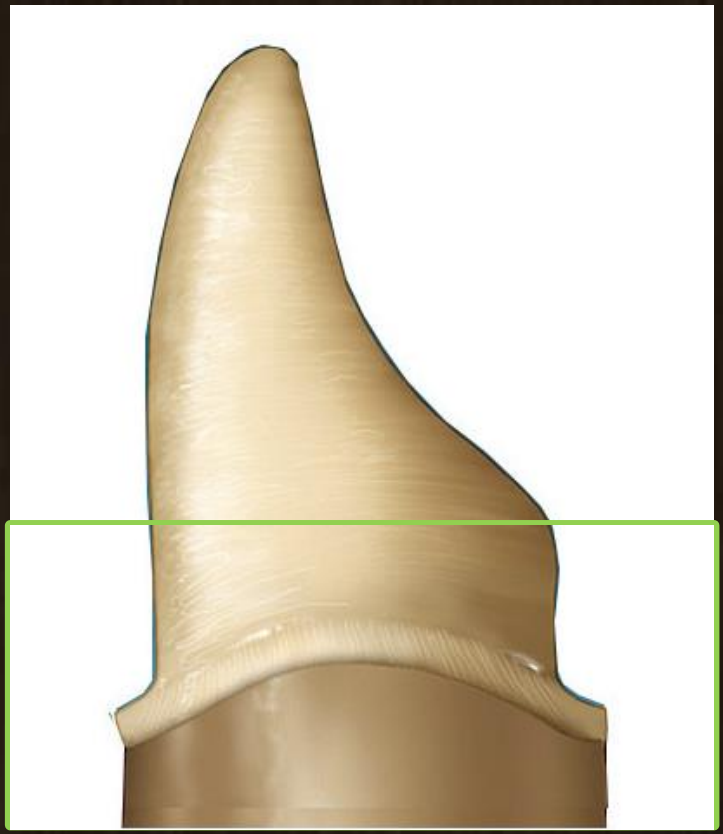
Case 5

- Dx: localized stage II, grade B periodontitis 3.6, 3.7 secondary to invasion of supracrestal attached tissues 3.6D

Invasion of Supracrestal Attached Tissues

- In the previous case, the restoration on 3.6 had *already* invaded the supracrestal attached tissues
- Another indication for a CCL is a *projected* invasion of the supracrestal attached tissues
- How can you tell if you're *going to* invade the supracrestal attached tissues?

Tooth Prep



Supragingival Margins

Subgingival Margins

Invasion of Supracrestal Attached Tissues

But won’t the inflammation caused by an invasion of supracrestal attached tissues just resolve after enough bone has been lost anyway?

Invasion of Supracrestal Attached Tissues

- There are multiple problems with that perspective

Problem #1: Inflammation

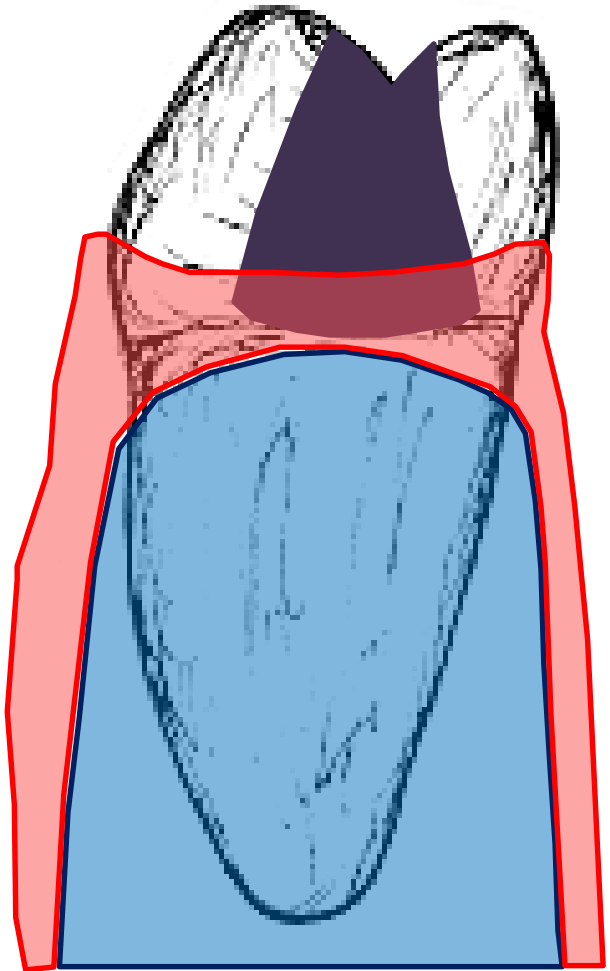
- Turning an inflammatory reaction on is very easy
- Turning it off…not so much[2]

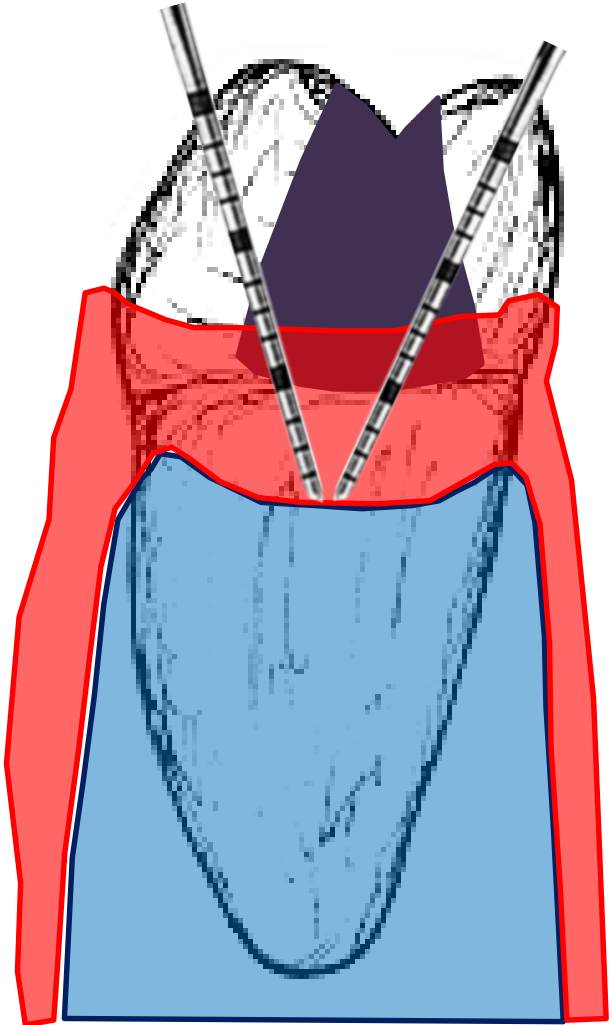
Problem #2: Architecture

- The osseous architecture isn't going to maintain its positive form just because you asked nicely
- Bone will be lost depending on the location on the inflammatory insult[2]
- If negative architecture results…you'll have created a deep pocket

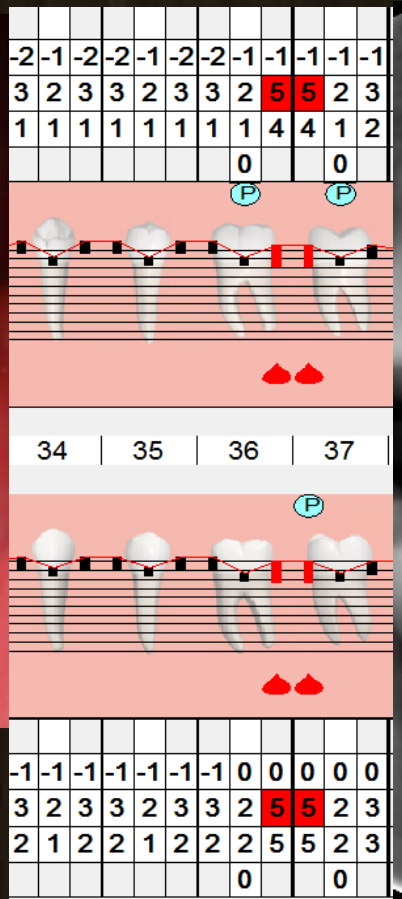
Problem #2: Architecture

- Similarly, even if you're doing a simple Class 2 restoration and your box goes very far apically and invades the supracrestal attached tissues, you'll wind up creating the same effect as if a piece of calculus was just under the contact point and was causing a localized periodontitis…a **crater** will result



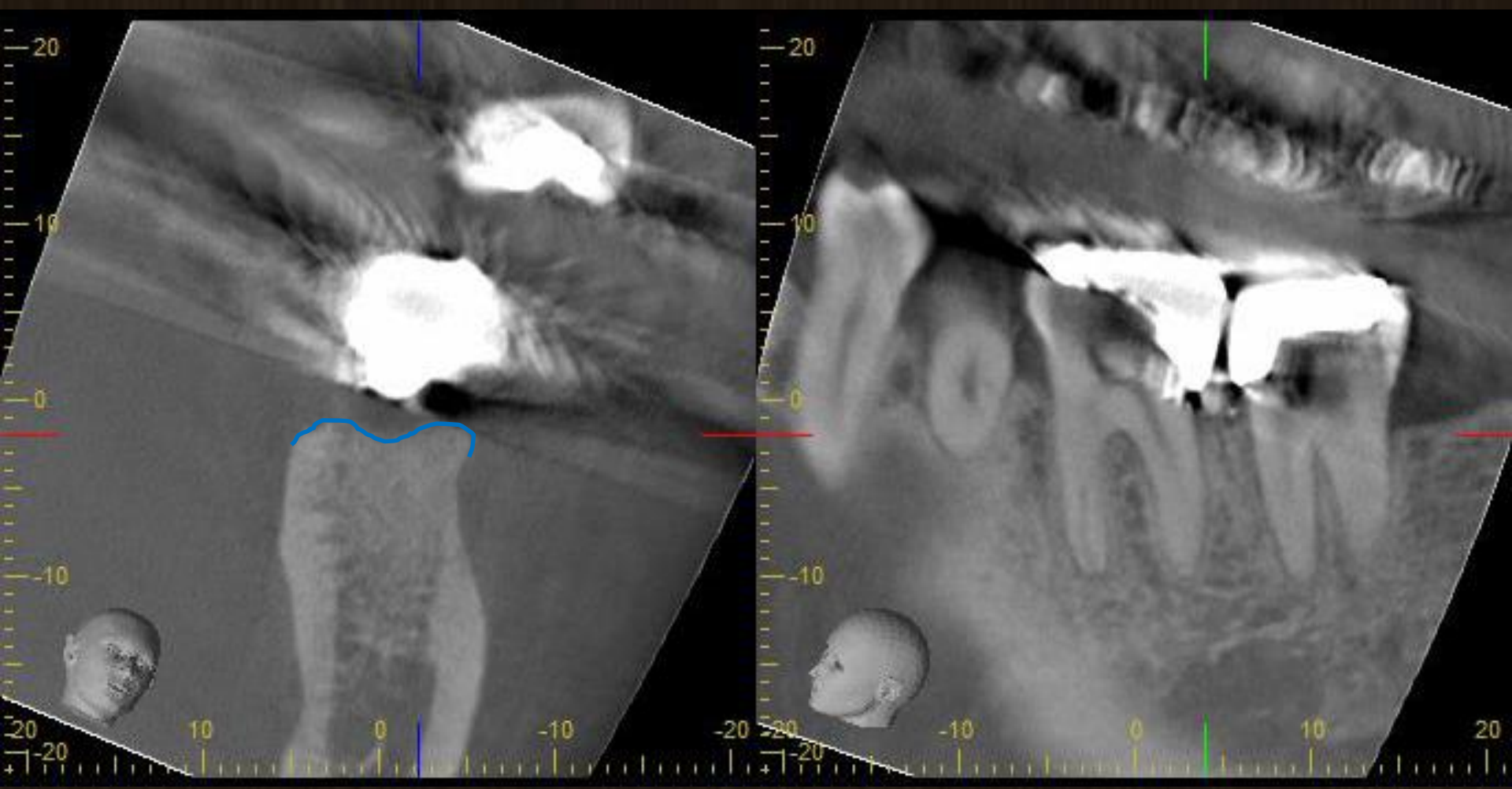


Back to Case 5….




F3


J5


20
10
0
-10
-20
20
10
0
-10
-20
20
10
0
-10
-20
20
10
0
-10
-20

Problem #3: Margins and Impressions

- If you cannot read your margin, your impression material won't be able to, either

Problem #3: Margins and Impressions

- This will create an absence of marginal integrity, leading to plaque accumulation, and eventual caries and periodontitis

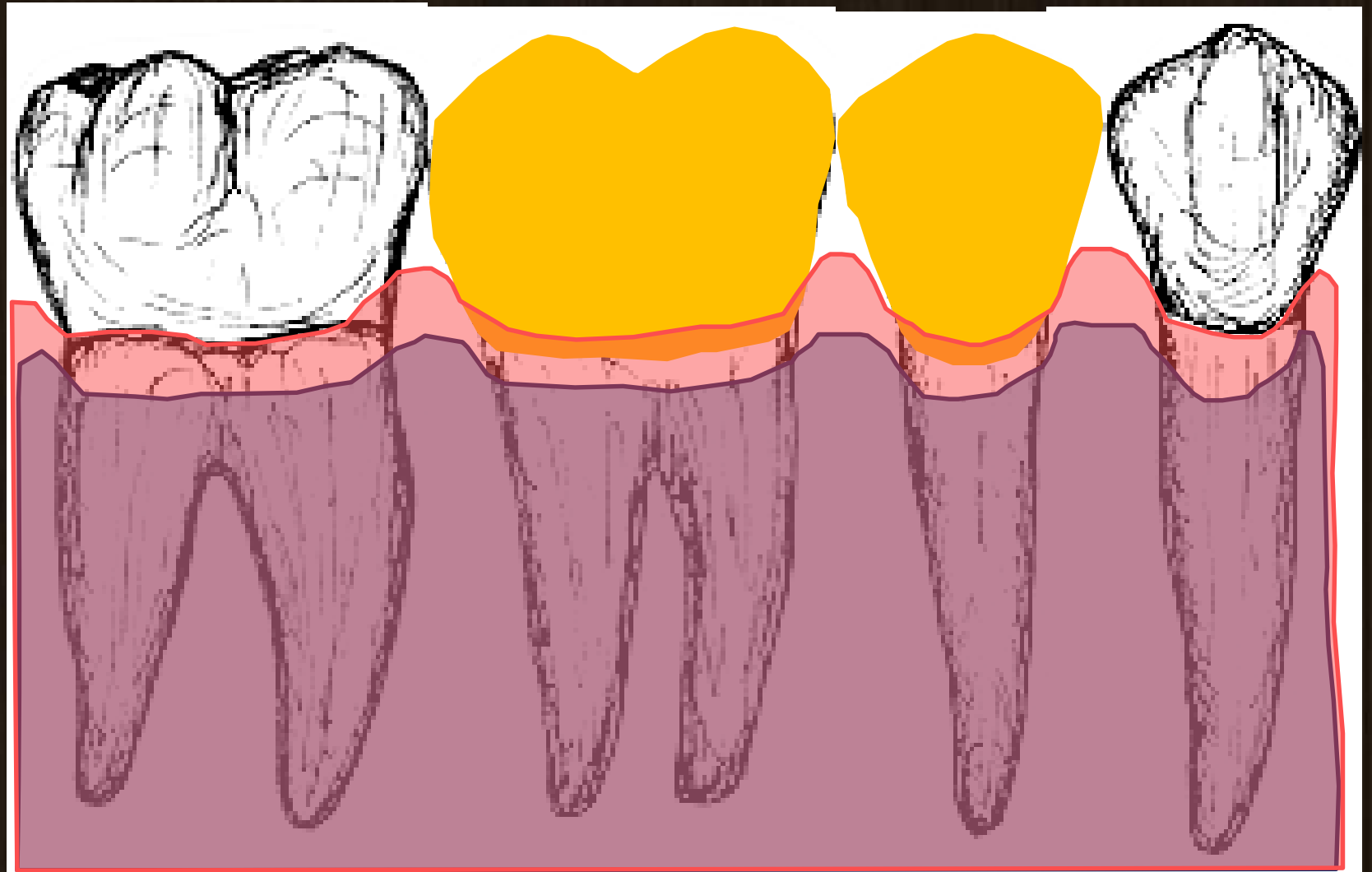
Case 6

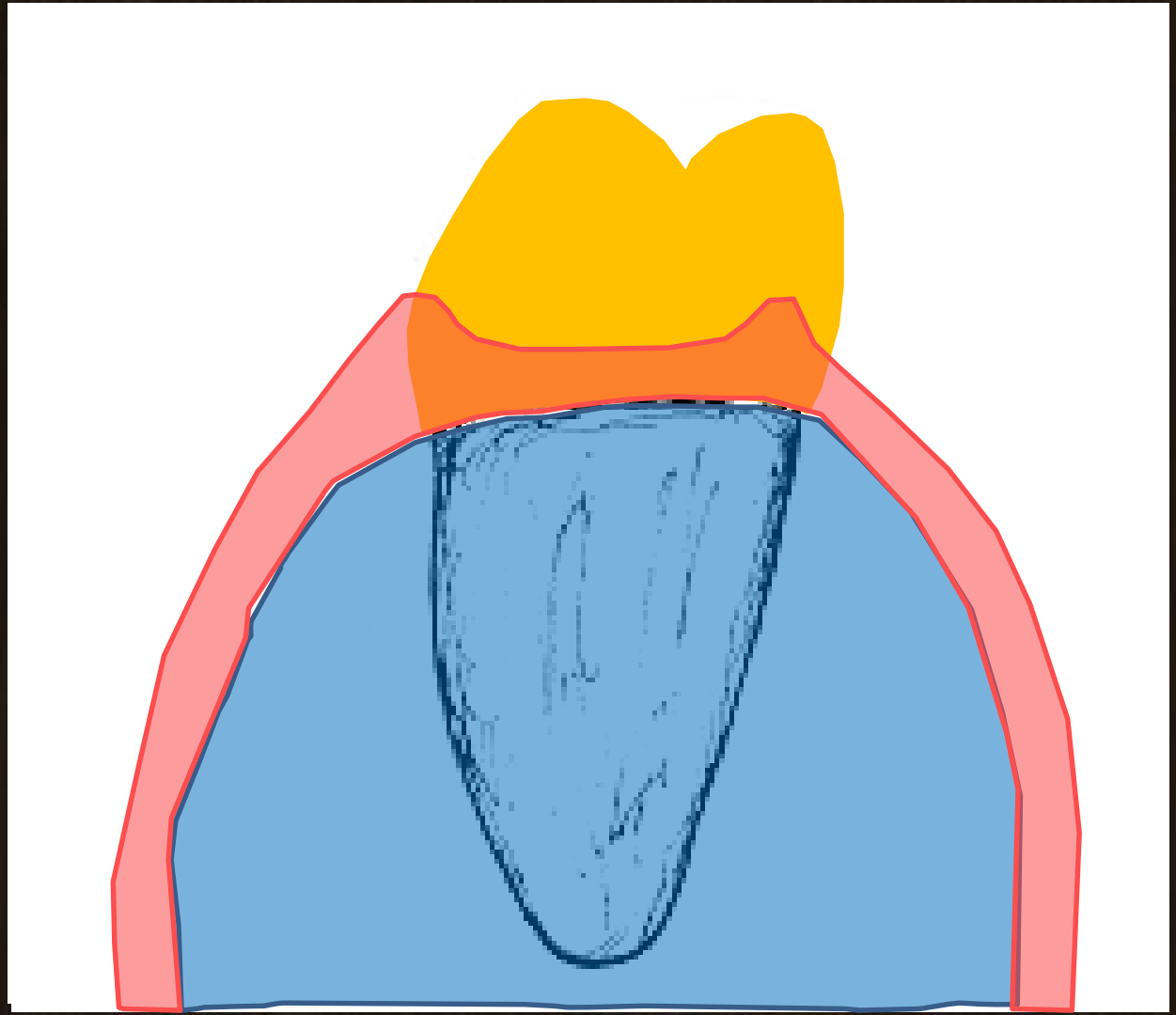
Case 6

- Dx: inaccessible restorative margin 15Pa

Overview

1. Indications for crown lengthening
2. The technique





Surgical Sequence for CCL

1. Incisions
2. Flap reflection/debridement
3. Osseous Resection
4. Suturing

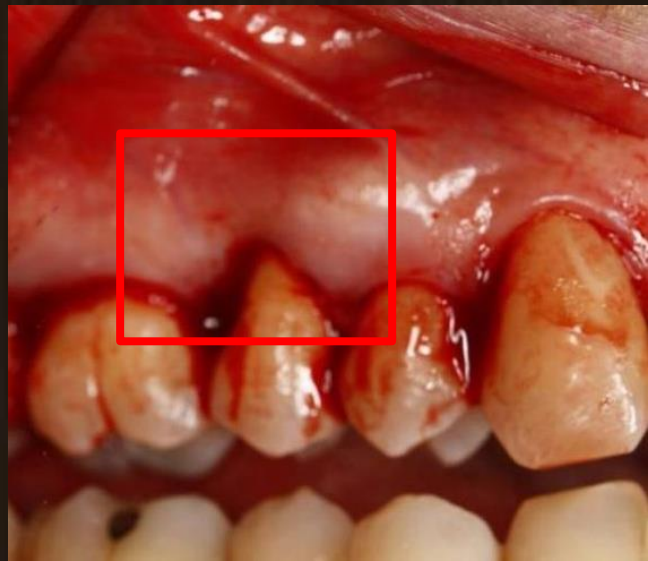
Incision Design

- When the final goal of a procedure is for the free gingival margin to have been moved apically, obviously a *submarginal* incision is most desirable



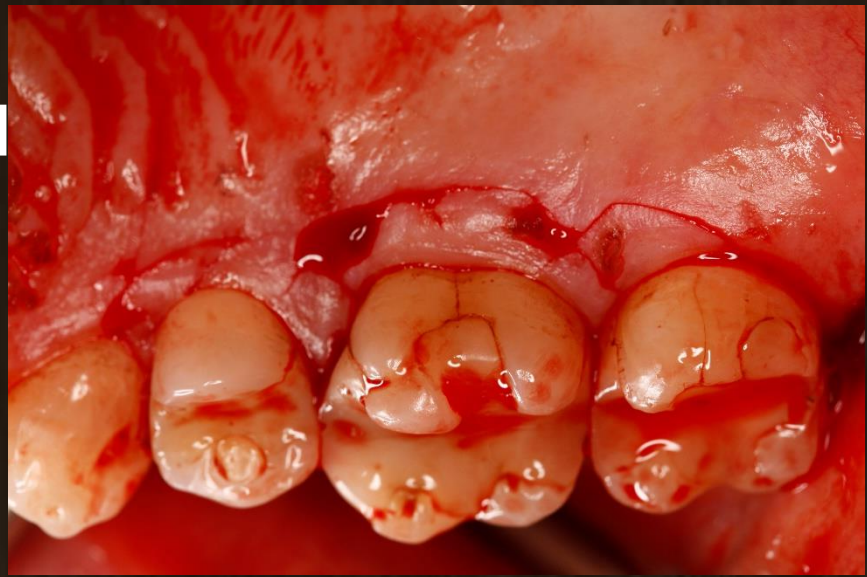
Incision Design

- However, this is limited by the amount of keratinized tissue you have, as you want to wind up with at least 2mm at the end of the surgery (keratinized tissue is more robust than alveolar mucosa)
- If you're starting with 2mm or less, then a *sulcular* incision is more appropriate



Incision Design

- The only place where you're guaranteed to be able to/need to do a submarginal incision is on the palate, where
  - all the tissue is keratinized
  - there's no mucogingival junction/alveolar mucosa to help you apically position your flap



No Keratinized Tissue?

- What happens if a tooth/teeth you're treating has/have no keratinized tissue at all?
- Two options:
  1. do a free gingival graft to augment keratinized tissue (either before or after, NOT during), or
  2. do a connective tissue graft at the time of surgery, and 6 weeks later uncover it with a gingivoplasty[3]

Case 7

Sequence of Osseous Resection

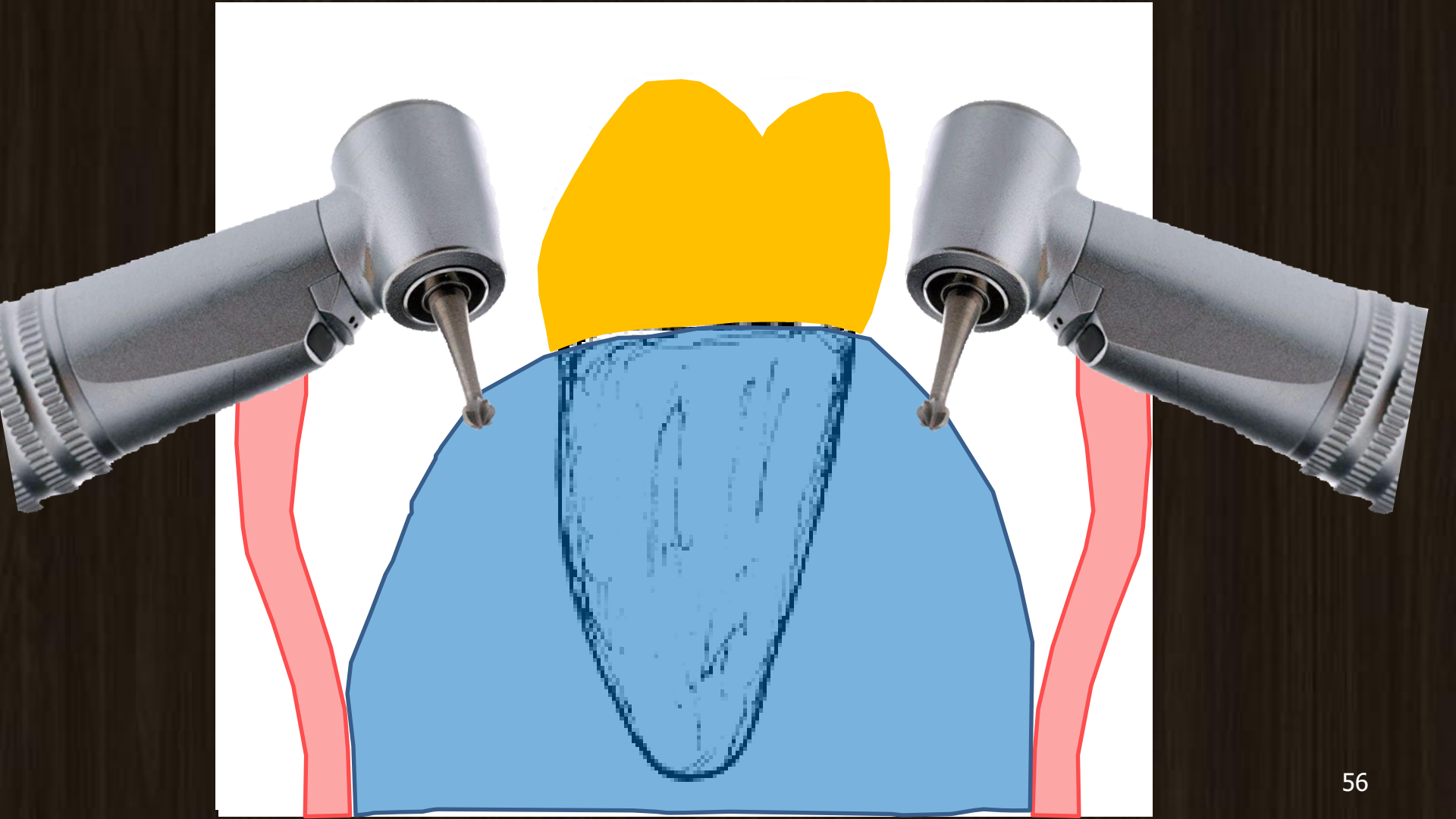
1. **Osteoplasty**
   a. Vertical grooving
   b. Radicular blending
2. **Ostectomy**
   c. Increasing interproximal crown height/re-establishing space for the supracrestal attached tissues
   d. Removal of buccal and lingual supporting bone to promote positive architecture

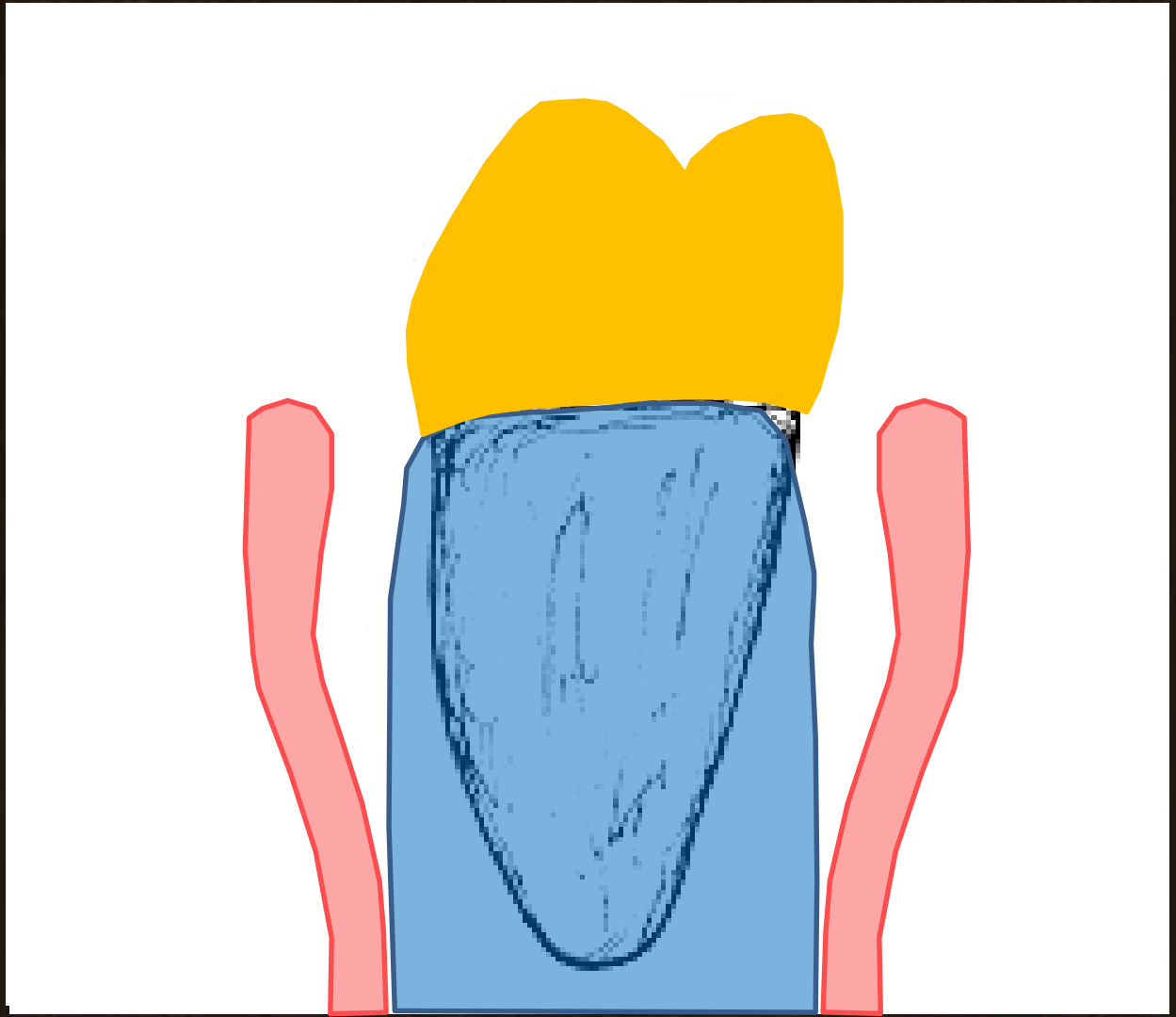
- This sequence can be modified to suit individual cases

Sequence of Osseous Resection

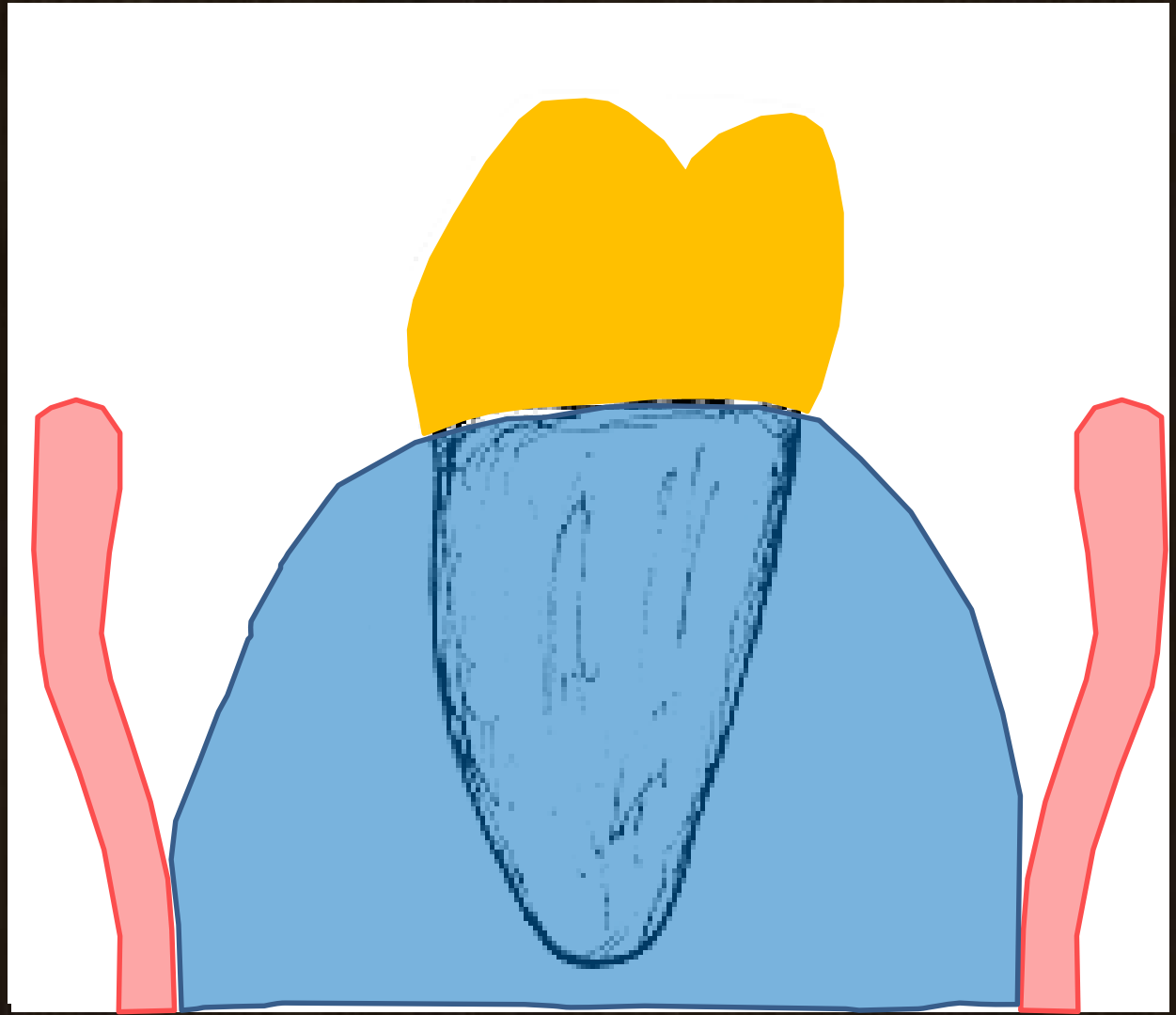
1. **Osteoplasty**
   a. Vertical grooving
   b. Radicular blending
2. **Ostectomy**
   c. Increasing interproximal crown height/re-establishing space for the supracrestal attached tissues
   d. Removal of buccal and lingual supporting bone to promote positive architecture

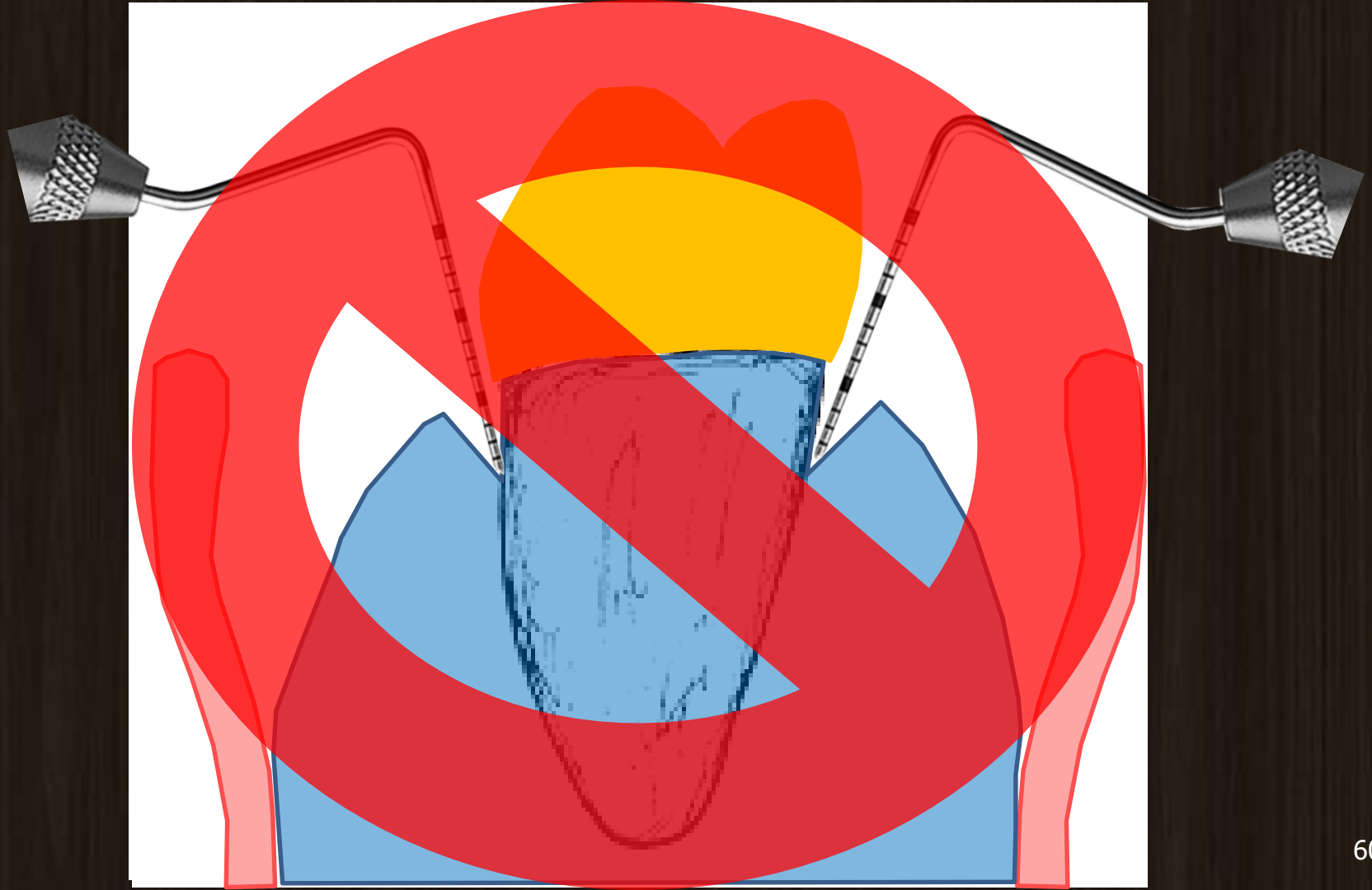
- This sequence can be modified to suit individual cases





What happens if you DON'T do osteoplasty, or don't do enough of it?

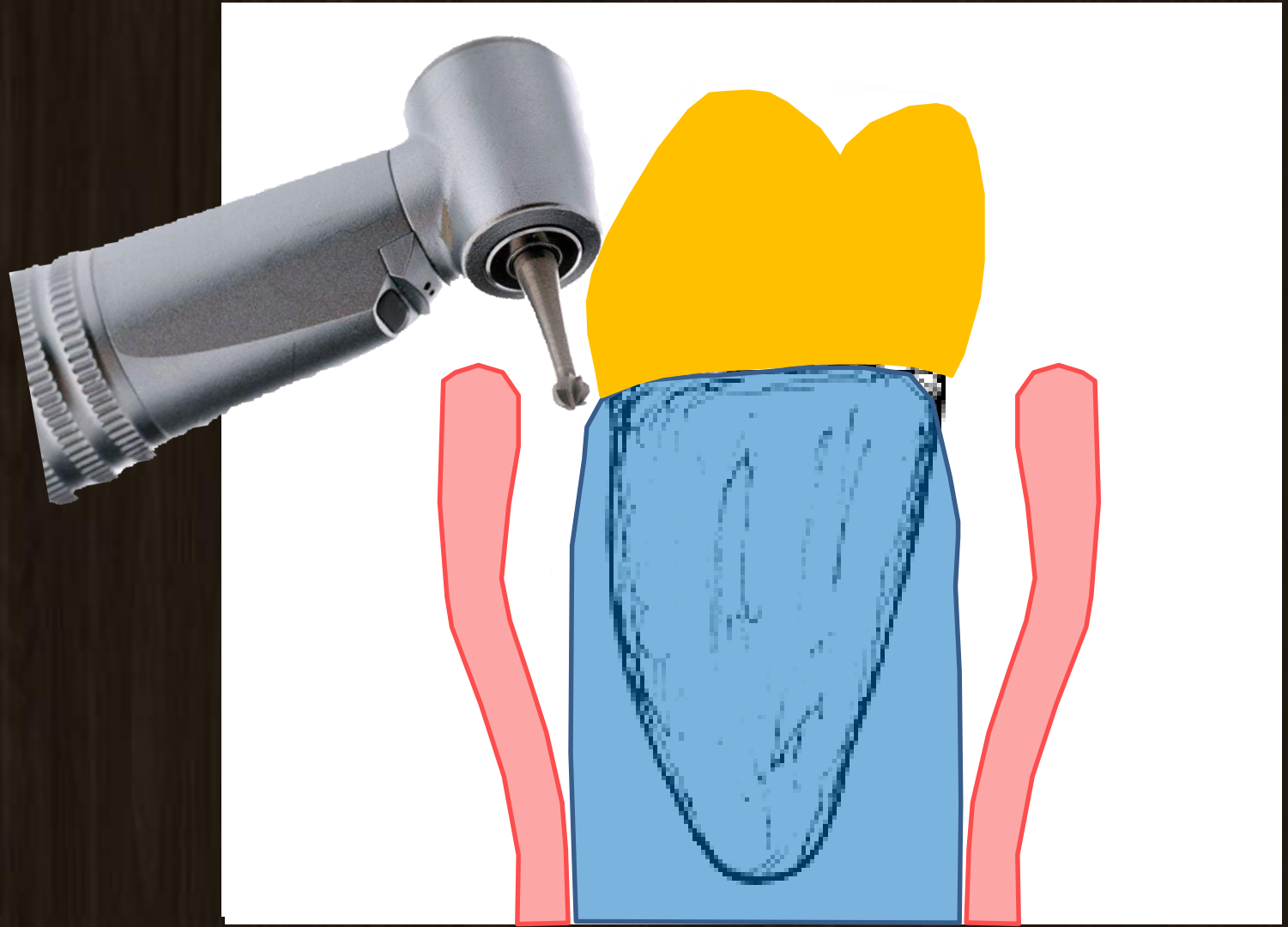


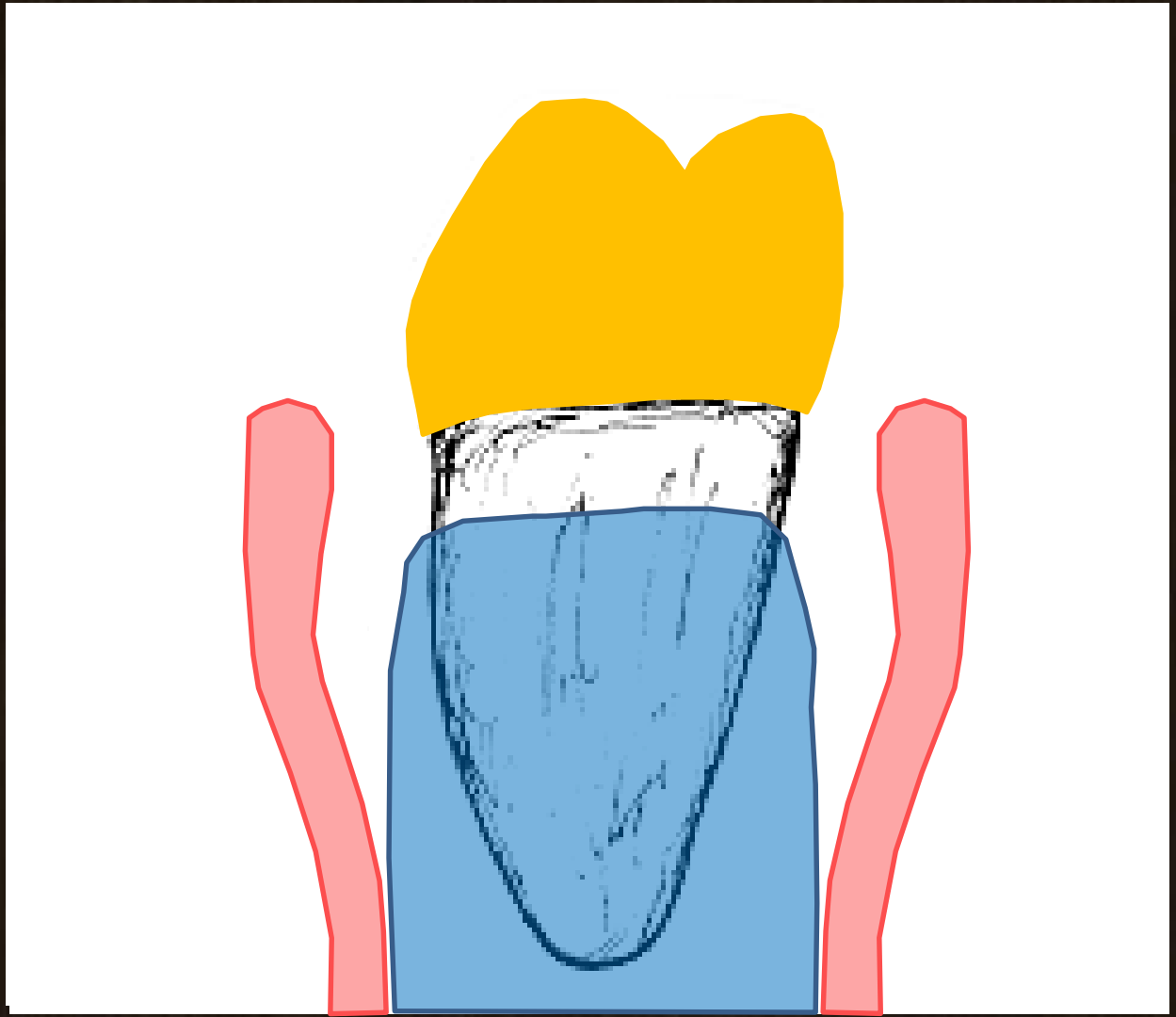


Sequence of Osseous Resection

1. **Osteoplasty**
   a. Vertical grooving
   b. Radicular blending
2. **Ostectomy**
   c. Increasing interproximal crown height/re-establishing space for the supracrestal attached tissues
   d. Removal of buccal and lingual supporting bone to promote positive architecture

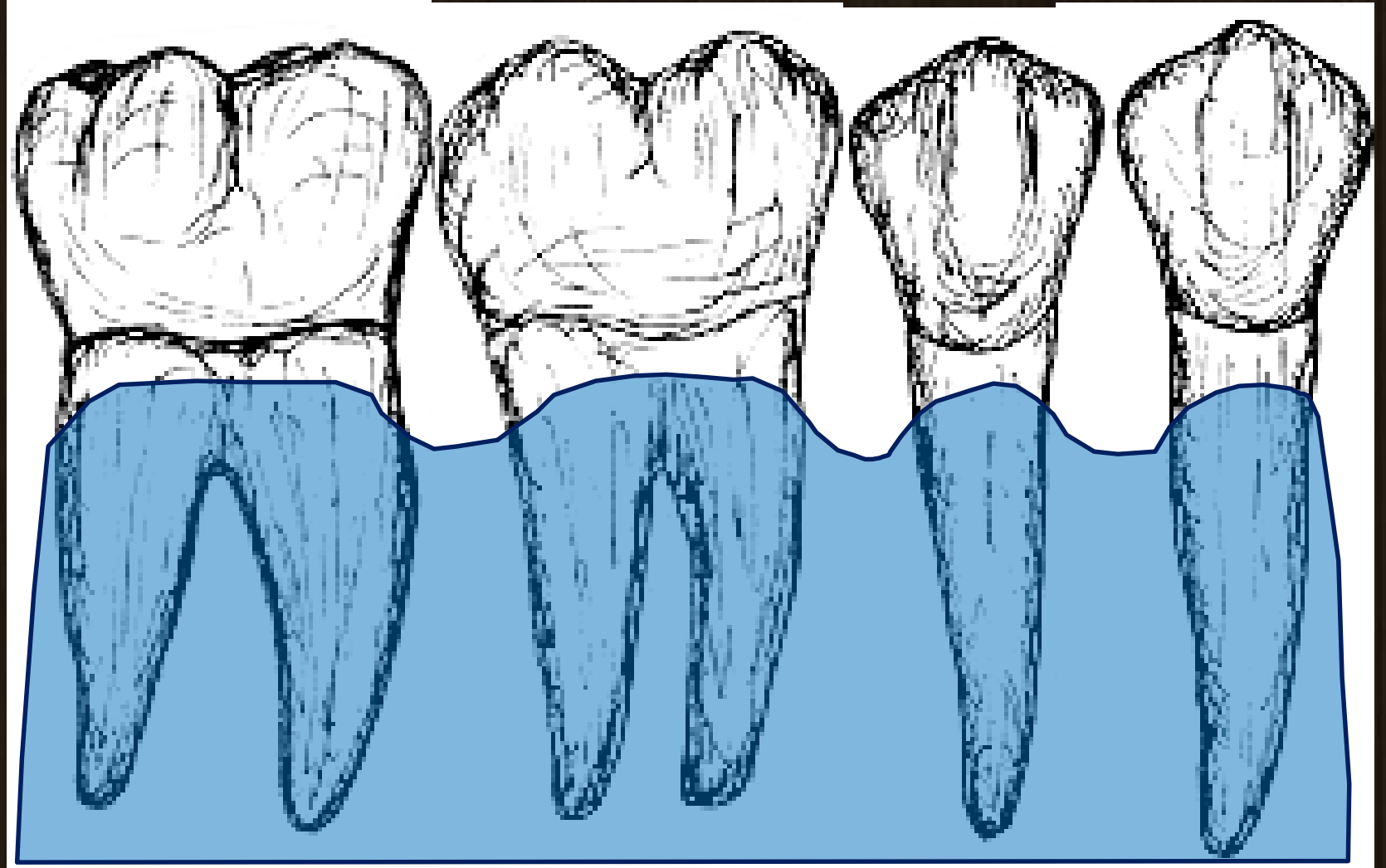
- This sequence can be modified to suit individual cases





Where will this leave us in terms of architecture?

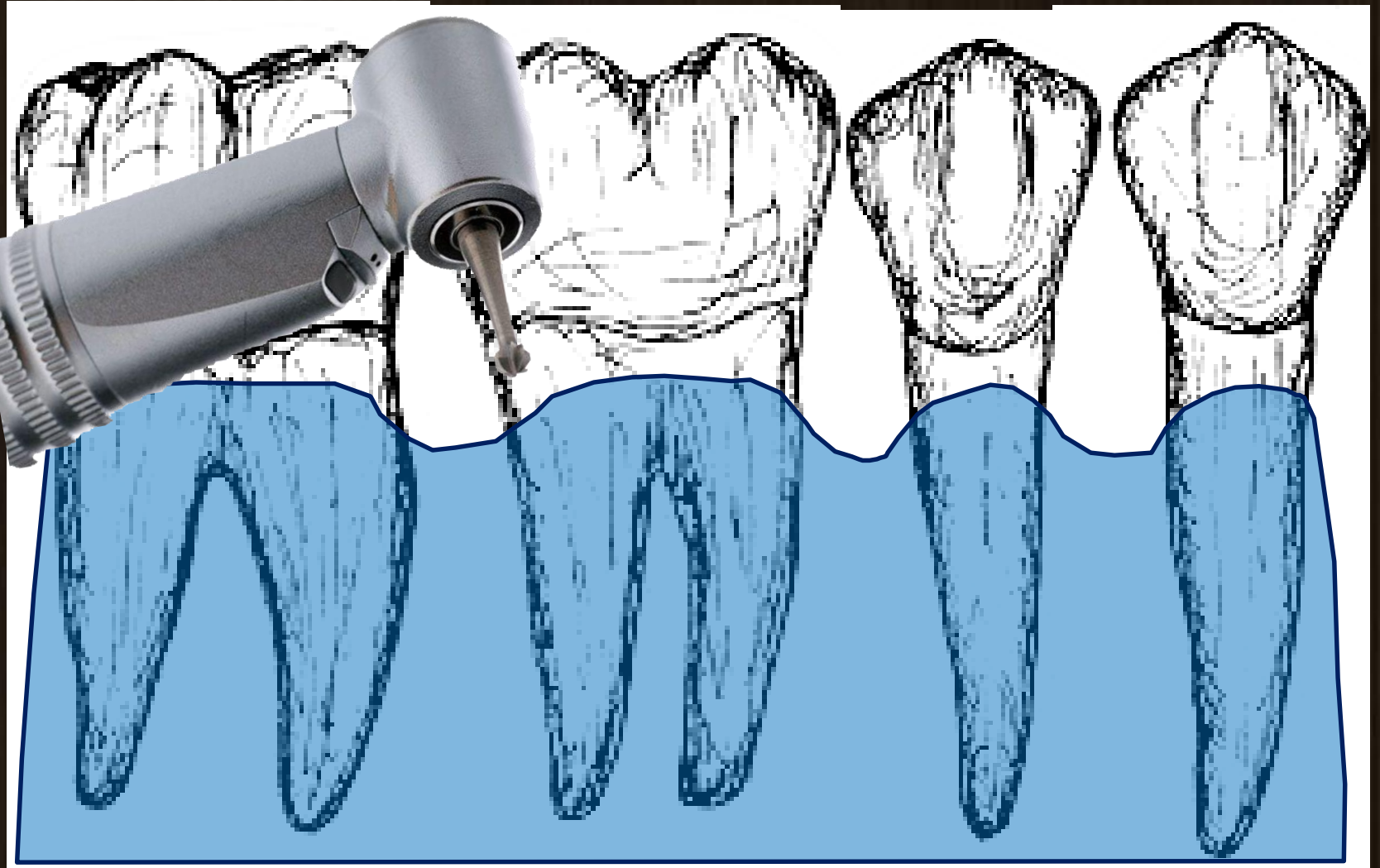
Negative!

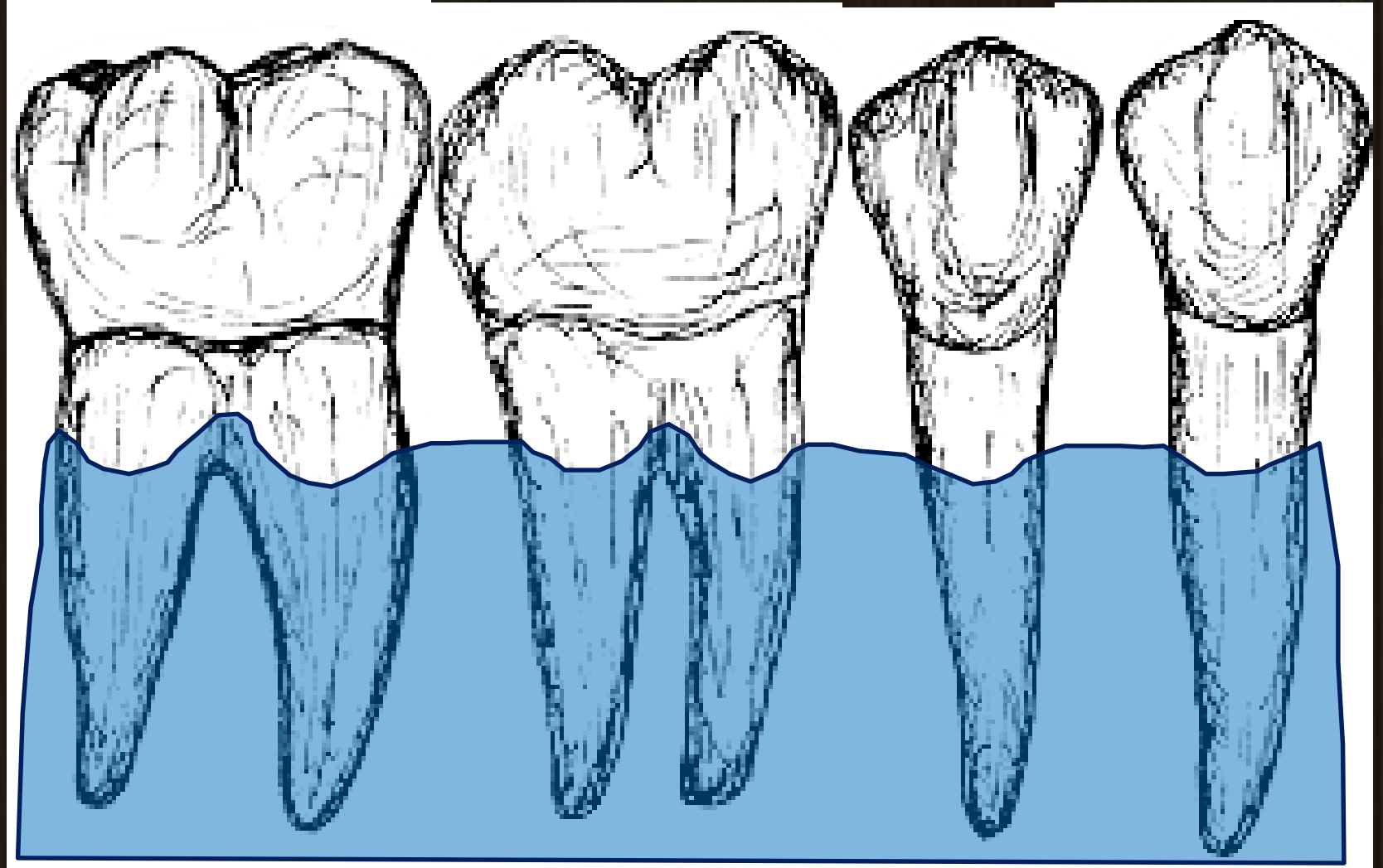


Sequence of Osseous Resection

1. **Osteoplasty**
   a. Vertical grooving
   b. Radicular blending
2. **Ostectomy**
   c. Increasing interproximal crown height/re-establishing space for the supracrestal attached tissues
   d. Removal of buccal and lingual supporting bone to promote positive architecture

- This sequence can be modified to suit individual cases





By the way…

How do you handle a furcation if the margin is already too close to it, and you HAVE to crown lengthen into it?

Furcation Management[4]

(case courtesy of Dr. Danny Melker)

Furcation Management (case courtesy of Dr. Danny Melker)

Suturing

- Suture however you want:
  - Interrupted sutures
  - External vertical mattress sutures
  - Double continuous sling suture

as long as the tissue ends up apical to where it was when you started

Suturing

- Suture *with* whatever you want
  - Chromic gut
  - Vicryl
  - Monocryl
  - Silk

as long as you know how long the sutures you chose will stay in place

Overview

1. Indications for crown lengthening
2. The technique
3. Contraindications for crown lengthening

Contraindications - CCL

- Expected crown:root ratio of affected teeth will be compromised
- Roots of adjacent teeth are too close together to instrument between them
- Sinus is too close to osseous crest
- External oblique ridge projects horizontally in an aggressive fashion

Crown:Root Ratio

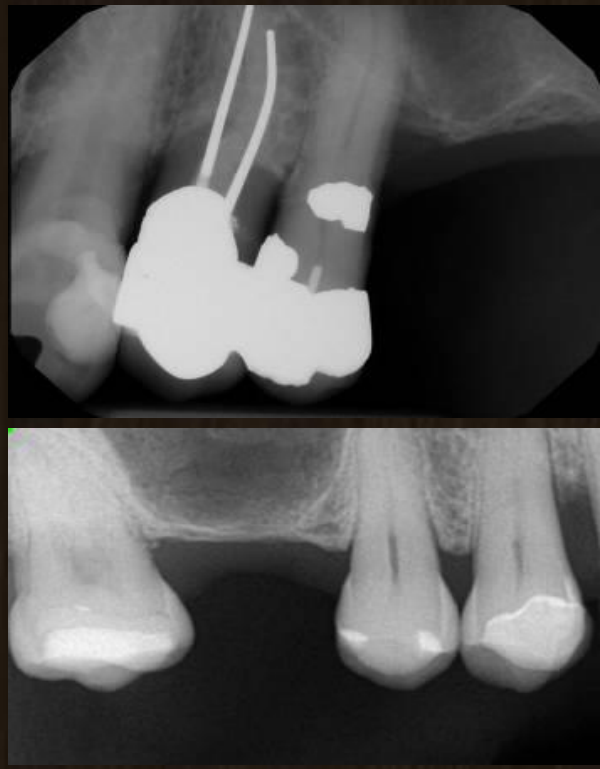
- Because CCL involves the removal of bone, it obviously doesn't make sense to compromise the C:R ratio to >1:1 via therapy

Root Proximity

- You need an adequate width of bone between roots for your instruments/burs
- Teeth that have narrow emergence profiles and teeth that have poorly angulated roots can sometimes have inadequate space interproximally

Maxillary Sinus

- Always consider the position of the maxillary sinus prior to performing osseous surgery
- Can you imagine performing a beautiful CCL…only to have exposed the sinus?



External Oblique Ridge

- As we have seen, osseous surgery as done in CCLs involves thinning out Bu and Li/Pa bone
- If the external oblique ridge projects horizontally outward, this osseous resection would involve an unacceptable amount of bony removal

Overview

1. Indications for crown lengthening
2. The technique
3. Contraindications for crown lengthening
4. Competitive options

Case 8

Diagnoses

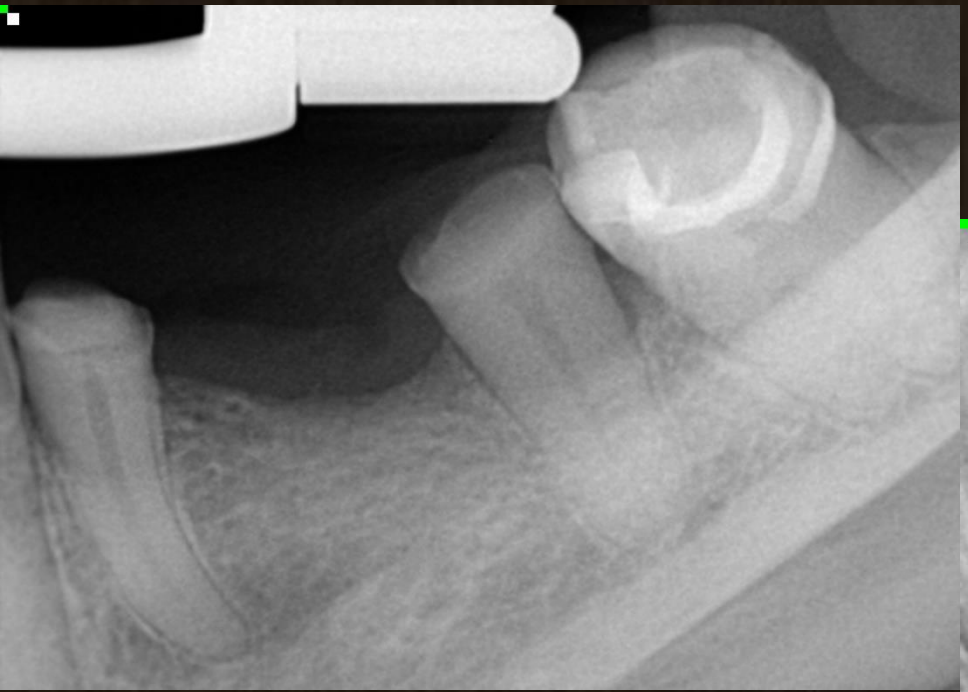
- Caries 4.5
- Insufficient axial wall height 4.5
- (Previously treated root canal, normal apical tissues 4.5[5])
- Tx options?

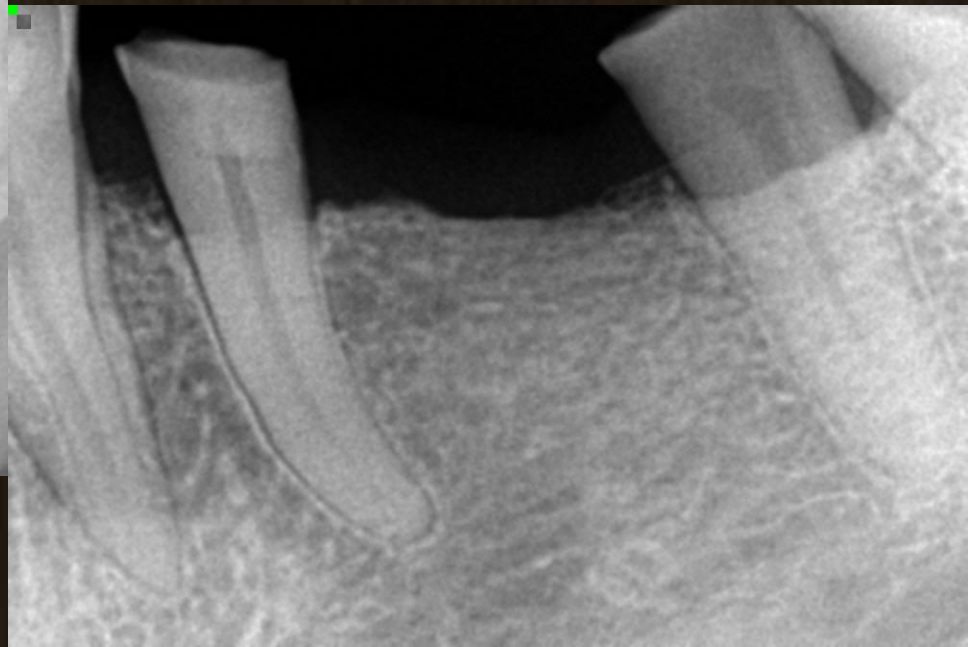
Implant(s)

- Implants are a great option for many different patients and clinical situations
- The cost of implant therapy is generally the highest, so make sure your patient knows ALL the costs involved
- Make sure your patient is periodontitis-free!

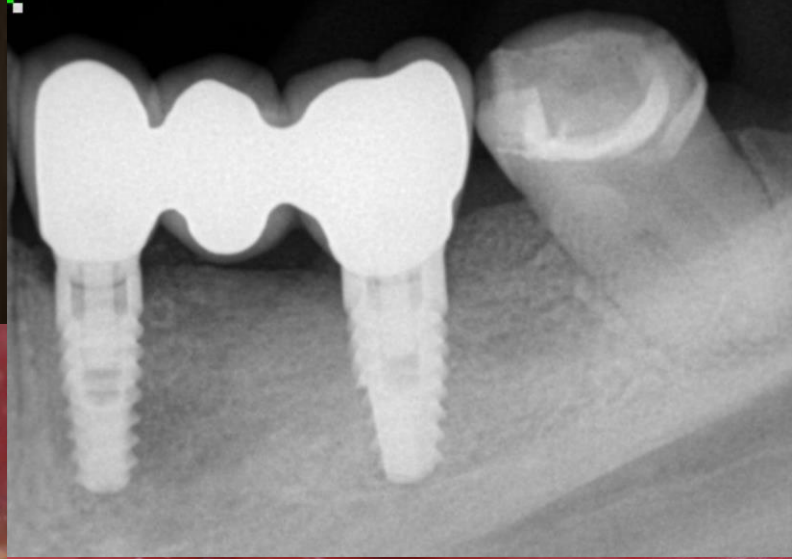
Case 9

Case 9



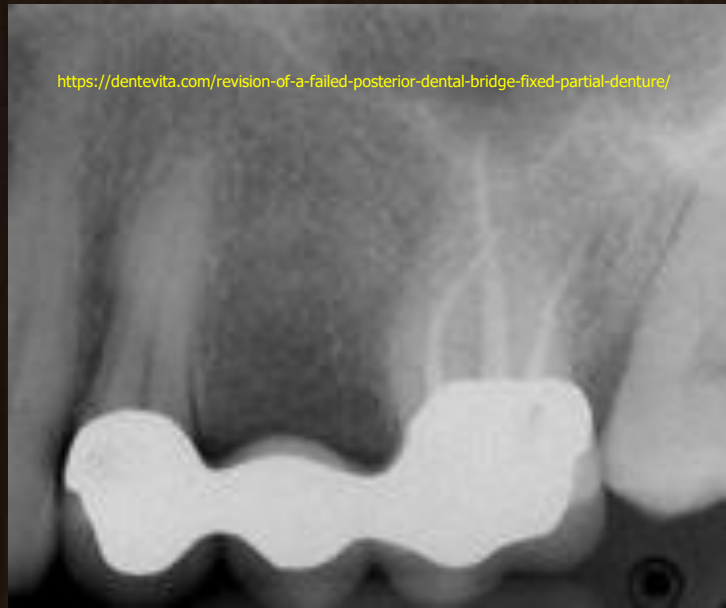


Case 9



Fixed Partial Dentures (Bridges)

- While the average lifespan of an FPD is 10-15 years[8], with proper maintenance a well-made FPD can last much longer than that
- Obviously doesn't help if the tooth to be replaced is the terminal tooth in the quadrant
- May require double-abutting (think replacement of canines or first molars)



Removable Partial Dentures

- Since they imply a lot of metal/plastic in a patient's mouth, work best when more than one tooth needs to be replaced
- The cheapest option
- Also the least well-tolerated by patients

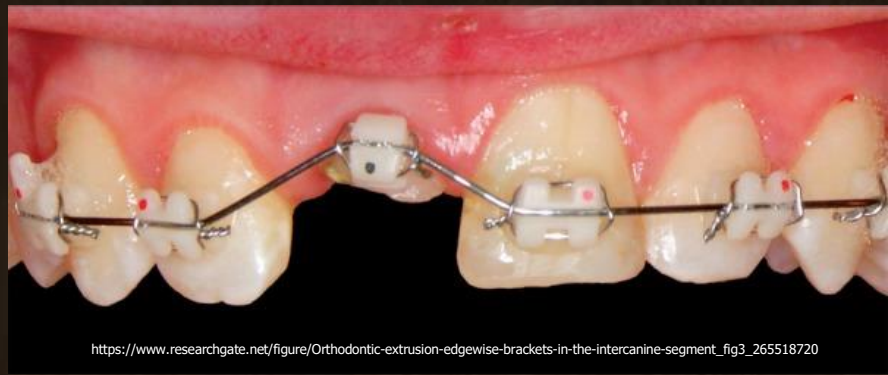
https://www.daydental.ca/dental-services/innisfail-partial-dentures/

Orthodontic Extrusion + CCL

- In the anterior region, recession may be esthetically unacceptable, BUT a patient may not be a good candidate for other treatment modalities.

Orthodontic Extrusion + CCL

- Another option is to do slow[9] orthodontic extrusion of a tooth, bringing the whole dentogingival complex coronally, and then once an adequate axial wall height/ferrule has been attained, CCL to replace the gingiva where they originally were



https://www.researchgate.net/figure/Orthodontic-extrusion-edgewise-brackets-in-the-intercanine-segment_fig3_265518720

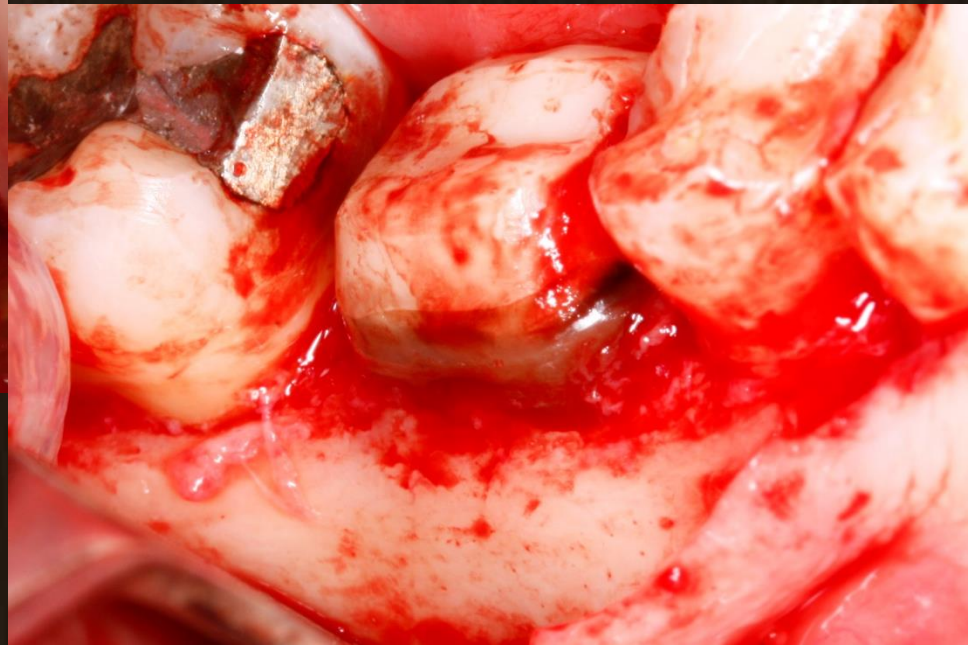
Overview

1. Indications for crown lengthening
2. The technique
3. Contraindications for crown lengthening
4. Competitive options
5. Cases

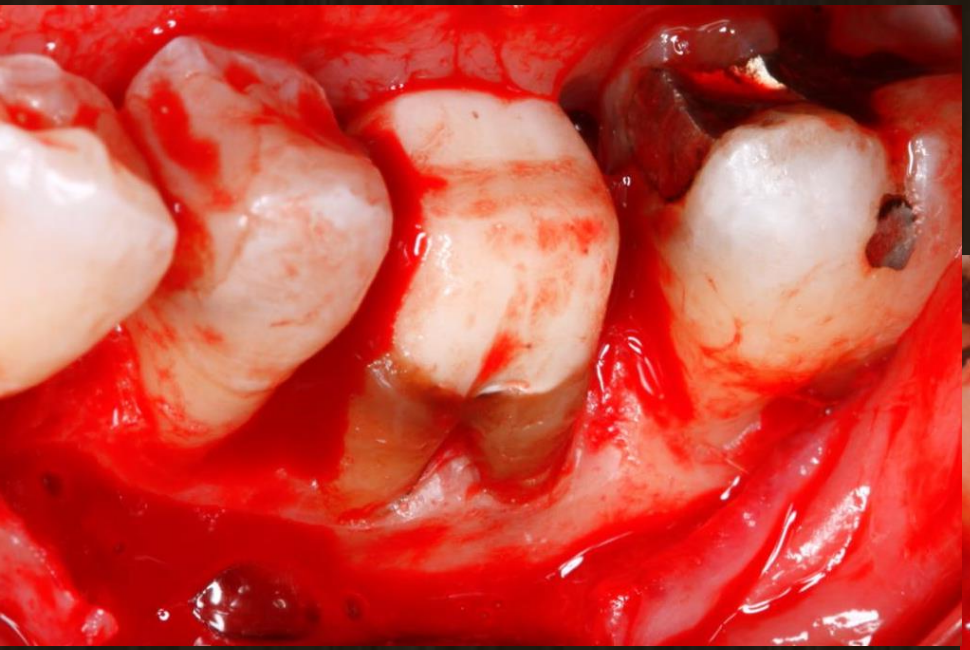
Back to Case 1

Case 1

Case 1



Case 1

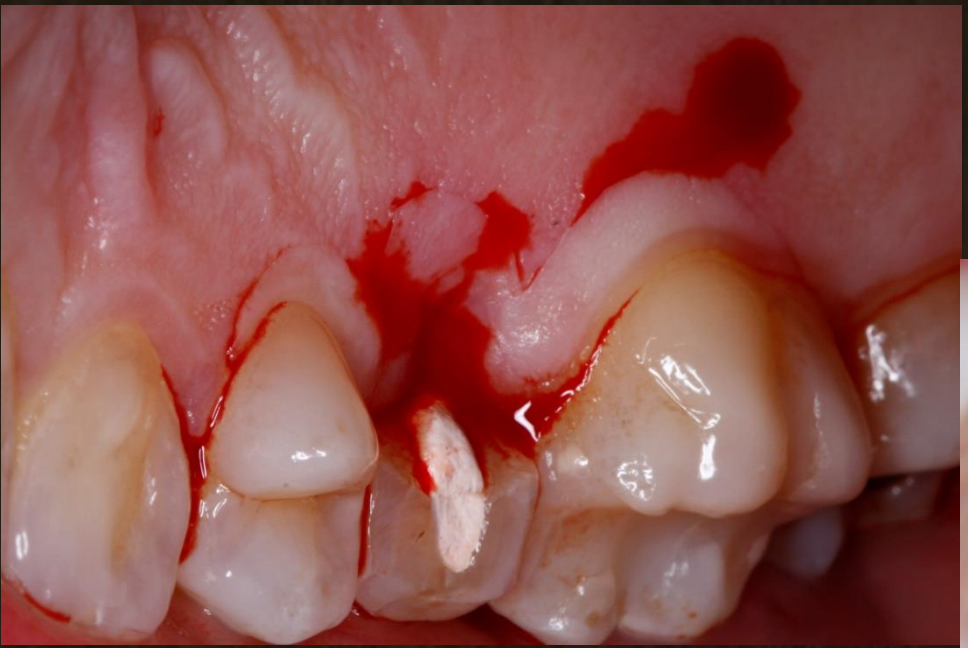


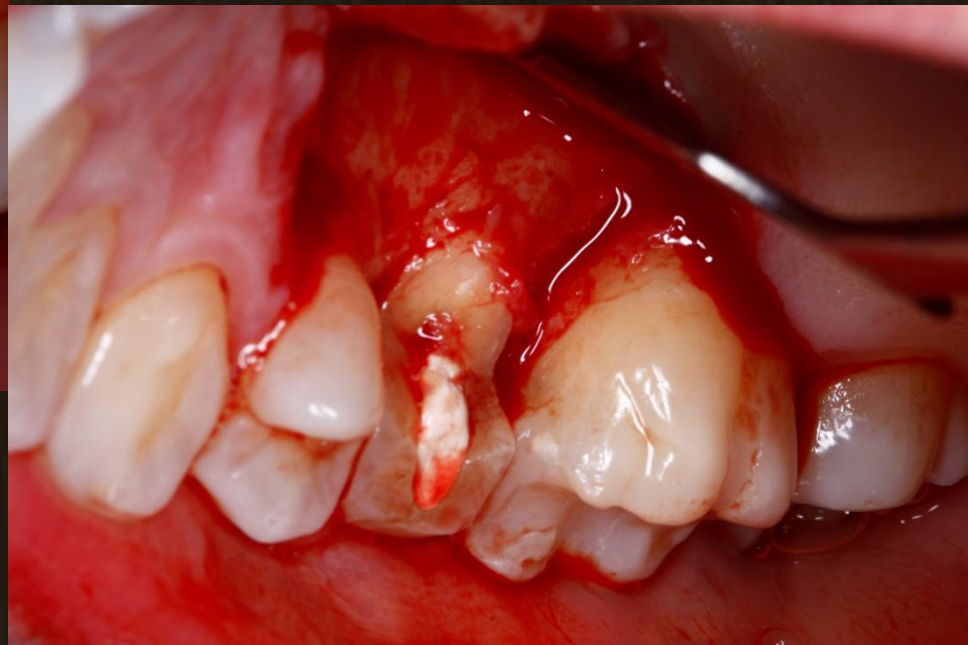
Case 1

Case 1

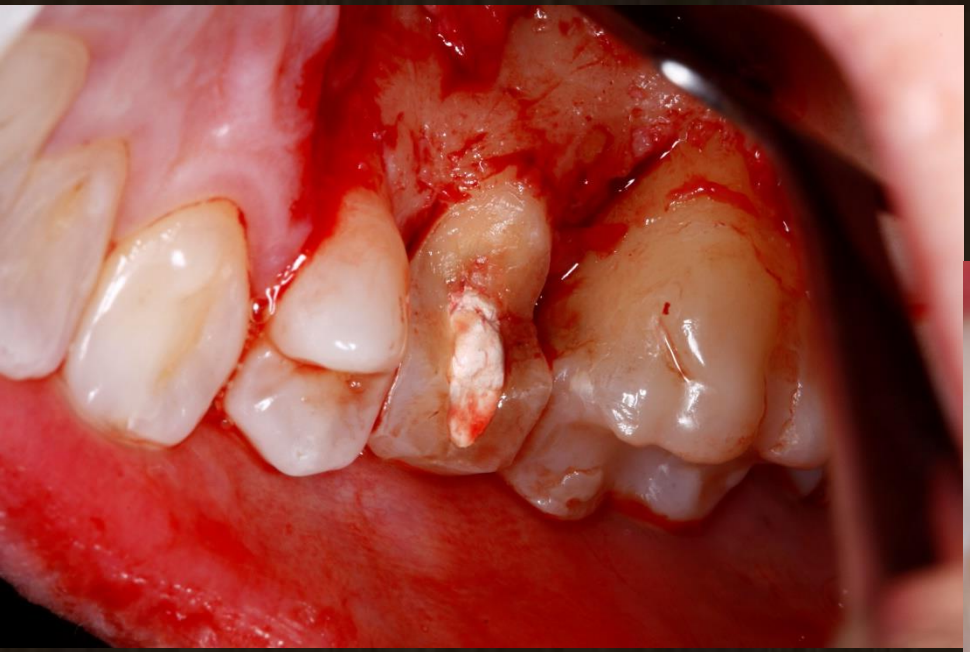
Back to Case 6

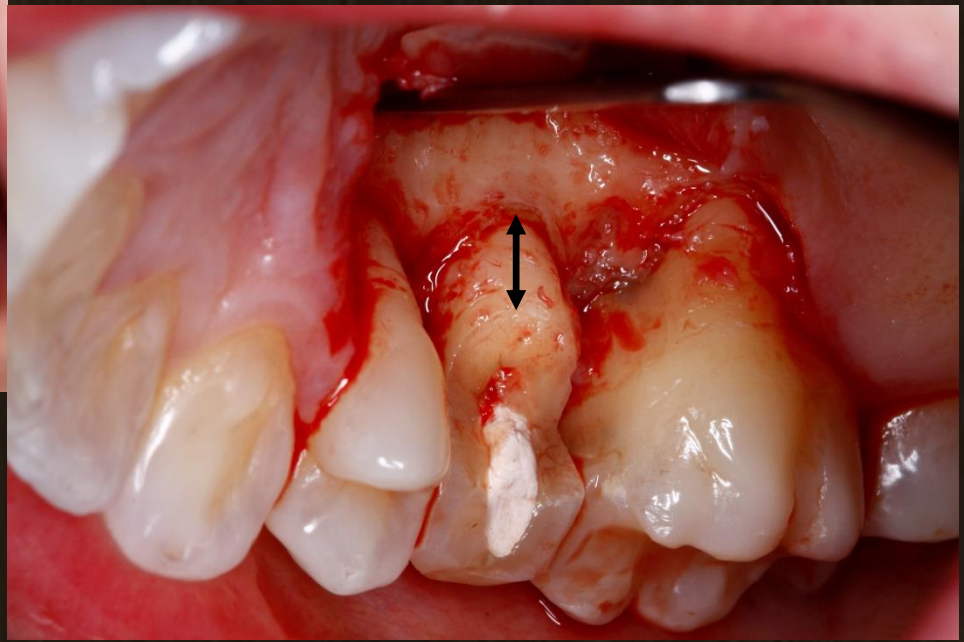
Case 6



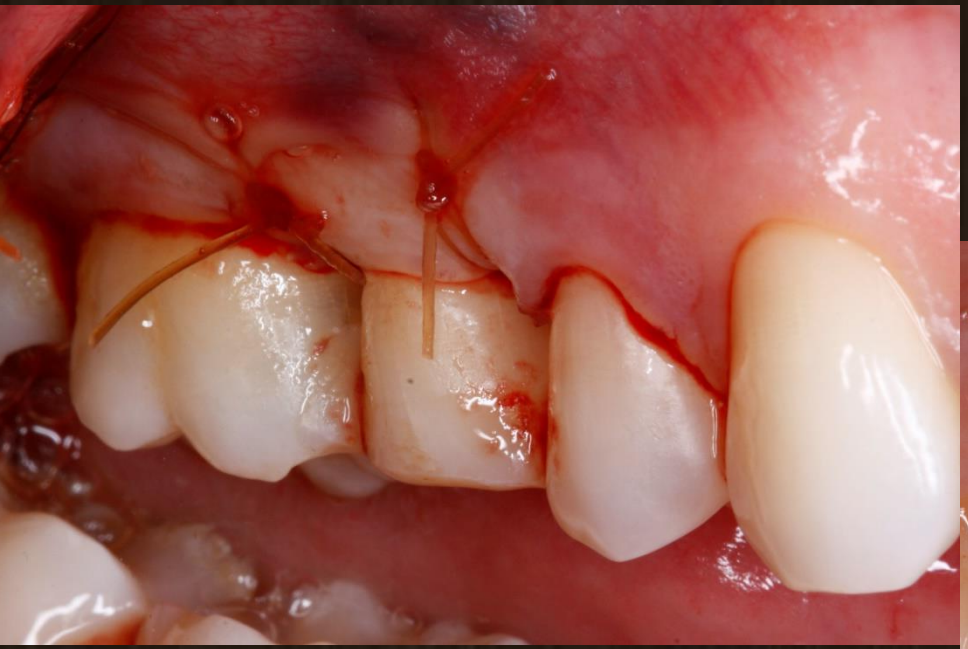


Case 6



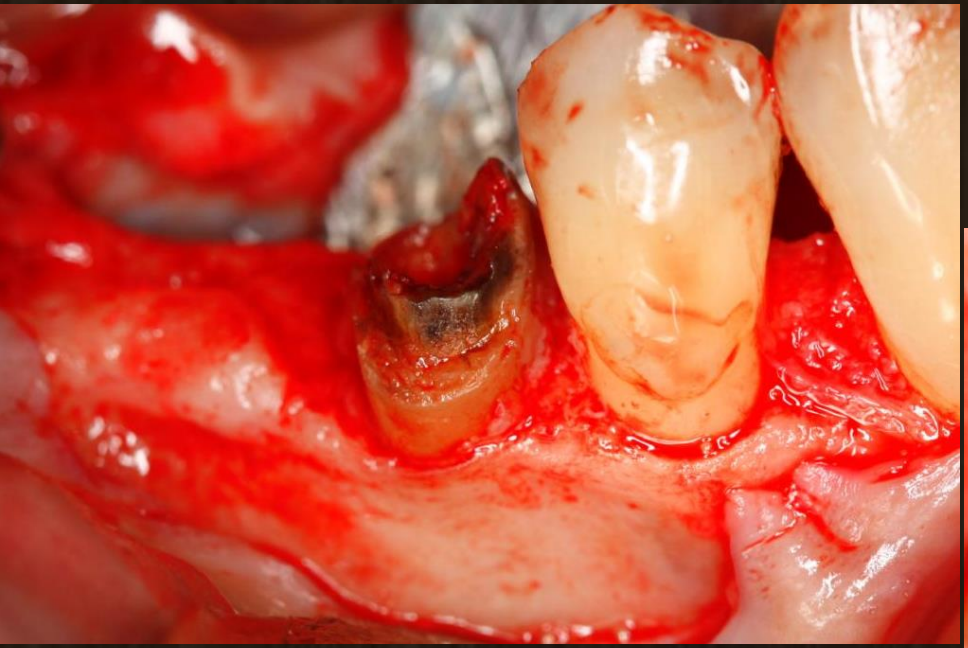


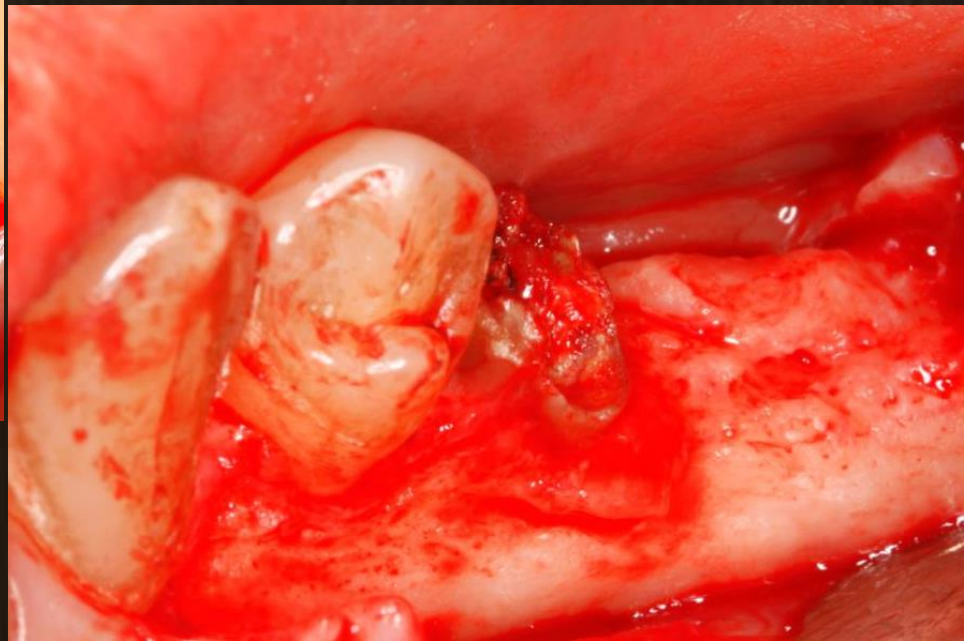
Case 6



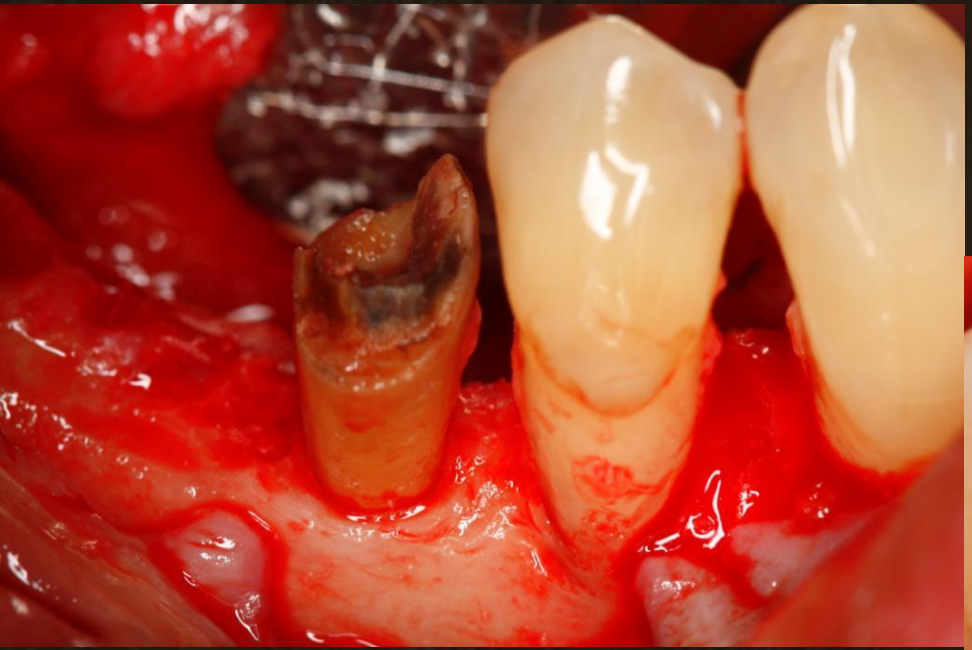
Back to Case 8

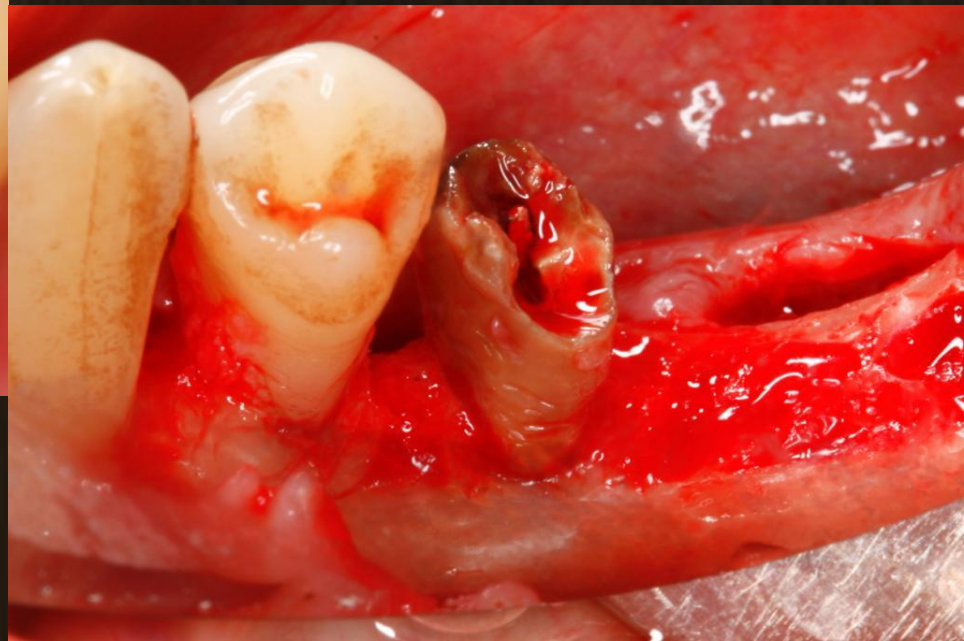
Case 8

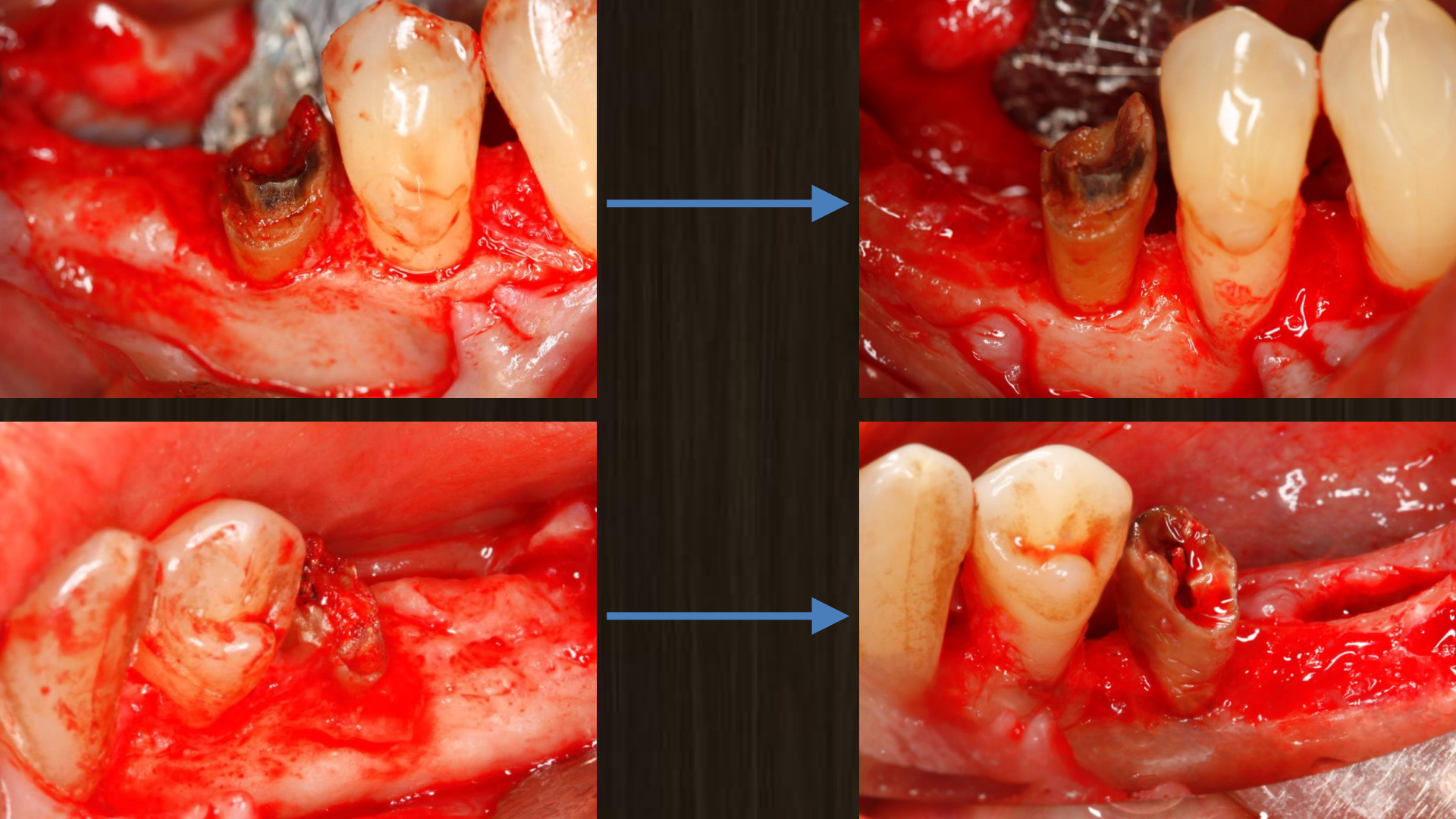




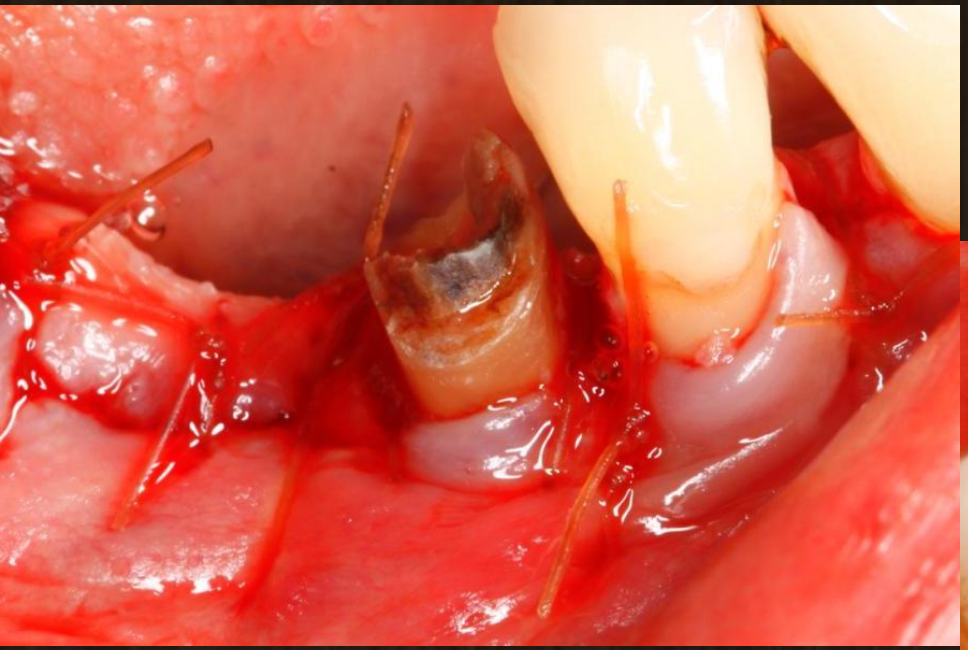
Case 8

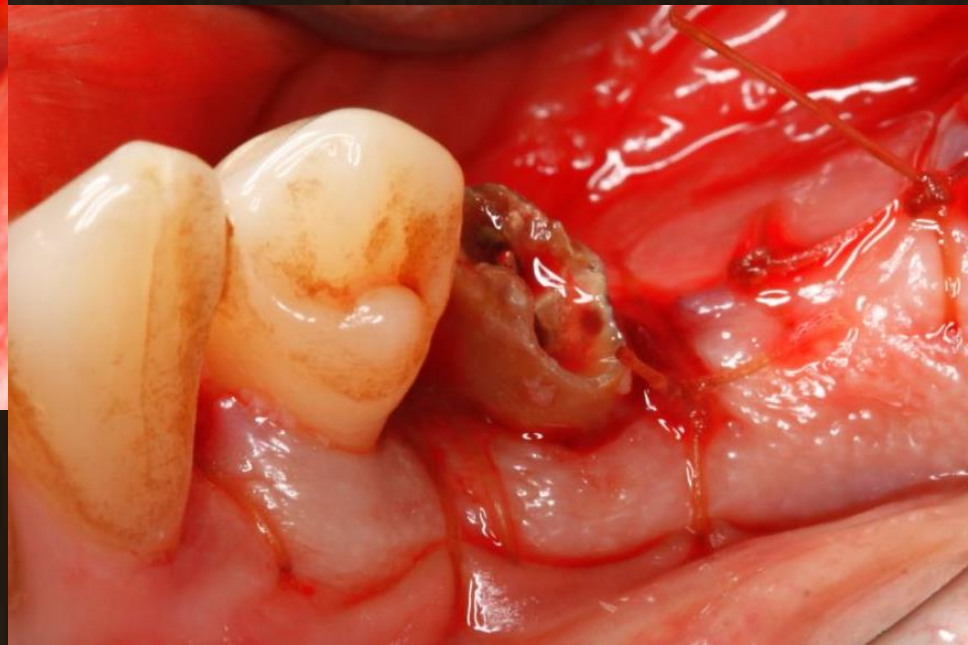






Case 8



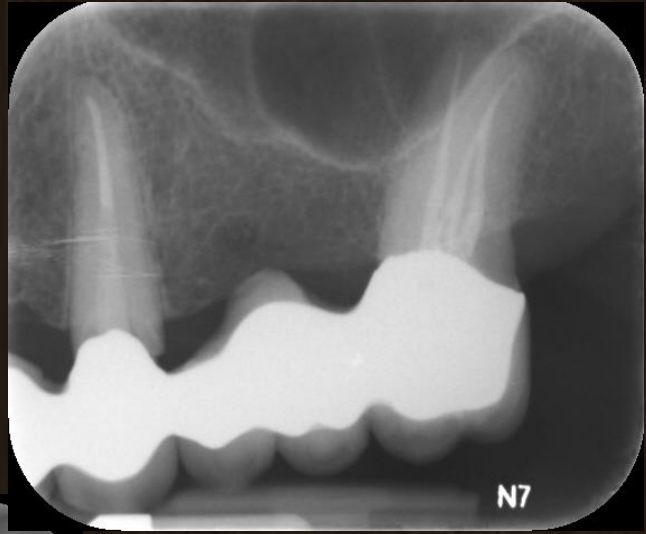


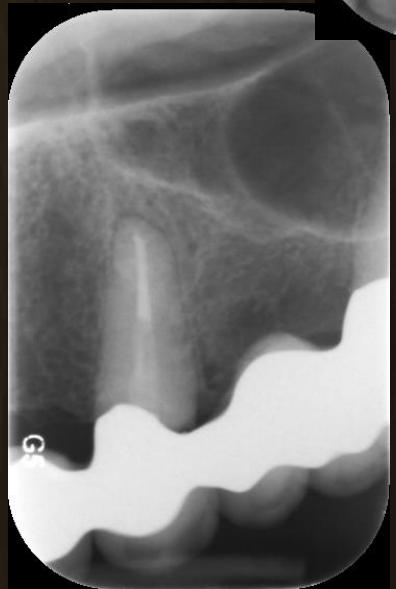
Case 8

Case 8

Case 8

Case 10

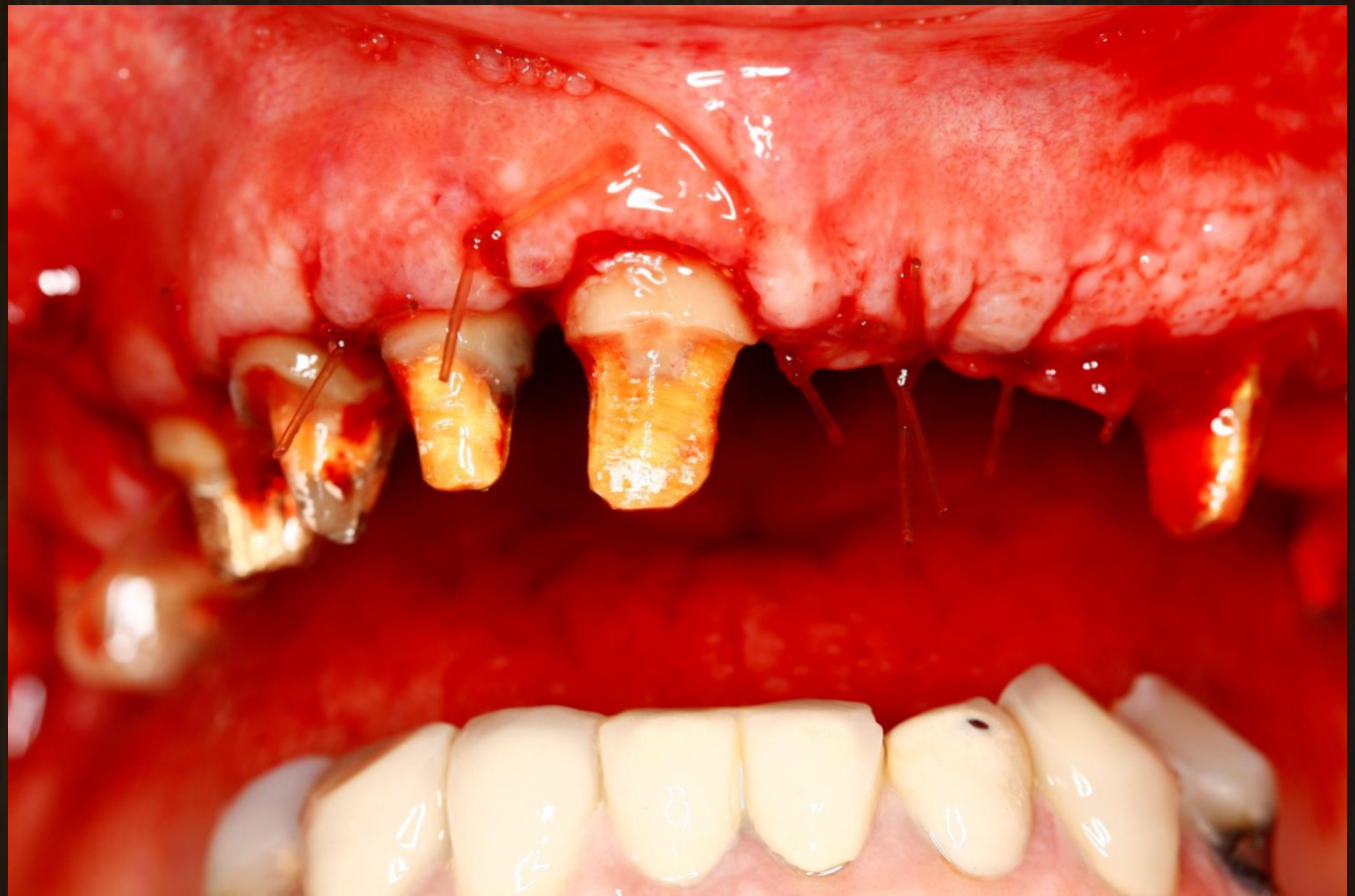




Case 10

Case 10

Case 10



Case 10

Case 10

Case 10

Case 10

Should I Refer?

Easier ⟷ **Harder**

- Non-aesthetic area
- Long roots (good post-op C:R ratio)
- Long root trunks (no furcation involvement)
- No large blood vessels/nerves
- Plenty of gingiva
- Deep palate/floor of mouth/ vestibule

- Aesthetic area
- Short roots (poor C:R ratio)
- Short root trunks (furcation involvement possible)
- Blood vessels/nerves close
- Inadequate gingiva
- Shallow palate/floor of mouth/ vestibule

Overview

1. Introduction
2. Clinical Crown Lengthening
3. Ridge Preservation

Objectives

By the end of this part, you should be able to:

- Understand what happens to the alveolar ridge following dental extractions
- Be familiar with common materials and techniques used to preserve the alveolar ridge
- have an idea of what results to expect from the procedure, as well as see how these results influence the subsequent implant placement

Overview

1. Post-extraction healing
2. Considerations for implant placement
3. Ridge preservation materials
4. Ridge preservation technique
5. Cases

Overview

1. Post-extraction healing

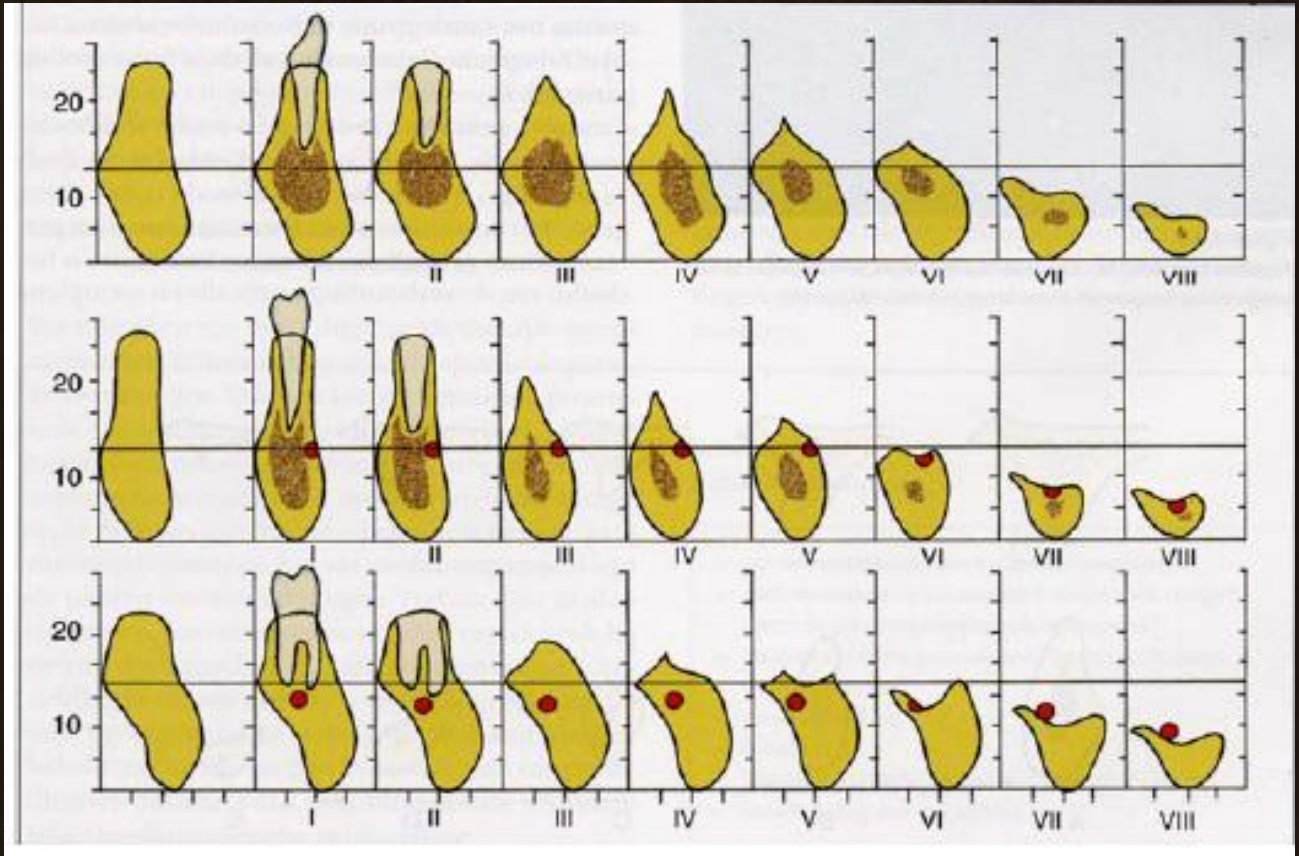
Post-Extraction Healing

- What happens to the alveolus following an extraction?

Hard Tissue Changes

- The most significant change is a change in ridge width
- This occurs more on the buccal aspect[7]

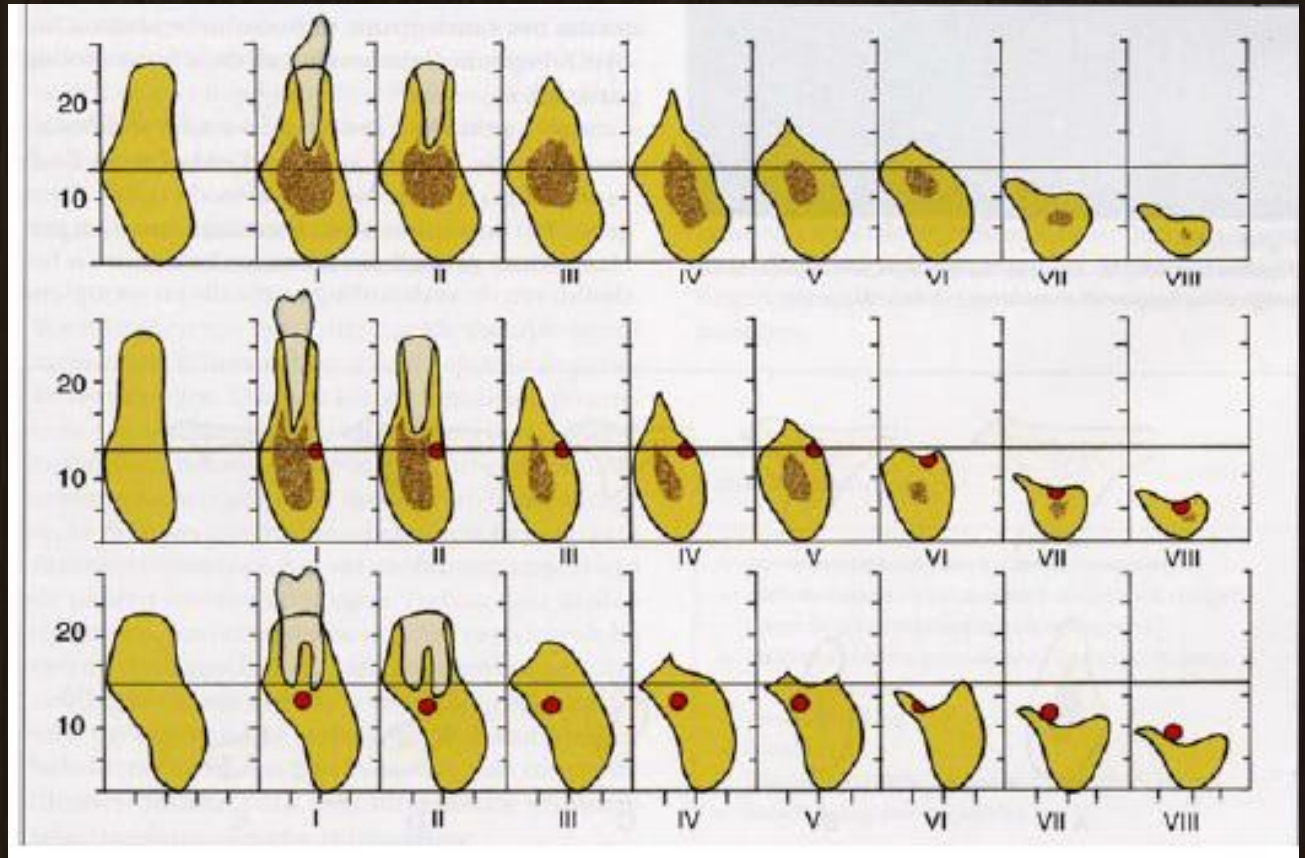
Hard Tissue Changes



Hard Tissue Changes

- There is a concomitant, though slightly less pronounced, decrease in height
- This occurs mainly on the buccal aspect[7]
- Over time, the ridge flattens

Hard Tissue Changes



Ridge Preservation

- Ridge preservation (aka socket preservation, aka site preservation) is any procedure undertaken at the time of extraction of a tooth, to retain normal healthy contours of alveolar bone, and the overlying soft tissue
- Today we will place our emphasis on the bone

Indications – Ridge Preservation

1. Extraction of a tooth for eventual implant insertion
2. Extraction of a tooth for eventual FPD insertion
3. Extraction of a tooth for eventual RPD insertion

Contraindications – Ridge Preservation

1. Patient does not consent to ridge preservation
2. No treatment plan exists to use the ridge in question for any form of restoration

Overview

1. Post-extraction healing
2. Considerations for implant placement

Screw it in

- When you place a screw into wood, you want the width of the wood to be larger than the diameter of the screw, right?
- Same thing for implant placement
- Why?

Phenotype

- It is now time to discuss phenotype as it relates to teeth and implants
- What is phenotype?

Phenotype

- Phenotype refers to the thickness and form of the periodontal soft and hard tissues

Phenotype: Thick vs. Thin

- A thicker soft tissue phenotype is associated with a thicker osseous morphotype (thicker labial bony plate), and vice versa[8,9,10]

How Do You Measure Phenotype?

- Multiple methods have been suggested, but the most validated is the ability to see a probe through the sulcular/pocket[9] tissues
- Visibility implies a thin phenotype

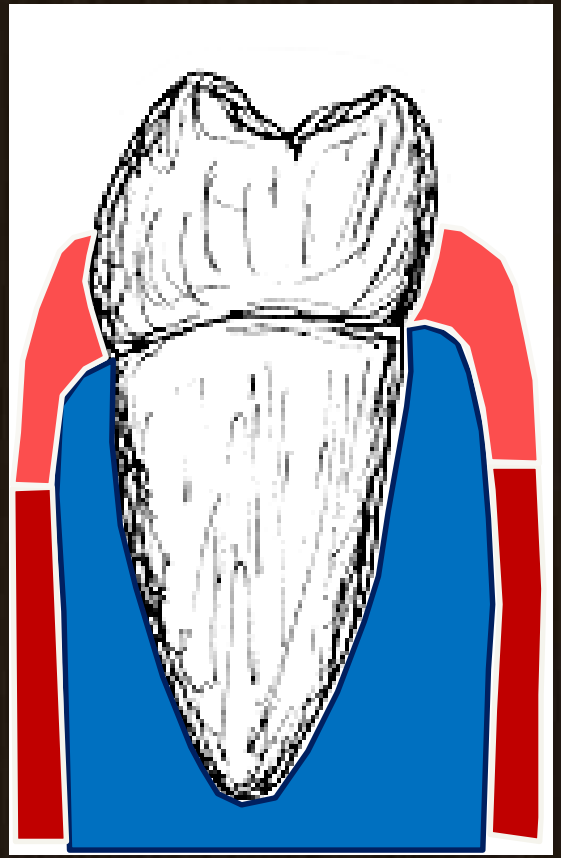
Who Cares?

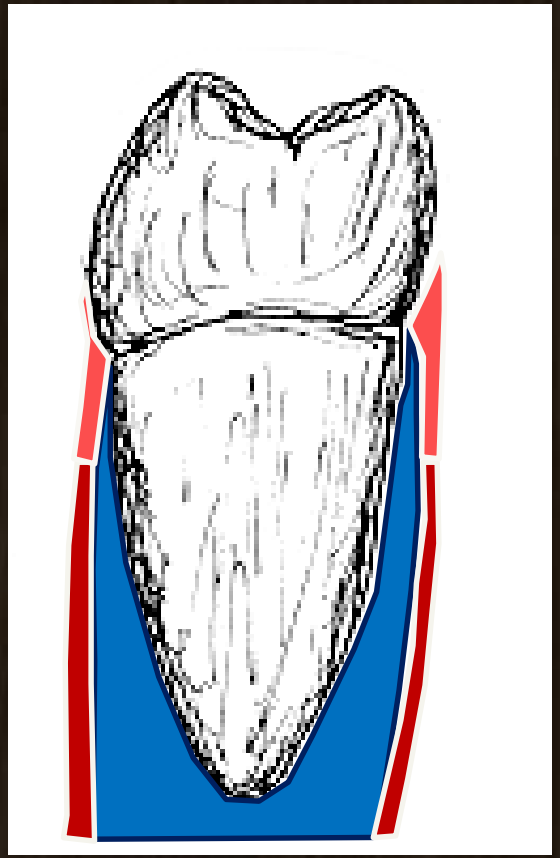
- Why is phenotype so important?
- Because….

Phenotype determines response to insult

Recession vs. Pocket Formation

Phenotype: Thick vs. Thin

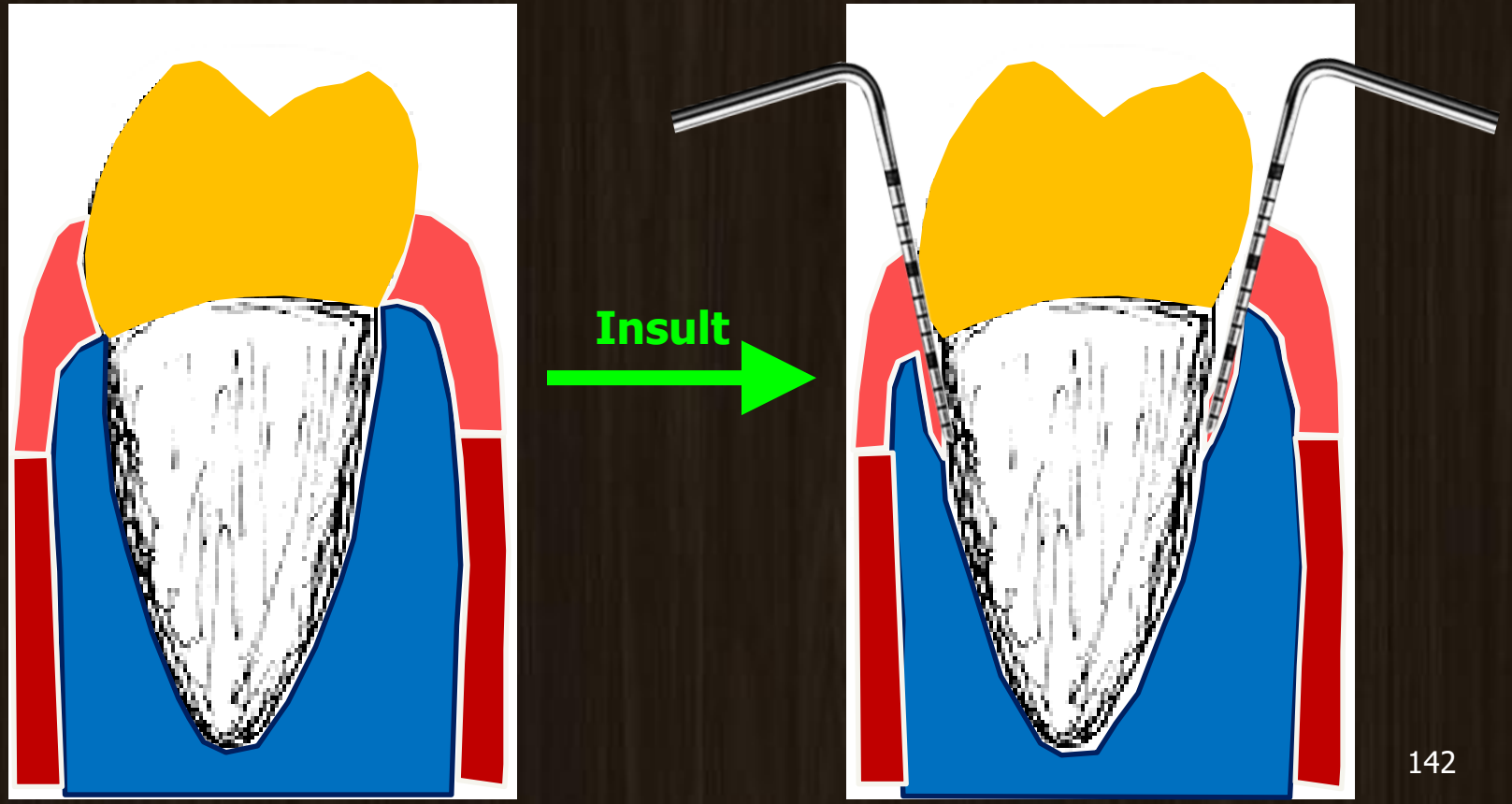




Thick Phenotype

- In response to an insult (traumatic, inflammatory, invasion of supracrestal attached tissues etc.), a thick phenotype will **form a pocket**[11,12]

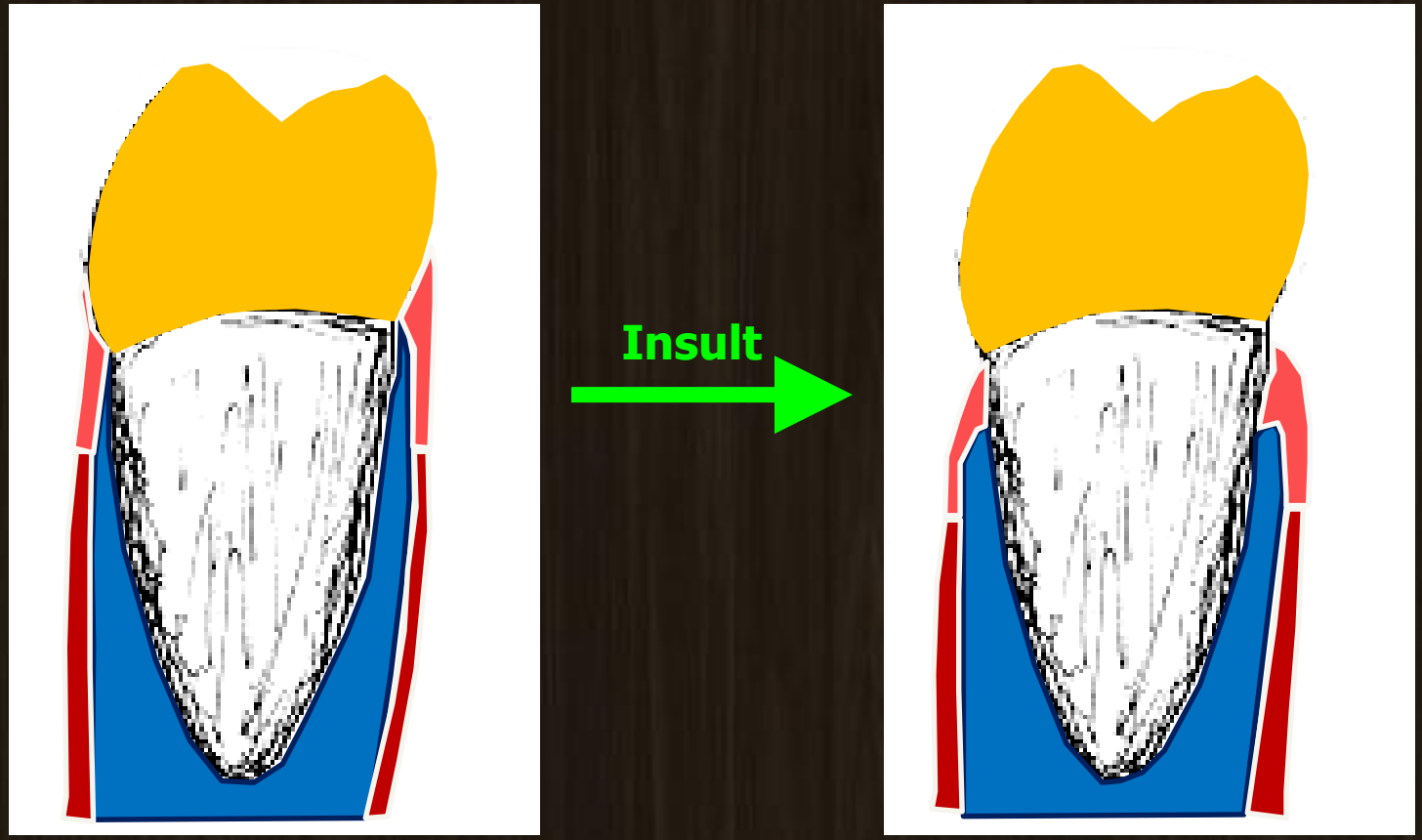
Thick Phenotype



Thin Phenotype

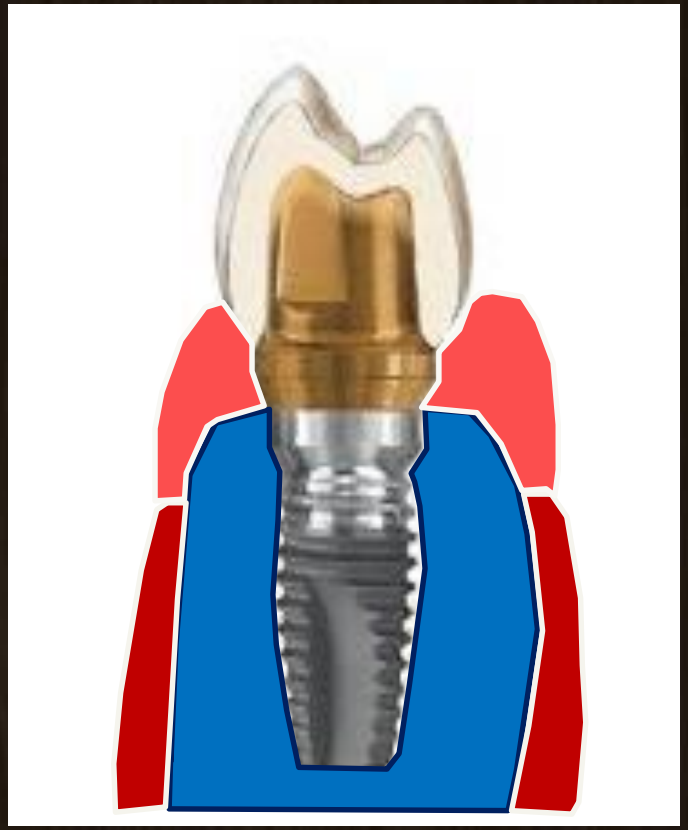
- In response to an insult (traumatic, inflammatory, invasion of supracrestal attached tissues etc.), a thin phenotype will **recede**[11,12]

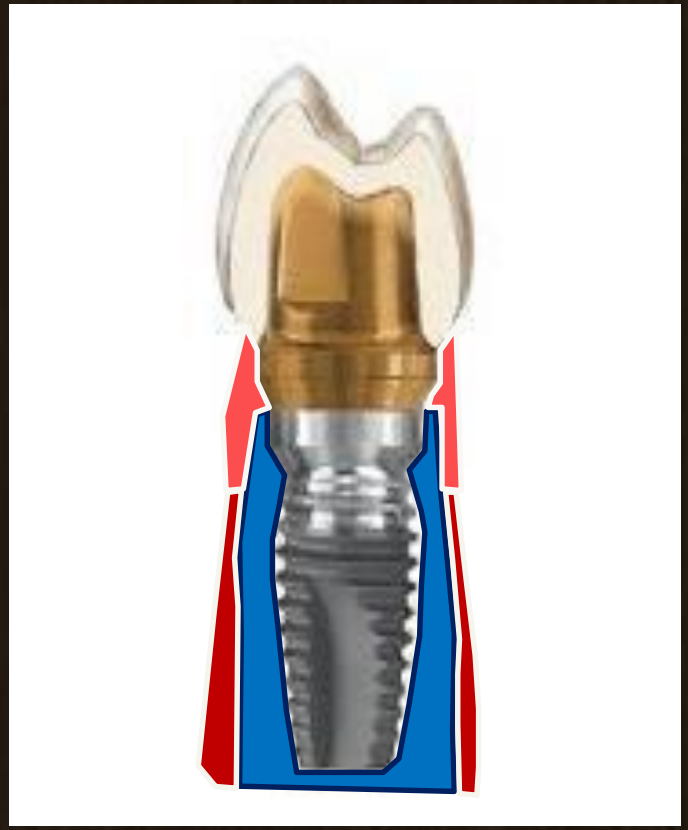
Thin Phenotype



How does this relate to implants?

Implant Phenotype





Implant Phenotype

- The exact same rules which applied for teeth apply to implants[13], in terms of thick phenotypes leading to deeper pockets around implants when insulted, and thinner phenotypes leading to recession
- Recession is most often an issue….

Buccally

- Why? Because of
  1. the tendency of buccal bone to resorb the most, and
  2. the position/angle of certain implants needing to be biased towards the buccal, and
  3. the finite amount of attached keratinized tissue,

this is the area which is most at risk for becoming **phenotypically thin**

The Point

- A lot of our treatment planning and execution in implantology is based around ensuring a **thick** phenotype on the buccal aspect of the implants we place

Wait a minute!

Pocket Depth vs. Recession

- Why do we favour deep pockets around implants and avoid recession as much as possible, when the opposite is true around teeth?

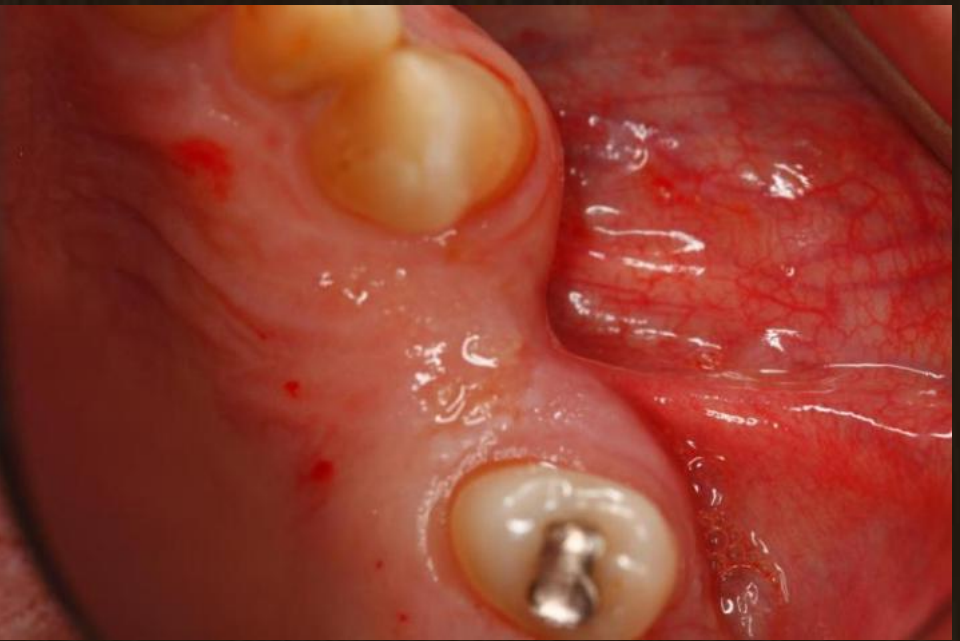
Implant Recession

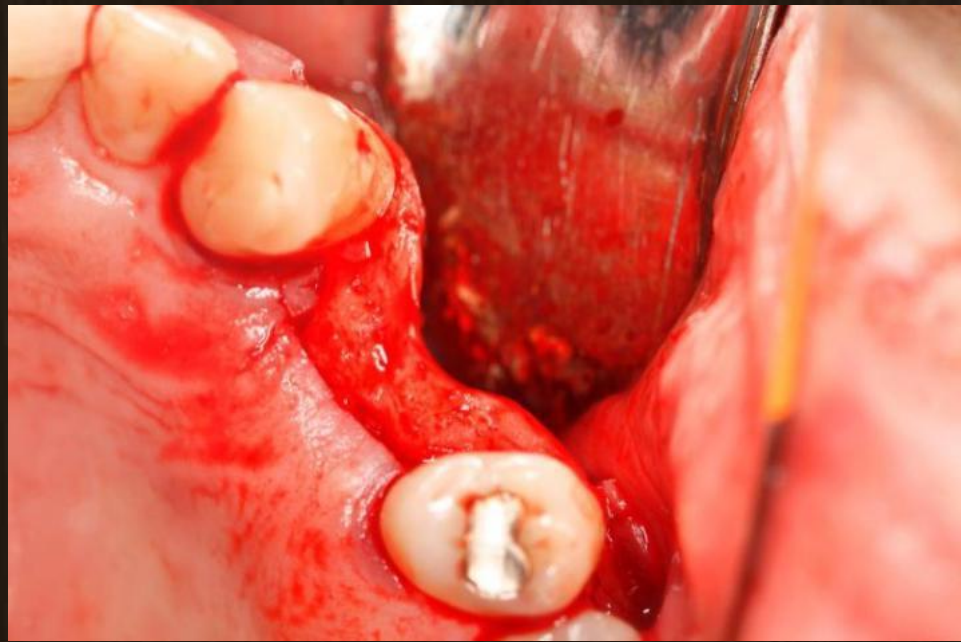
Implant Pocket Depth

- We are still concerned about very deep pockets around implants, as they foster the same pathological microbiological growth as deep pockets around teeth[14]
- However, we tolerate pockets up to 6mm around implant as long as they are not bleeding, since their association with peri-implantitis is poor[15,16]

The Point

- If the buccal ridge resorbs too much….



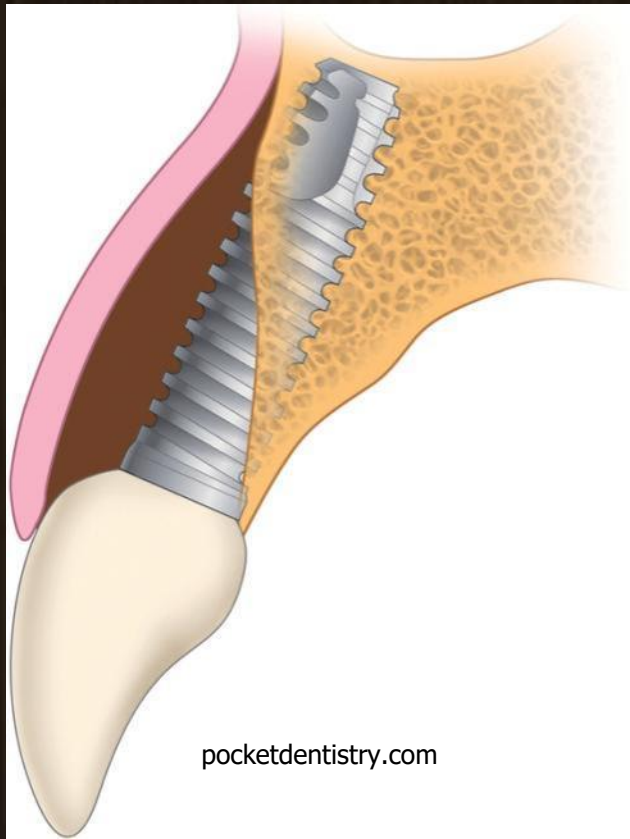


Ridge Augmentation

- Treating the previous situation is not a problem, but it is more expensive for the patient, and depending on the technique/materials, can add up to an extra year of healing time

Ridge Augmentation

- Alternatively, imagine trying to place an implant in a resorbed site, and having to graft around it
- You can do it, but the functional and esthetic outcomes are less predictable



Ridge Preservation

- Hence, rather than having to do a ridge augmentation procedure prior to implant placement, and/or rather than risking a poor esthetic outcome by grafting at the time of implant placement, why not save time, money, and better predict the outcome by **preserving** what we already have?

Overview

1. Post-extraction healing
2. Considerations for implant placement
3. Ridge preservation materials

Materials

What do you *need* to do a ridge preservation?

- Bone graft
- Membrane

Bone Grafts

- Since we are trying to augment/preserve bone, it only makes sense that we need a bone graft

Bone Graft Characteristics

- Bone grafts can be:
  - **Osteogenic**: containing all the cells to form new bone
  - **Osteoinductive**: containing the growth factors necessary to induce surrounding bone to form new bone
  - **Osteoconductive**: acting as a scaffold for existing bone to grow around

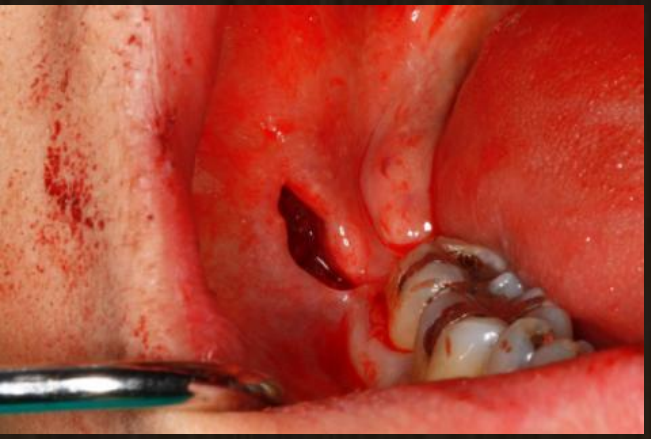
Bone Grafts

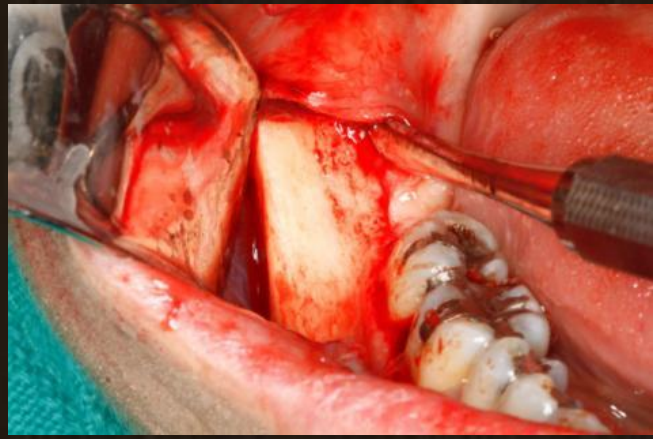
Bone Type		Major characteristics	Resorption
Autograft		From the patient, osteogenic	N/A
Allograft	DFDBA	From a human donor, osteoinductive	Fast
	FDBA	From a human donor, osteoconductive	Slower than DFDBA
Xenograft		From another species, osteoconductive	Slowest
Alloplast		Synthetic	Variable

Autografts

- Because these come from the patient, they contain all the cells necessary to form bone = osteogenic
- The only problem is….

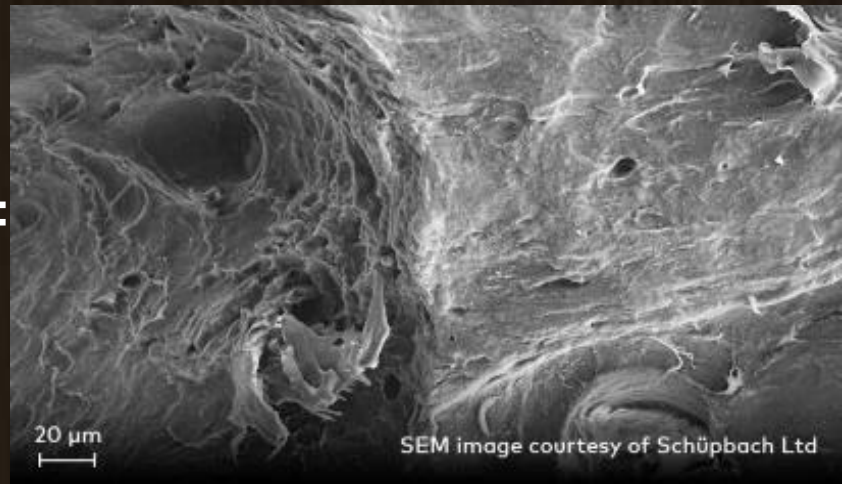
Autografts: 2nd Surgical Site





Allografts - DFDBA

- Demineralized Freeze-Dried Bone Allograft
- Because it is demineralized (means the outer layer of mineral content has been removed), the theory is the growth factors contained therein are more available for immediate use to induce bone formation = osteoinductive



So isn't DFDBA the ideal choice?

Allografts - DFDBA

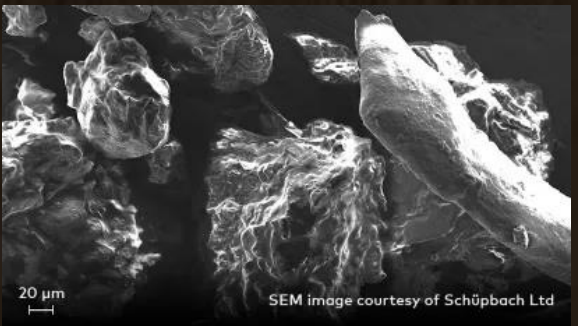
- Not for ridge preservation
- Because it's demineralized characteristic is that it fast to be of any osteo large volume
- Works better for **rege** around teeth

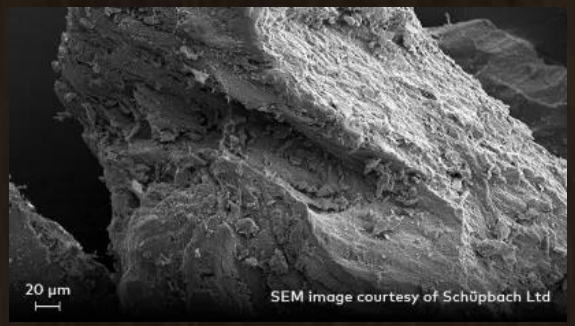
Allografts - FDBA

- Freeze-Dried Bone Allograft
- Because it is mineralized (means the outer layer of mineral content is still there), it takes longer to resorb, and by the time the growth factors get exposed, native vital bone is already forming around it = osteoconductive

Allografts - FDBA

- Characteristics can be modified by changing:
  - the particle size (larger particles take longer to resorb), and
  - whether it is cortical or cancellous bone (cortical resorbs slower because it is more mineralized)





Xenografts

- The standard is anorganic bovine bone
- Takes the longest to resorb

Alloplasts

- Synthetic bone grafting materials
- Some examples are:
  - Bioactive glass
  - β-TCP/Hydroxyapatite
  - Biphasic CP
- Great for patients with religious intolerances to allografts and xenografts, and who do not want a second surgical site for an autograft

Ideal Properties of a Membrane

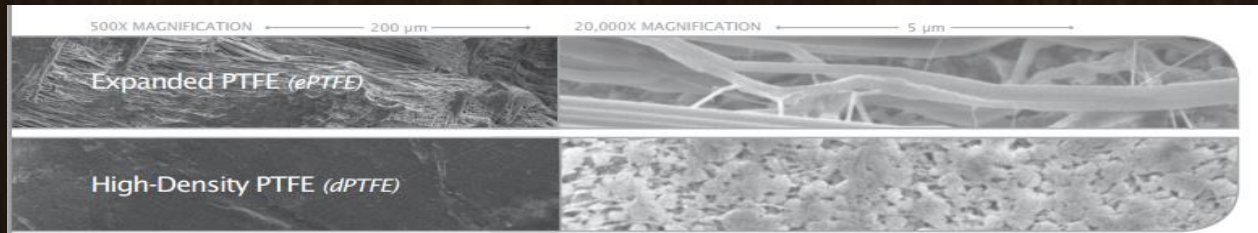
1. Biocompatibility to allow cohabitation with the host tissues without eliciting inflammatory responses,
2. Proper degradation profile to match those of new tissue formation,
3. Adequate handling properties to allow its placement in vivo
4. Sufficient sustained strength to avoid membrane collapse and to promote barrier function

Membranes

Membrane Type	Material	Resorption
Non-resorbable	dPTFE	Never
Resorbable	Collagen (most often)	4-24 weeks
Autogenous	FGG/CTG	N/A
Integrated	Alloderm	Never

High-Density Polytetrafluoroethylene

- aka dPTFE
- Porosity of <0.3µm (claimed to be "impervious to bacteria")
- Coated with plasma proteins, facilitating cellular adhesion

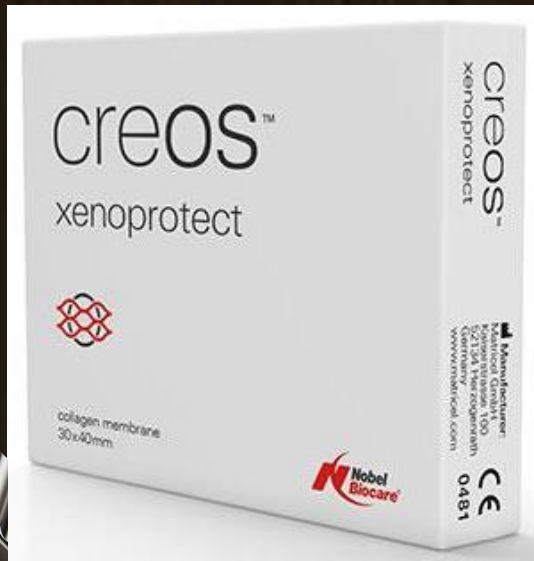


Titanium-Reinforced dPTFE

- If you don't have enough walls around a defect to support the membrane, then the support has to COME from the membrane
- A titanium spine is present on these membranes

Collagen

- Membrane collagen can be:
  - Human (pericardium)
  - Bovine
  - Porcine
  - Type I
  - A mixture of Types I and III



Autogenous

- Another use for free gingival grafts and connective tissue grafts, other than augmentation of attached gingiva/root coverage around teeth, is as a membrane[17]
- Excellent for areas which have thin gingival phenotypes/almost no keratinized tissue

Integrating

- Acellular dermal matrix (ADM) is an allograft extracellular matrix composed of:
  - Type I and VI collagen
  - elastin vascular channels
- Its original use in the mouth related to root coverage procedures
- During this time, it was discovered that its structure integrated with host tissues[18]

So what's the best material/combination of materials to use?

It Doesn't Matter

- If your knowledge of anatomy and biology is good, and your technique is sound, any and all of the above materials can give you the result you want[19-29]

Alternative Materials (PRF, Emdogain®, blah blah blah….)

- They work[30,31,33]
- They're not *necessary*[30,32,33]

What Sutures Should I Use?

- It depends on for how long you want the sutures to be there
- The larger the area of exposed membrane, the longer you need your sutures to hold everything in place → non-resorbable sutures are better

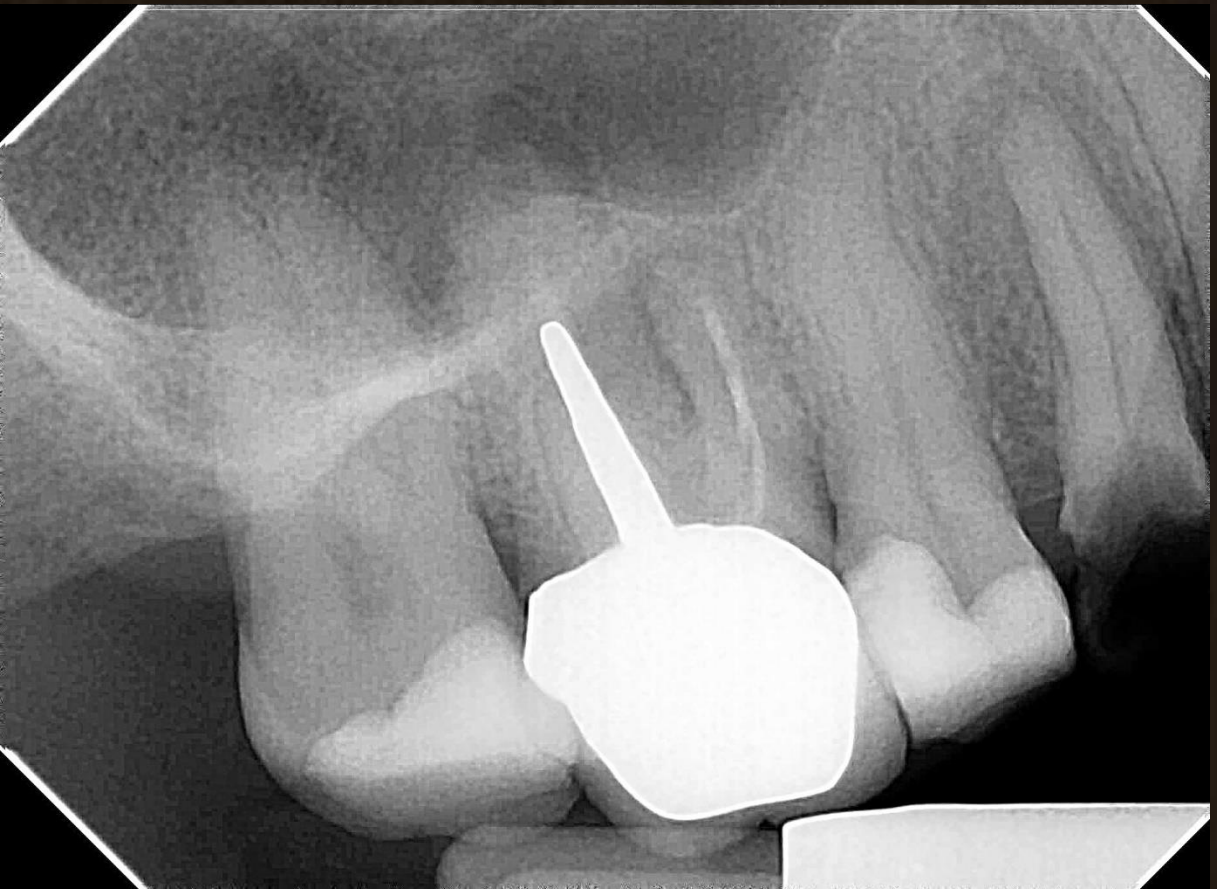
What Sutures Should I Use?

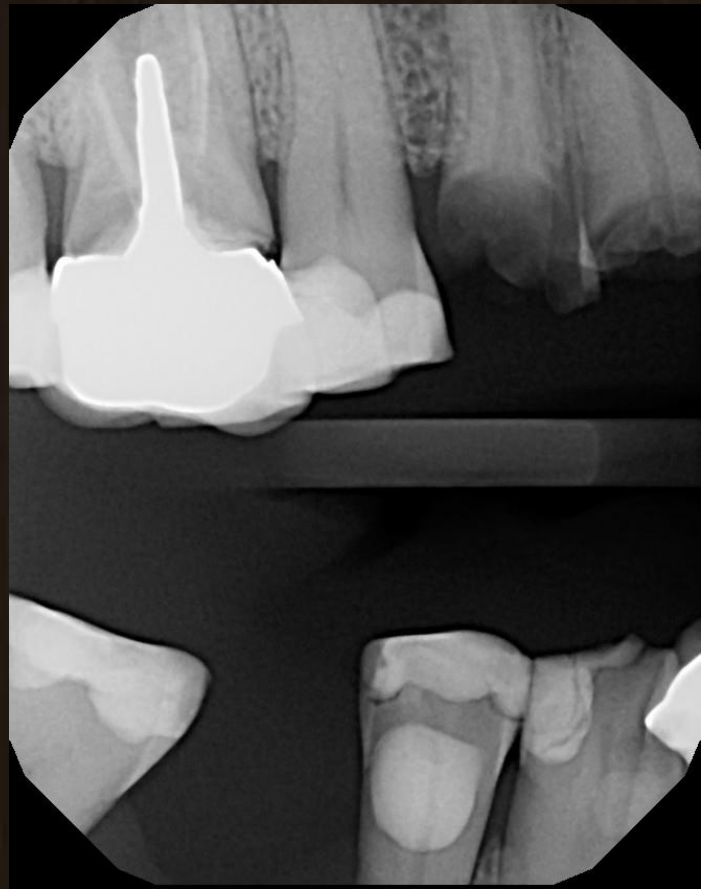
- On the other hand, if the flap naturally comes together with primary closure → resorbable sutures will work just fine
- Advise using 4-0 with FS-2 needles for posterior areas, and 5-0 with P-3 needles for anterior areas

Overview

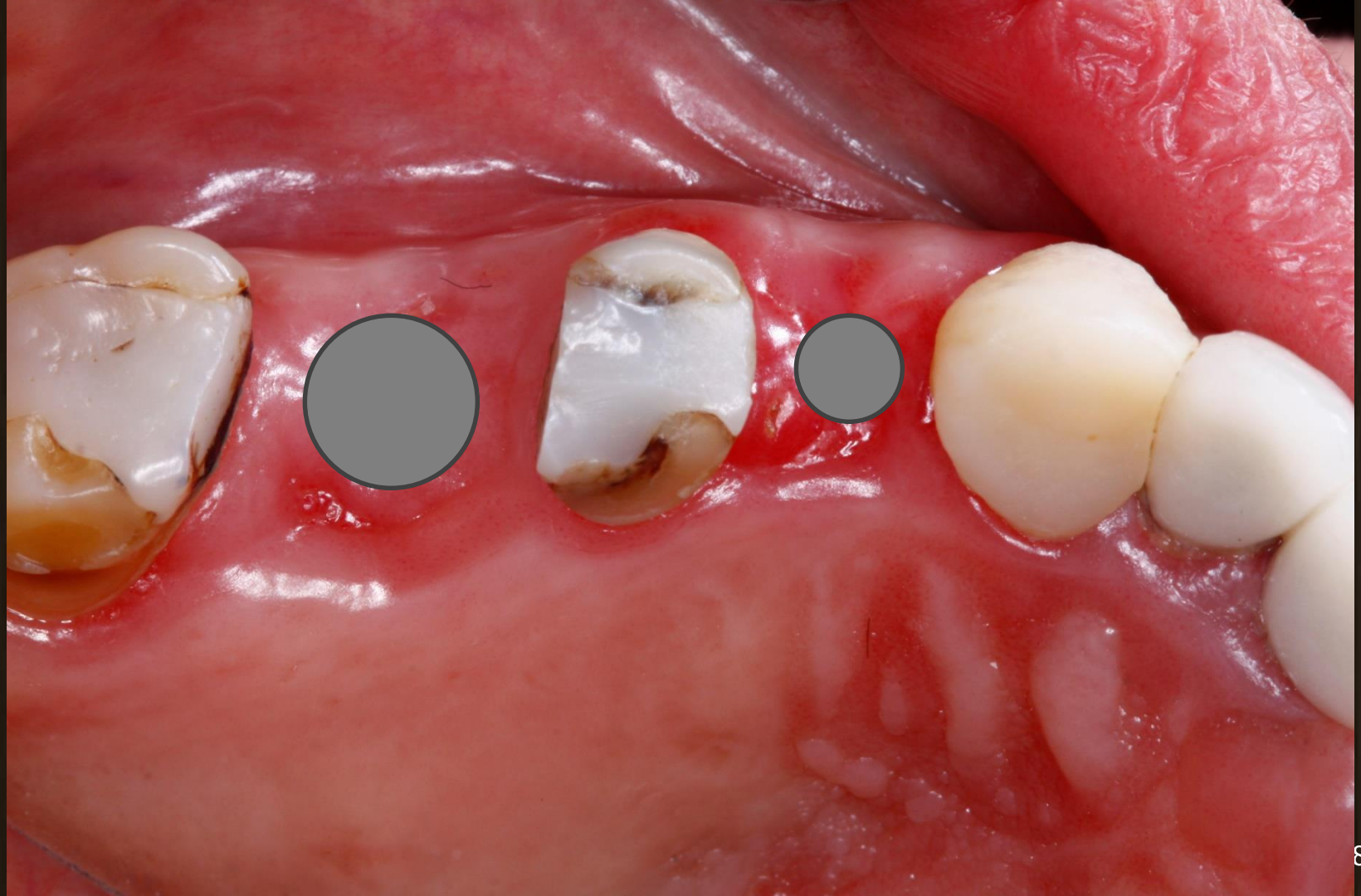
1. Post-extraction healing
2. Considerations for implant placement
3. Ridge preservation materials
4. Ridge preservation technique

Case 11





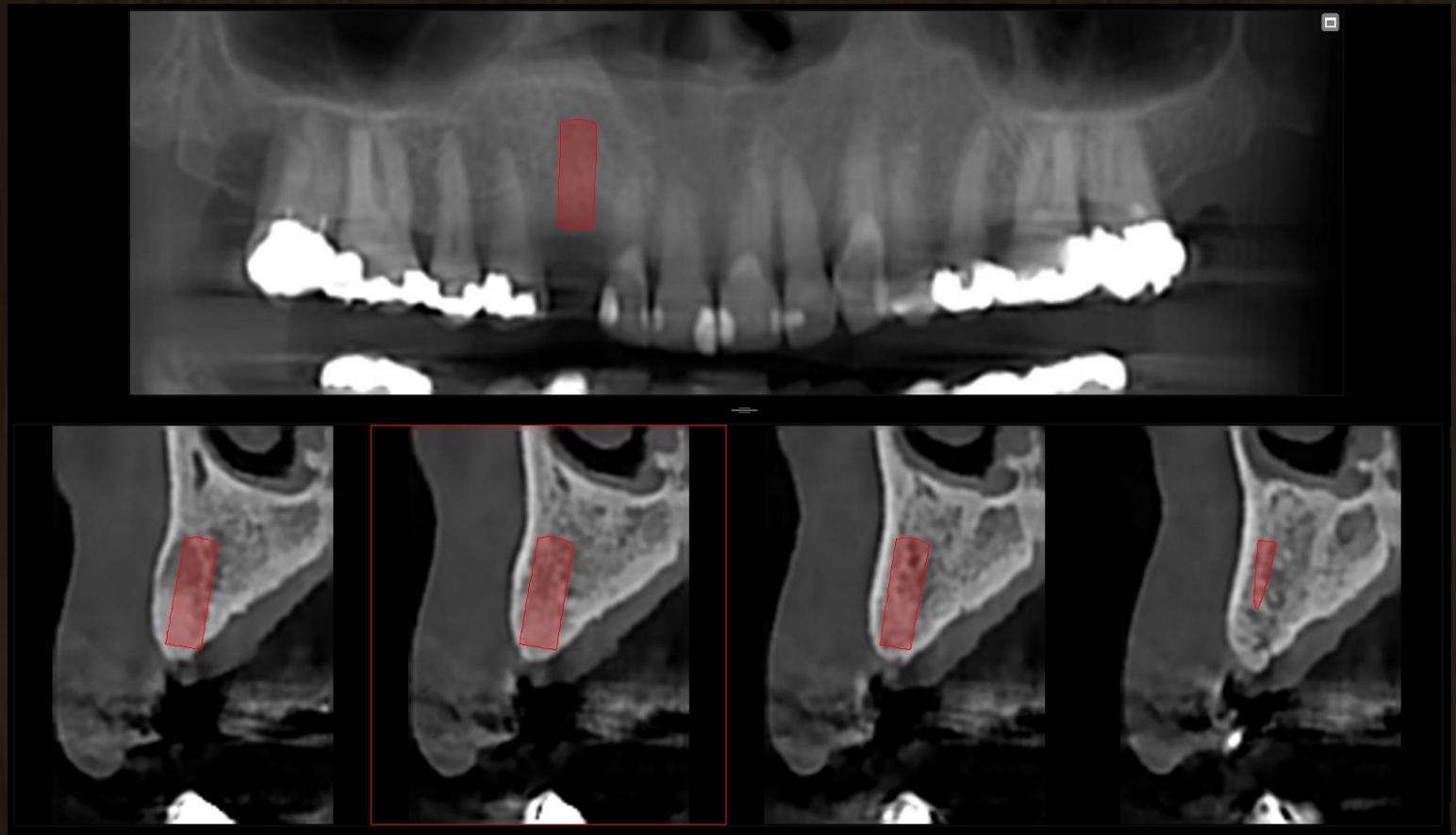
Post-op 6 weeks



Case 12

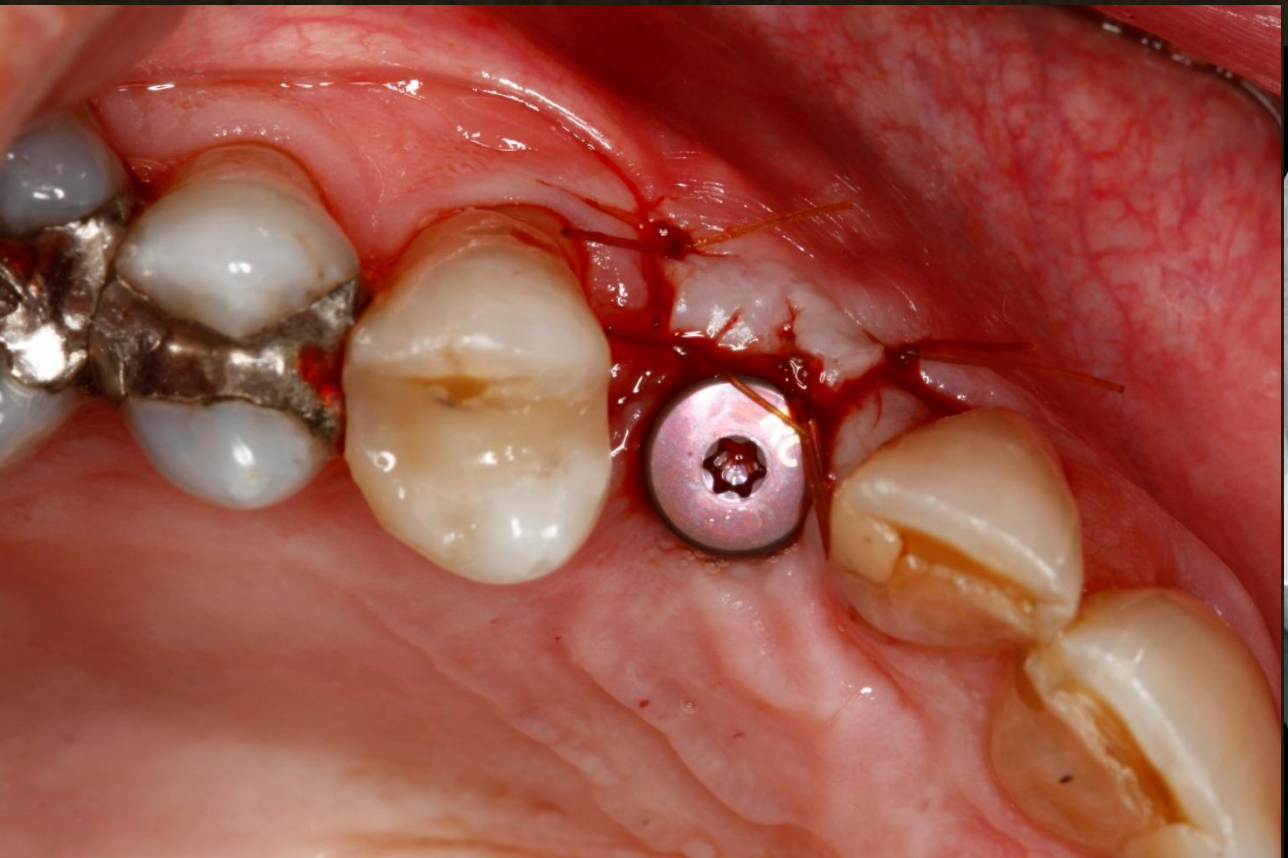
Post-op 4 Weeks

CT Scan



Day of Implant Placement

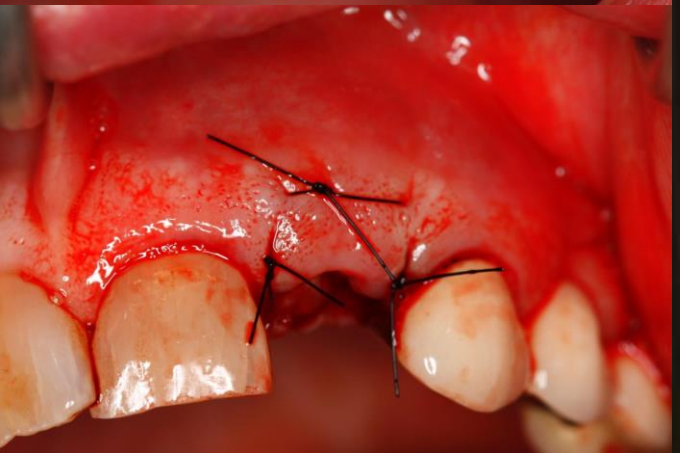
Implant Placement

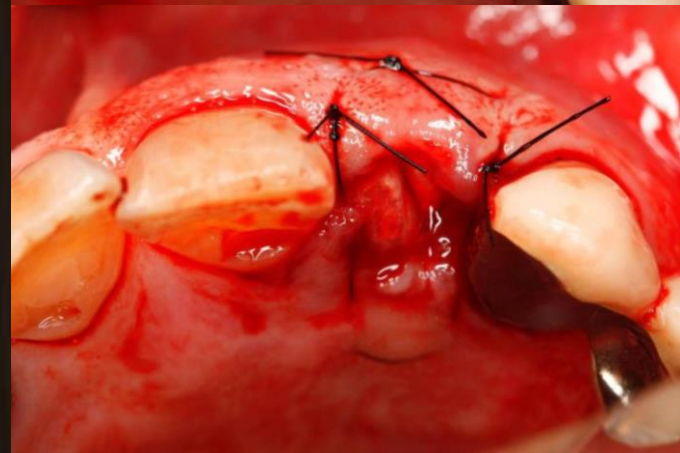


Overview

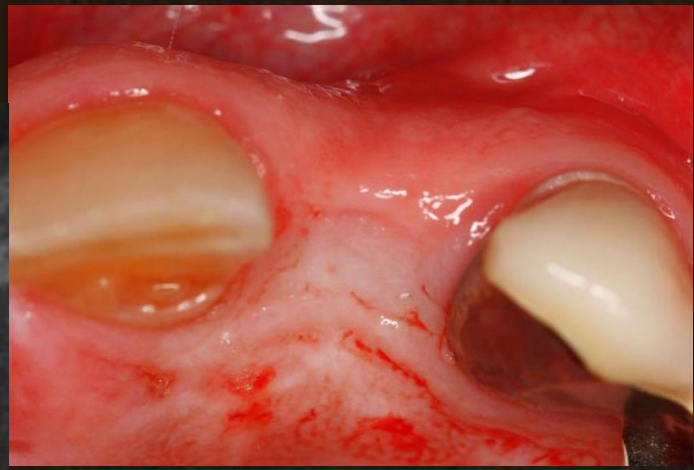
1. Post-extraction healing
2. Considerations for implant placement
3. Ridge preservation materials
4. Ridge preservation techniques
5. Cases

Case 13



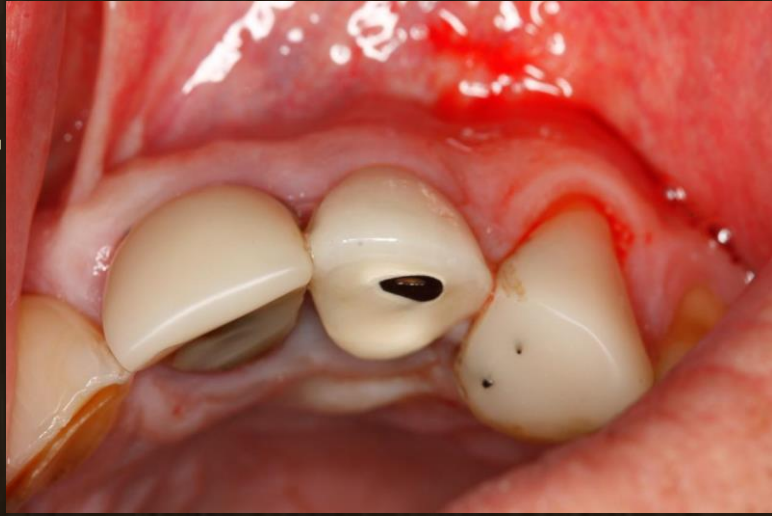


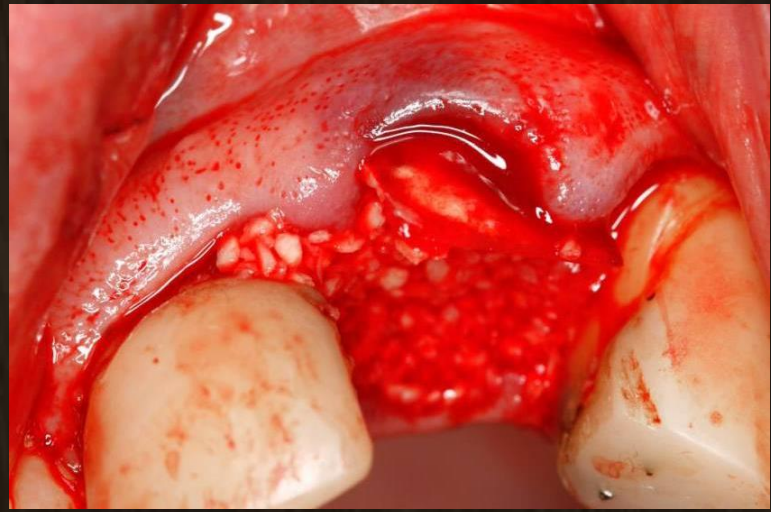
Case 13



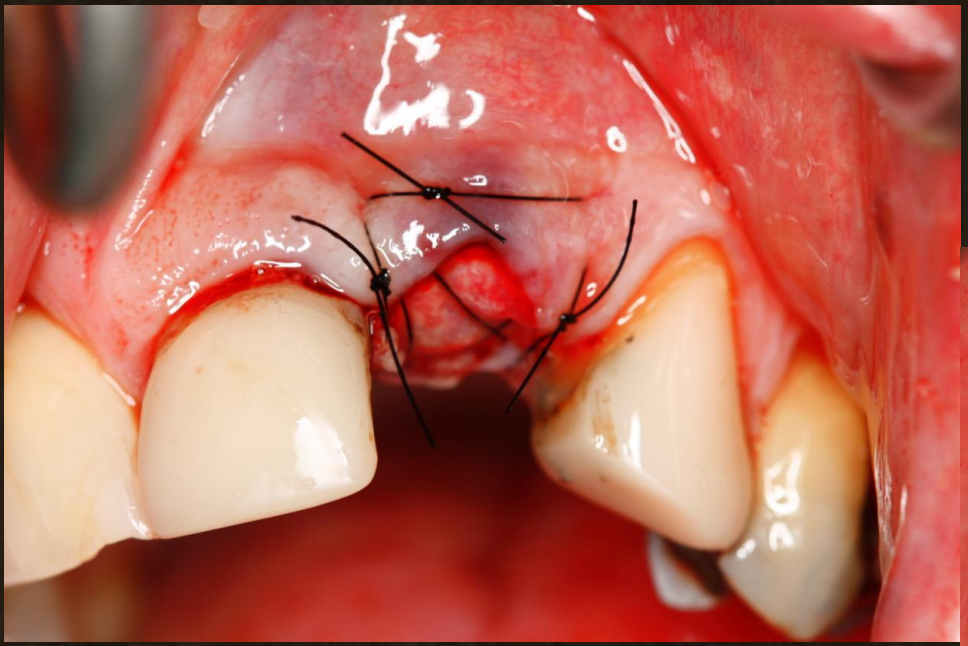
Case 14

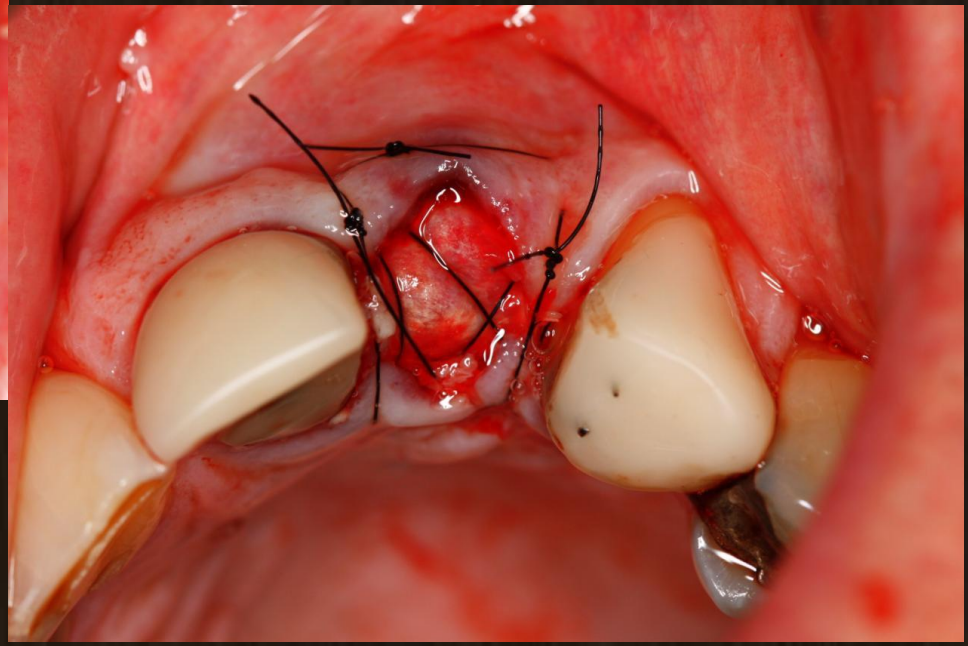
Case 14





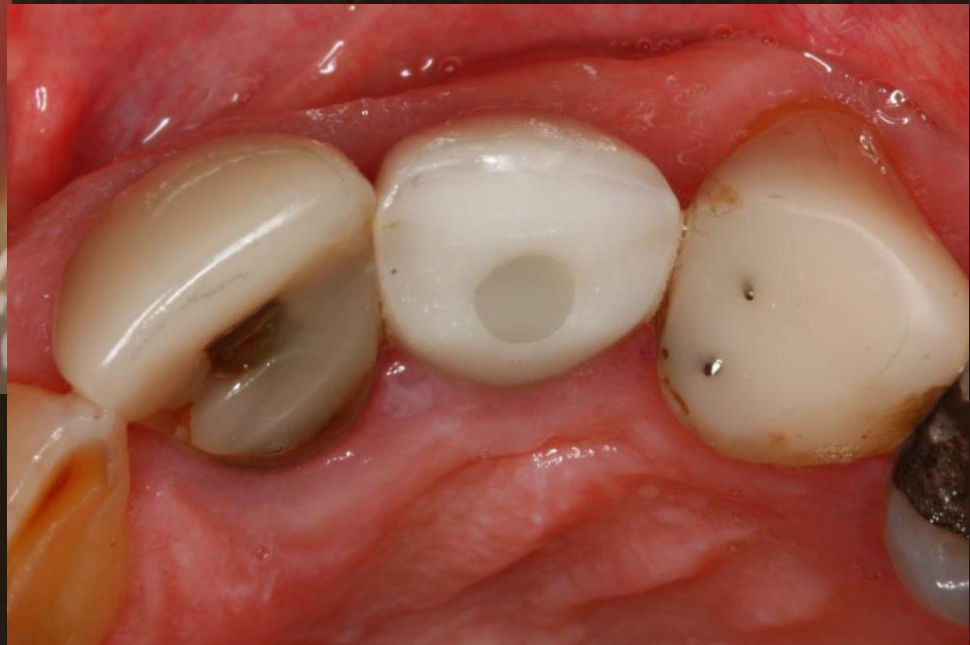
Case 14





Case 14

Case 14

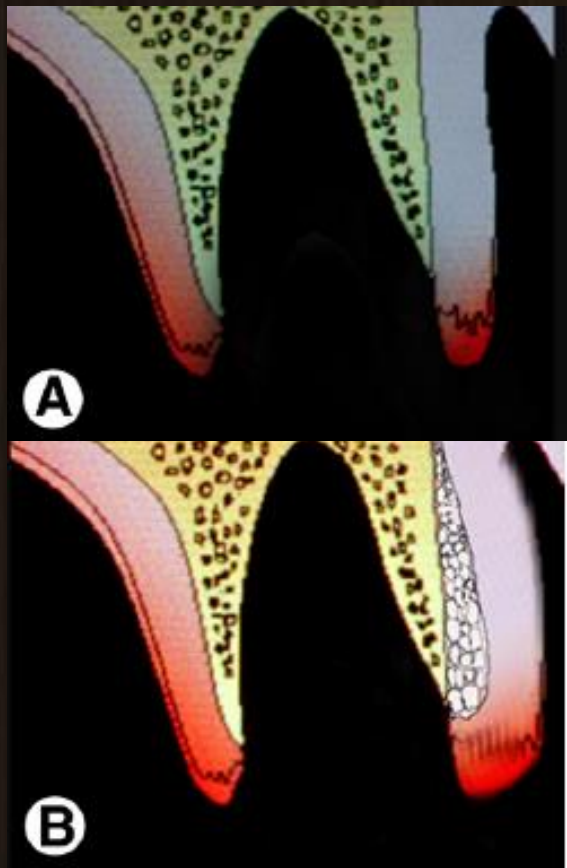


To Flap, or not to Flap?

- Very controversial
- In theory, if you reflect a flap off of bone, you get some resorption of the bone
- This can lead to a reduction in ridge width, compared to flapless procedures[34]
- However….

To Flap, or not to Flap?

- The buccal aspect of the ridge is going to resorb anyway if the bone is thin, or not present at all[35]
- Grafting on the buccal aspect can prevent this problem, and of course necessitates a flap[36]



The Lie of "Atraumatic Extraction"

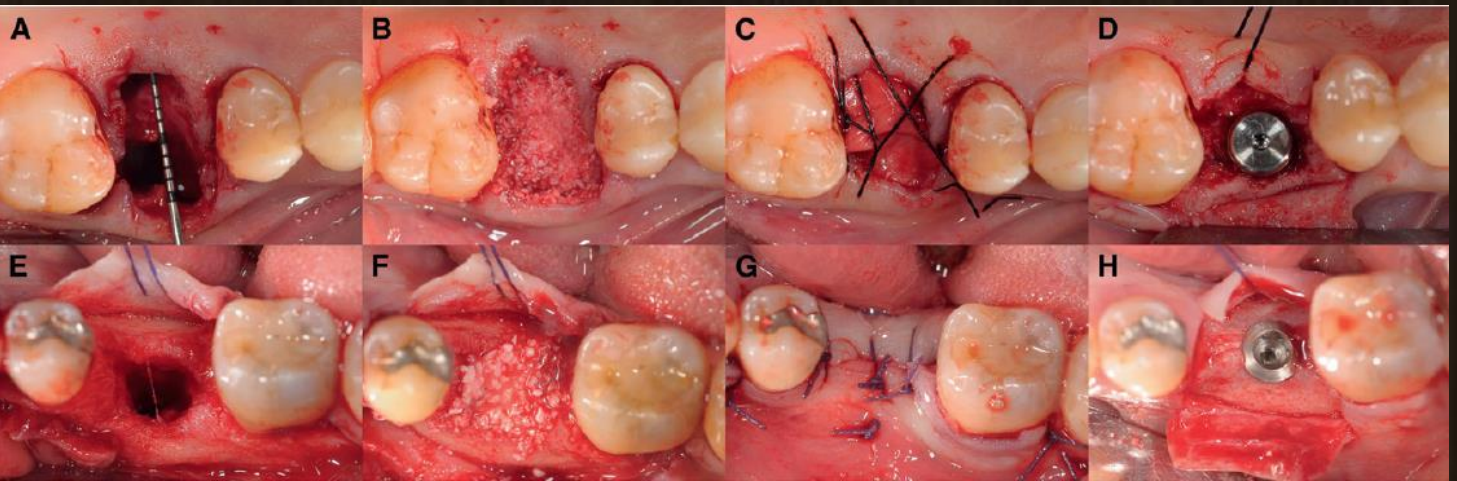
- It is a common research tagline that for ridge preservation to be successful, the tooth/teeth in question must be extracted in an atraumatic fashion
- **THERE IS NO SUCH THING AS AN ATRAUMATIC EXTRACTION**

The Lie of "Atraumatic Extraction"

- The buccal aspect of the ridge is going to resorb anyway if the bone is thin, or not present at all[35]
- If the buccal bone is thick, and the tooth is endo-treated, or undermined with caries, you're more likely to break the tooth than the bone (and this may necessitate bone removal to retrieve the root)
- In other words, don't worry about it too much

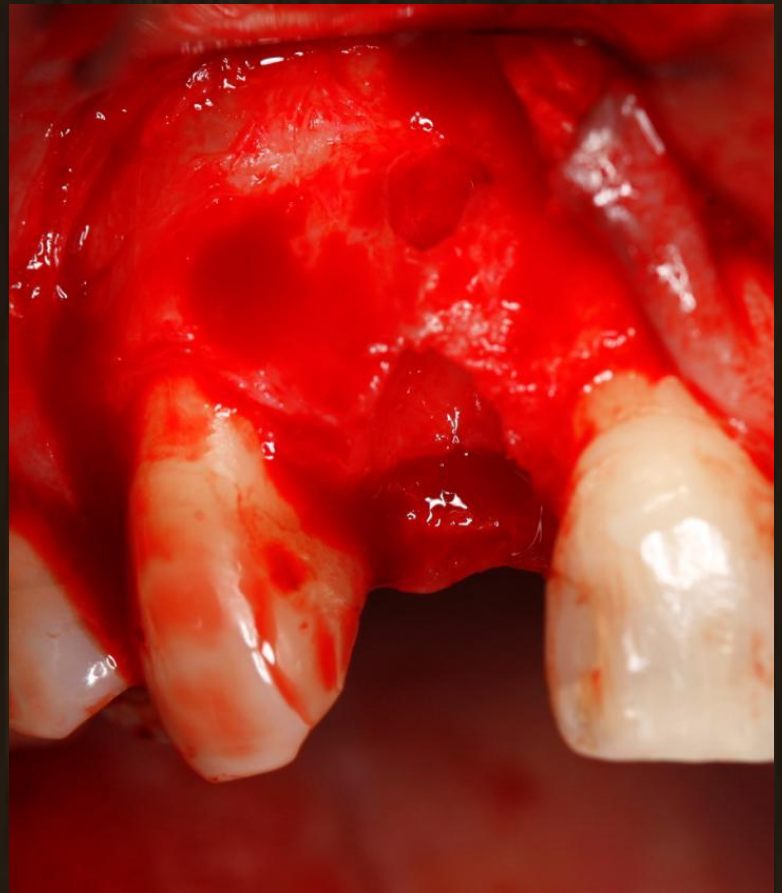
Do You Need Primary Closure?

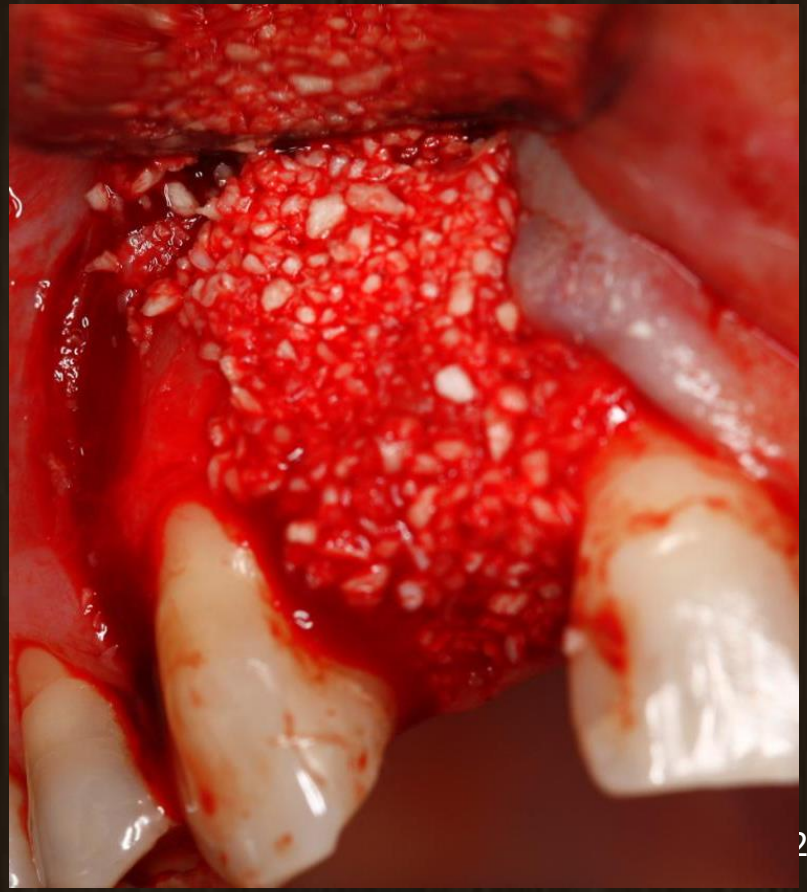
- If you can live with an exposed membrane, and slower early wound healing, then **NO**[35,37]



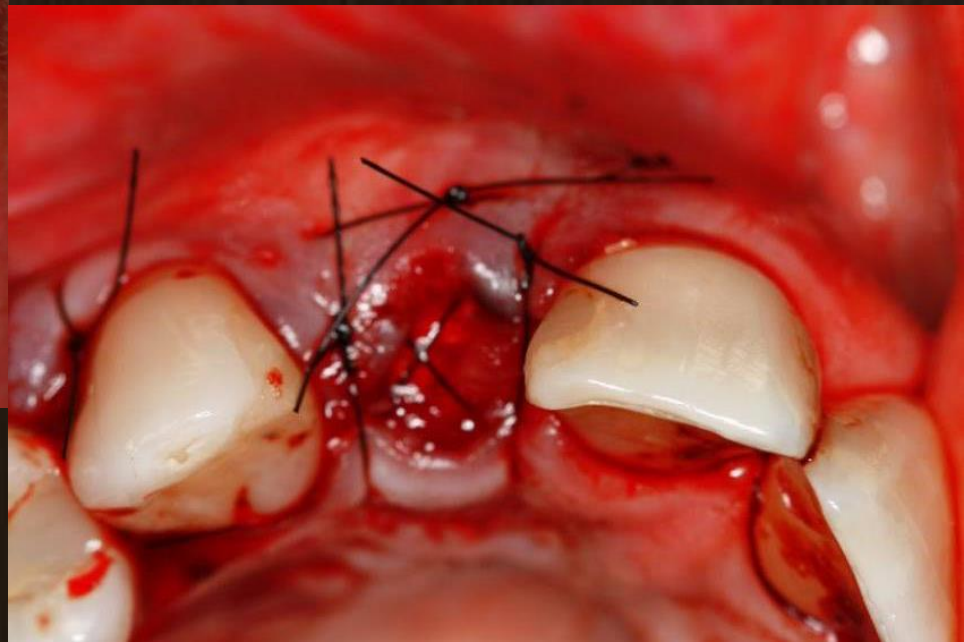
Case 15

Case 15

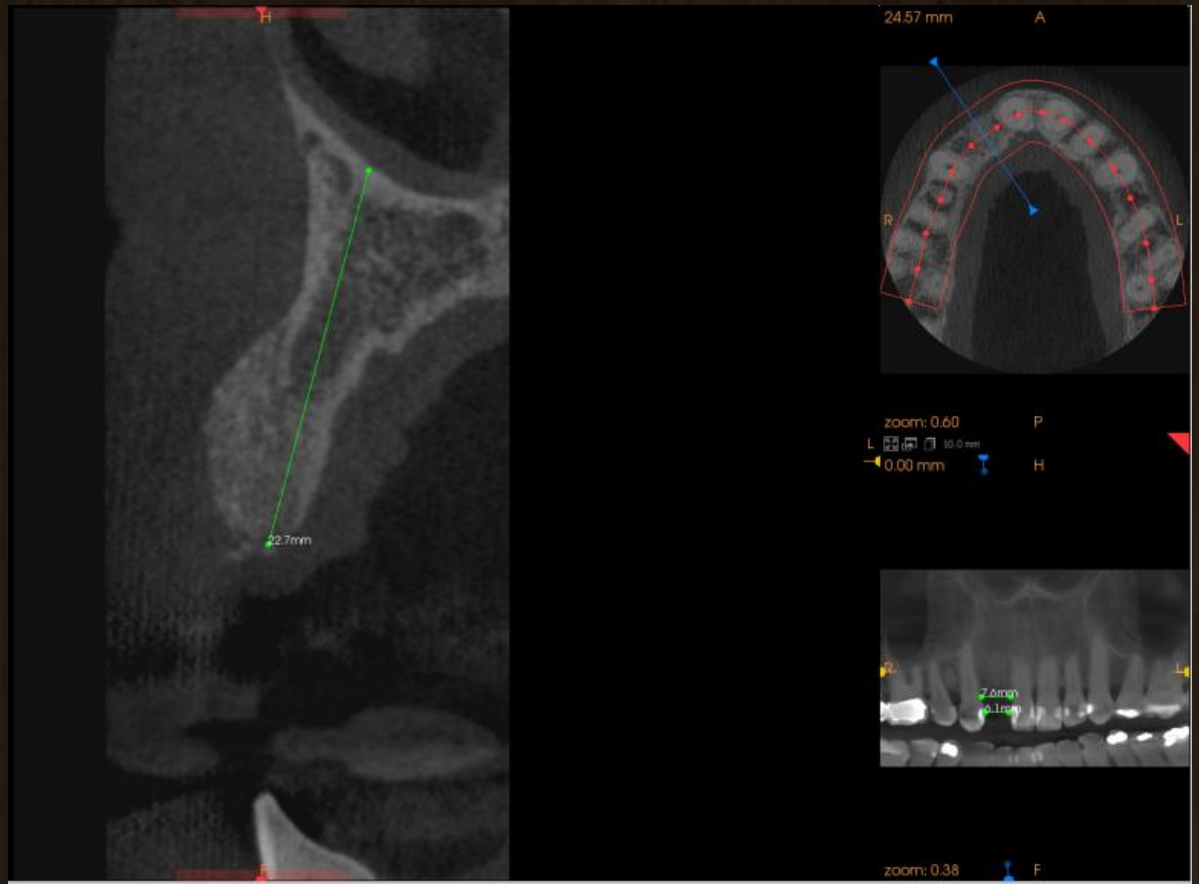




Case 15



Case 15



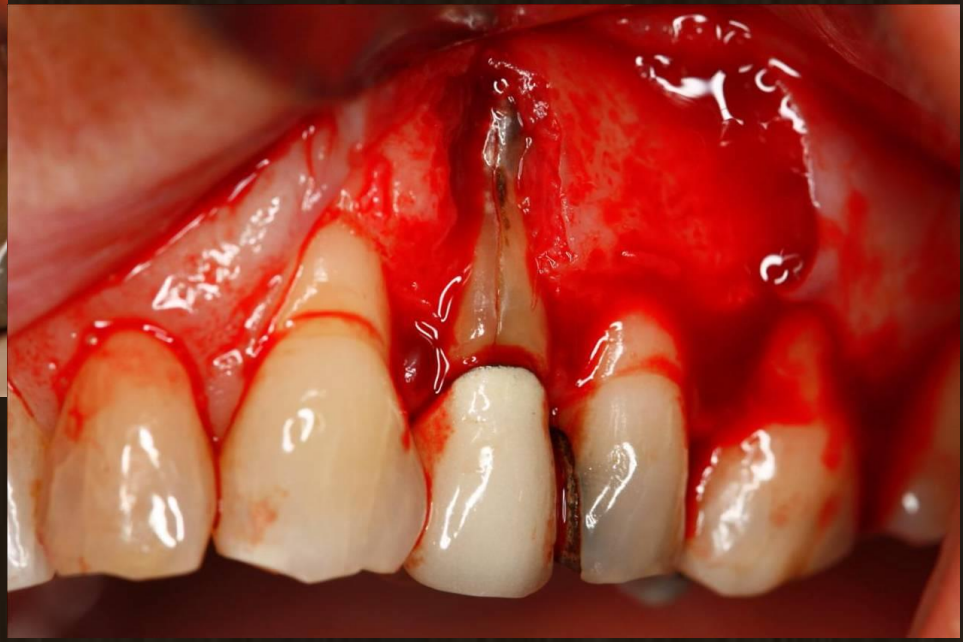
Case 15

Case 15

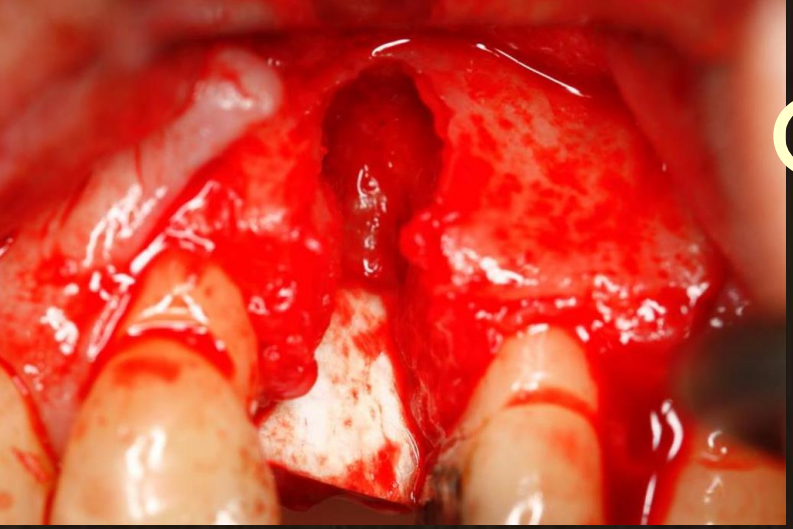
Case 16

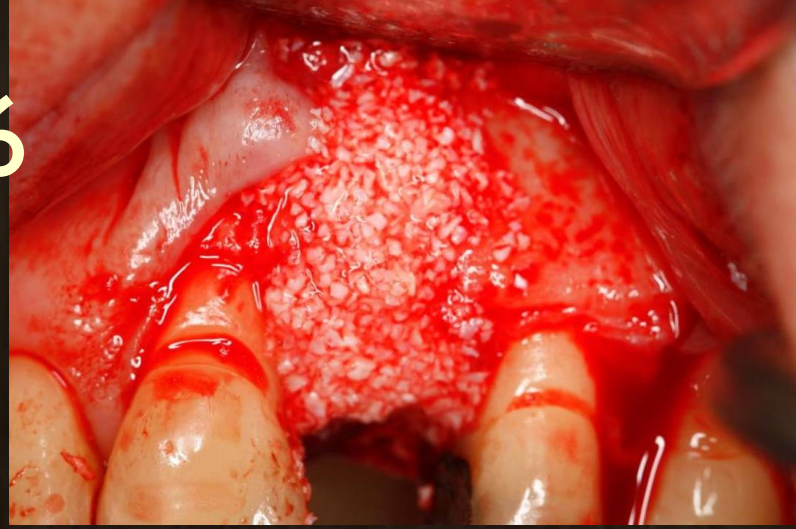
"10mm pocket on the mid-buccal, 8mm on the mid-palatal"

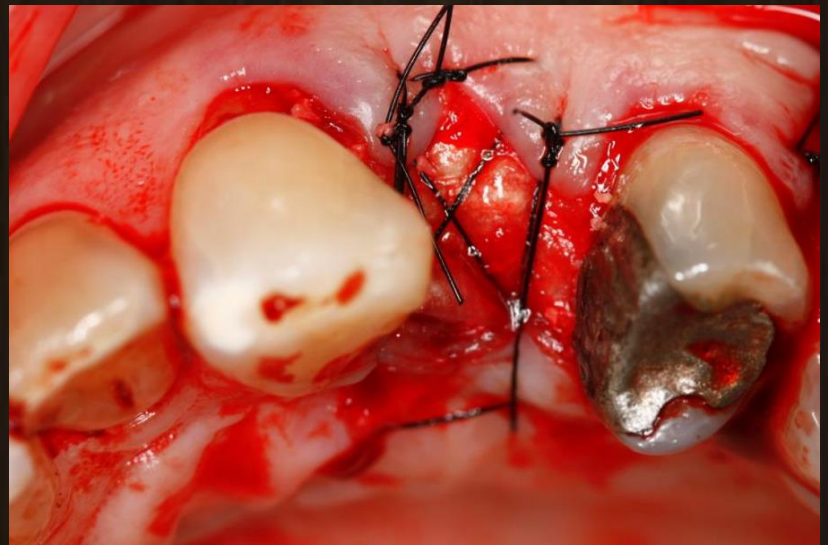
Case 16



Case 16





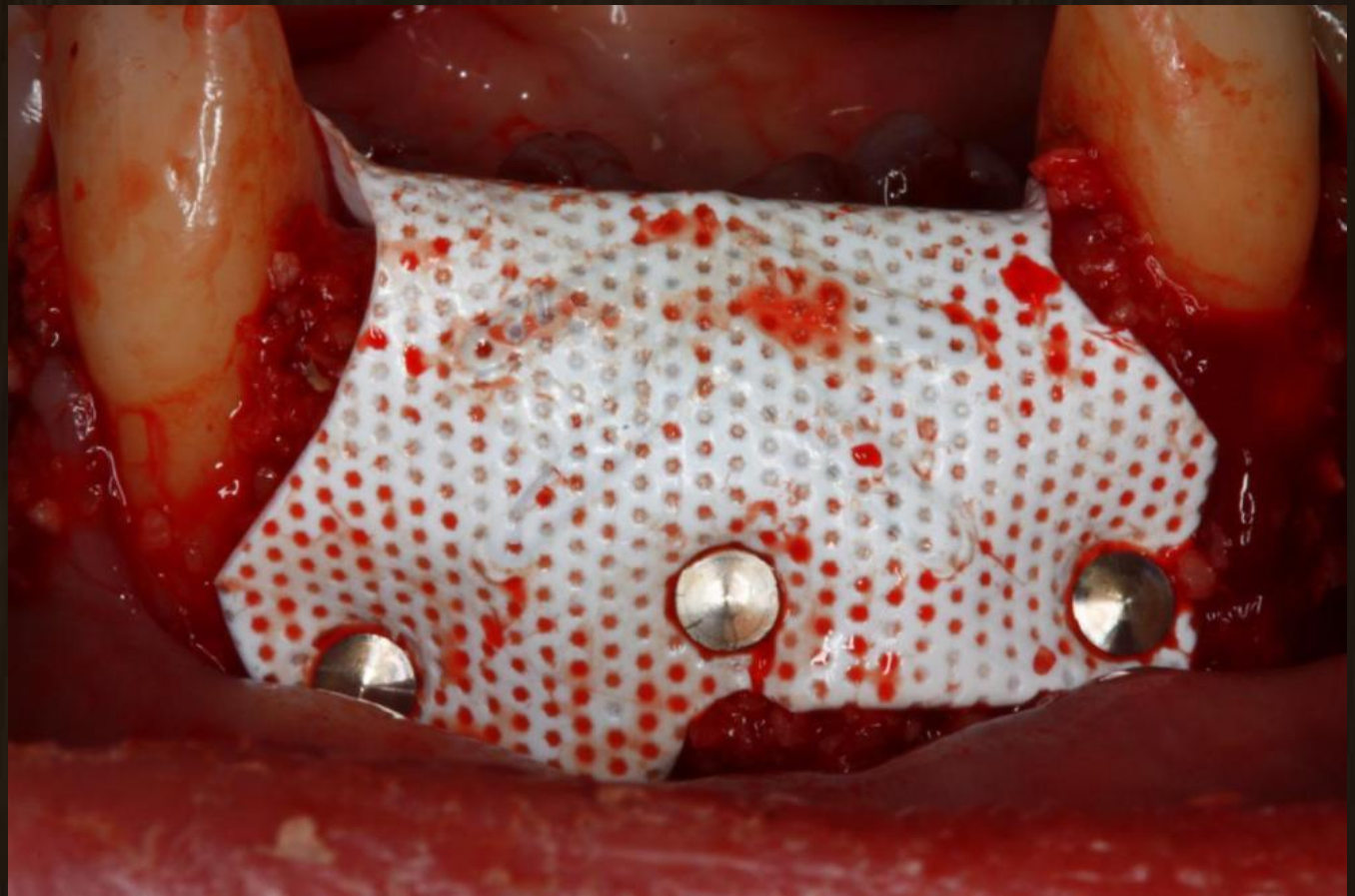


Case 17

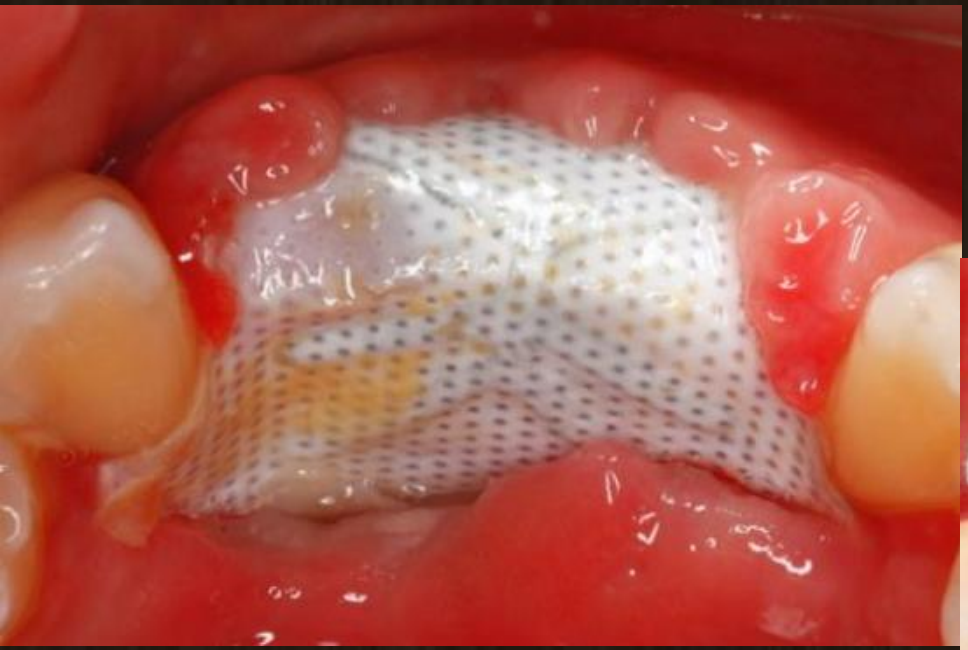
Case 17

Case 17

Case 17



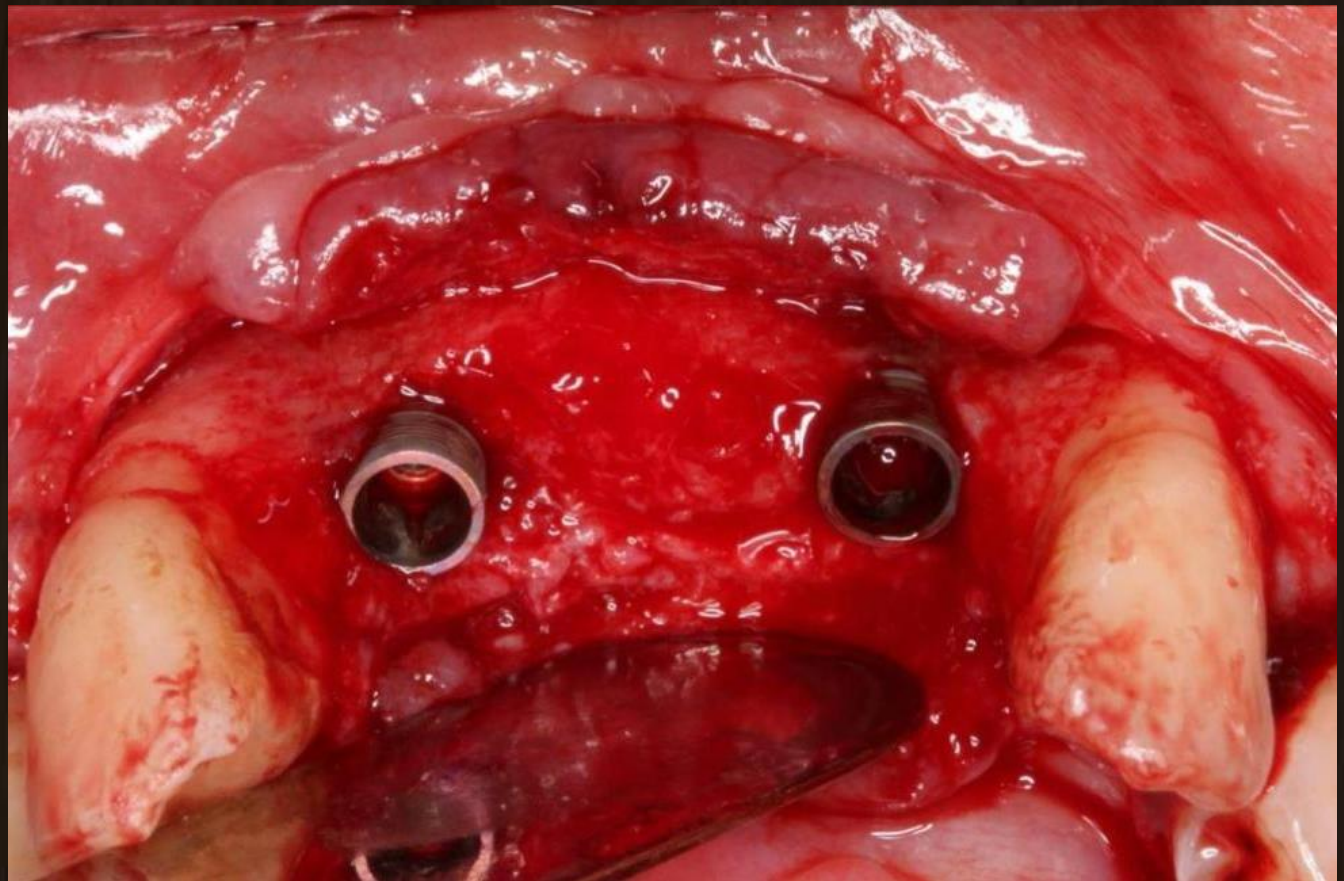
Case 17



Post-op 3 weeks

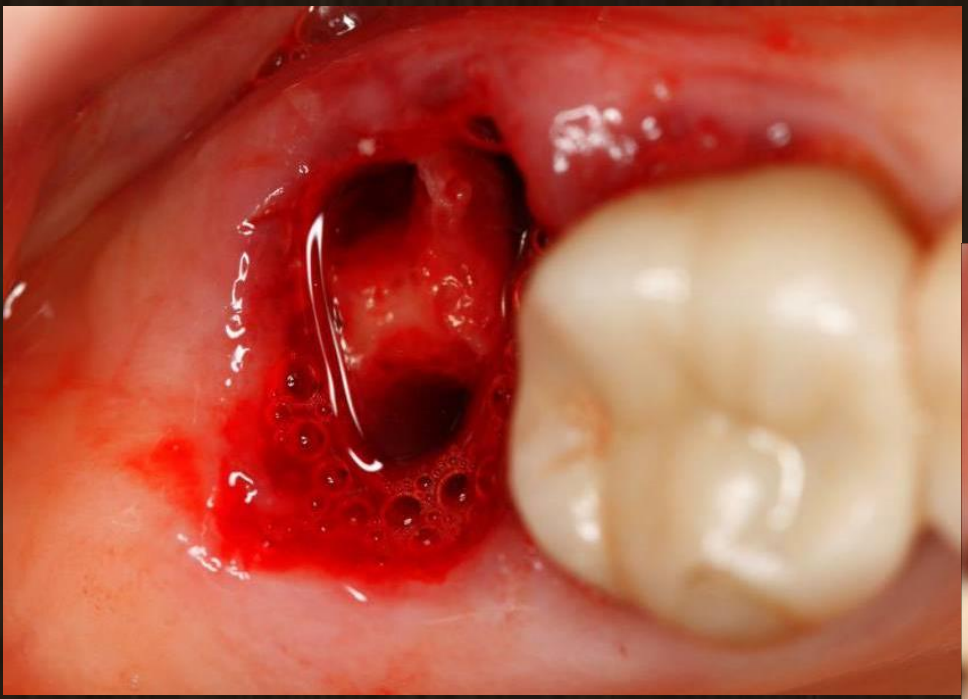
Post-op 3 months

Case 17

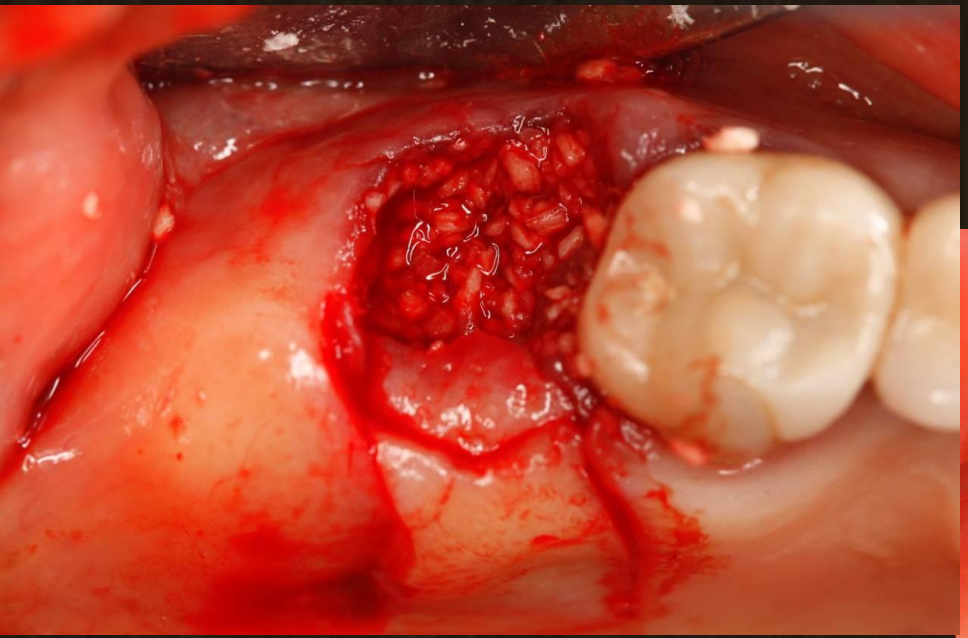


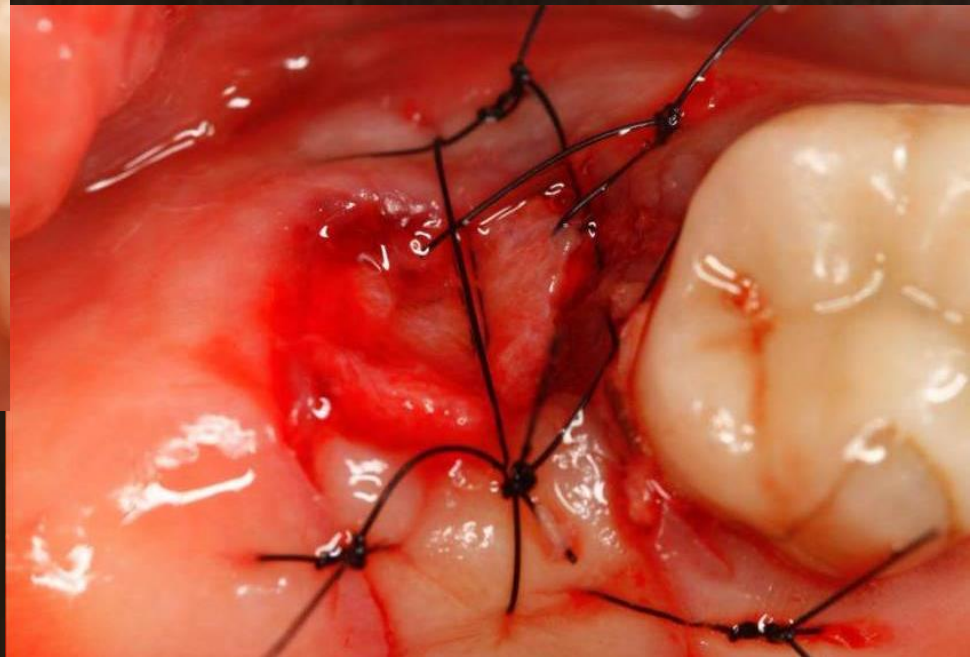
Case 18

Case 18

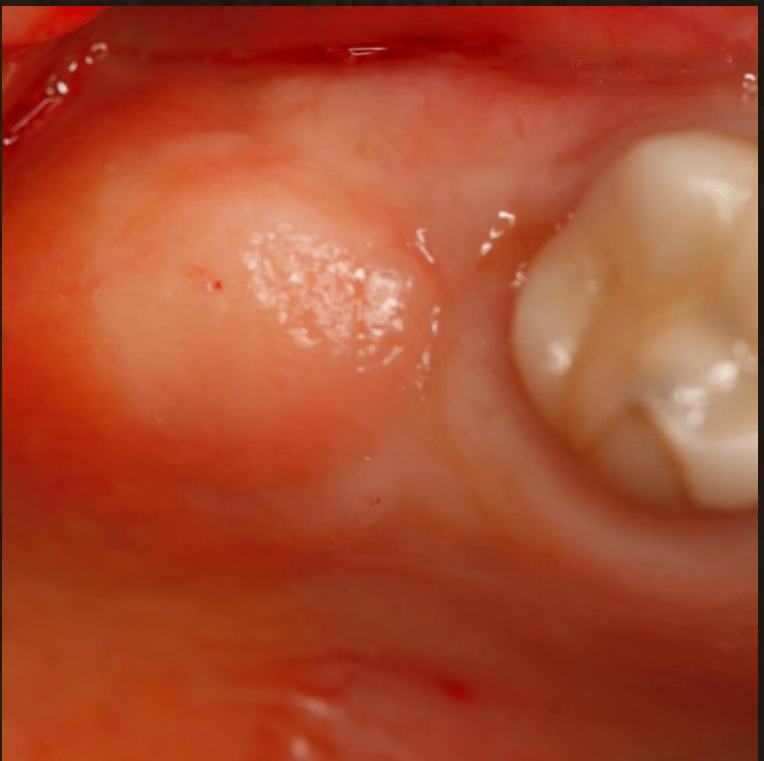


Case 18

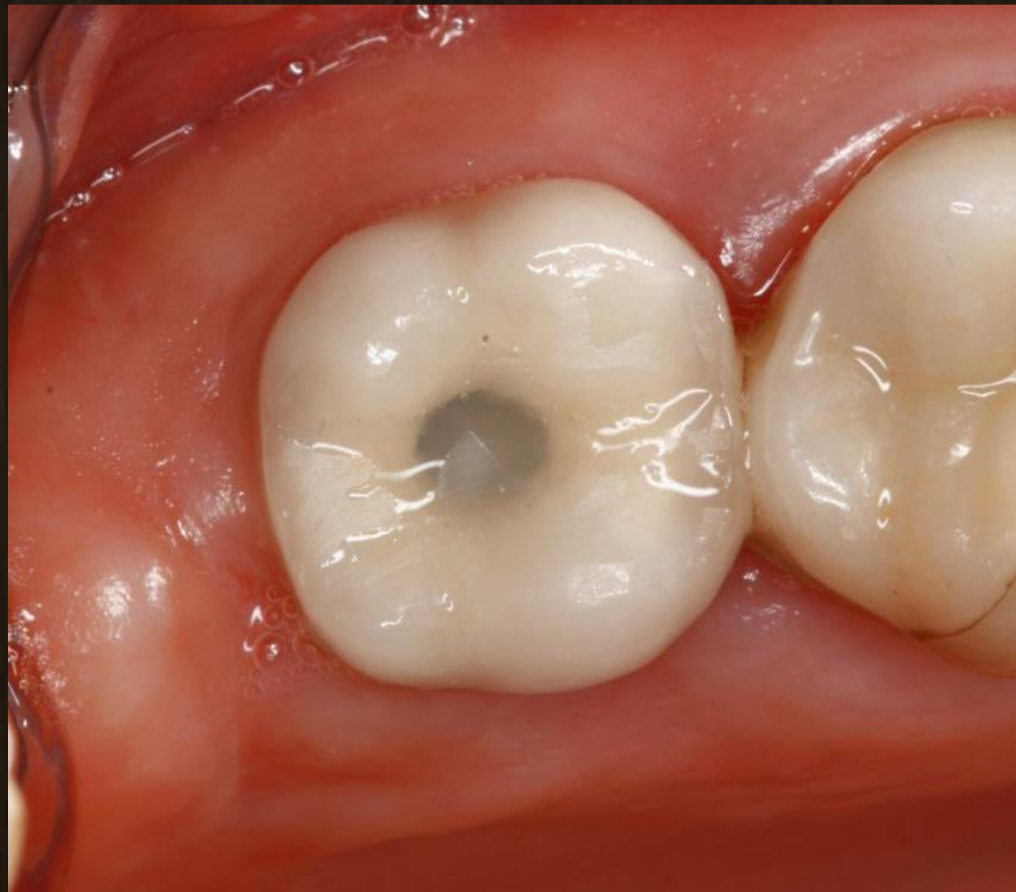




Case 18



Case 18



When Can I Place My Implant?

- Very controversial
- 2-12 months after ridge preservaton[38]
- It depends on what graft you used:

Autogenous Bone < DFDBA < FDBA < Xenograft

Should I Refer?

Easier ⟷ **Harder**

- Single tooth
- Bu and Li/Pa bony walls intact, or small dehiscence/ fenestration expected
- No bone loss on adjacent teeth
- Adequate KT on Bu/Li
- No blood vessels/nerves close to surgical area

- Multiple teeth
- Missing Bu and/or Li/Pa bony wall
- Bone loss on adjacent teeth
- Inadequate KT on Bu/Li
- Blood vessels/nerves close to surgical area

Overview

1. Introduction
2. Clinical Crown Lengthening
3. Ridge Preservation
4. Post-operative Care

Post-op Instructions

- Pain
- Swelling
- Bleeding
- Wound care
- Oral hygiene
- Sutures
- Diet
- Post-op visits
- Mouth-rinse
- Medications

Post-op Medications - Antibacterial

*℞: Chlorhexidine 0.12%

Disp: 473 ml

Sig: rinse w/ 15ml for 30 sec, then expectorate, bid x2 weeks

and

†℞: Amoxicillin 500mg

Disp: 24 caps

Sig: 1 tab tid x8 days until all finished

or

†℞: Clindamycin 150mg

Disp: 28 caps

Sig: take 1 cap qid x7 days until all finished

or

†℞: Azithromycin 500mg

Disp: 5 tabs

Sig: 1 tab qd x5 days until all finished

*Poor evidence that this does anything[39]
†For cases of ridge preservation

Post-op Medications - Analgesia

Rx: Ibuprofen 600mg
Disp: 20 tabs
Sig: 1 tab q6h prn for pain

and/or

Rx: Emtec 30 (codeine and acetaminophen)
Disp: 20 tabs
Sig: 1-2 tabs q6h prn for pain

or

Rx: Percocet 5/325mg (oxycodone and acetaminophen)
Disp: 20 tabs
Sig: 1 tab q6h prn for pain

or

Rx: Tramacet 37.5/325mg (tramadol and acetaminophen)
Disp: 20 tabs
Sig: 1-2 tabs q6h prn for pain

Post-op Appointments

- 2 weeks, 6 weeks
- Oral hygiene in the surgical area can be restarted after 2 weeks
- Can re-probe after 6 weeks *(any earlier and your probing might not give the true representation of the sulcus depth)*

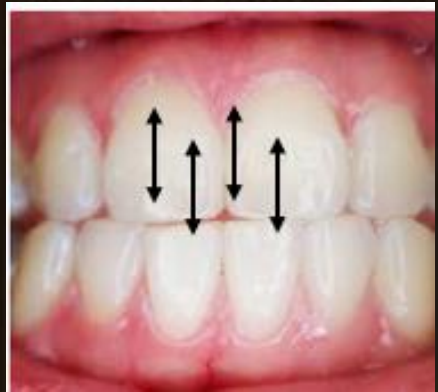

A few words about oral hygiene….


Oral-B
iO
SERIES 7
RECHARGEABLE TOOTHBRUSH
A.I.
2 MIN.
BLACK ONYX
5
SMART MODES
INSIDE
HANDLE, CHARGER,
2 BRUSH HEADS, TRAVEL CASE

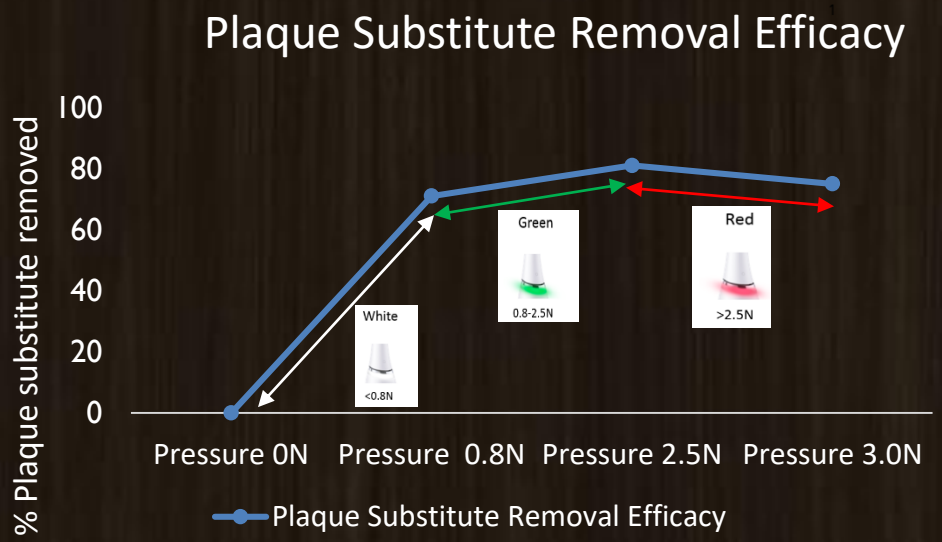
Shear Forces: Oscillating-rotating vs. Sonic

Multi-directional shear forces

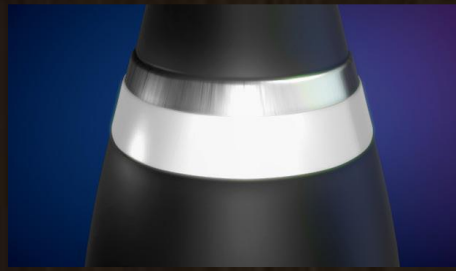
Unidirectional linear shear forces



iO Smart Pressure Sensor[40]



< 0.8N (inadequate pressure)



0.8N-2.5N (optimal pressure for plaque removal)

>2.5N (oscillation speed and plaque removal decreases due to excess pressure)

O-R Powerbrushes: Short-Term Effects

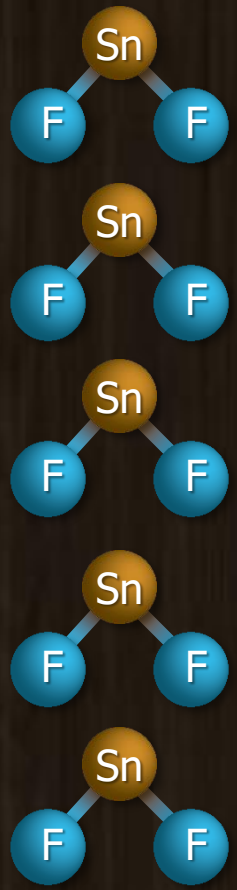
- Oscillating-rotating toothbrushes
  - Are better at reducing plaque and gingival inflammation than manual toothbrushes[41*]
  - Are better at reducing plaque and gingival inflammation than powered toothbrushes with a linear action only[42*]
  - Had 88% of patients with gingivitis convert to gingival health[43*]

*denotes a systematic review or meta-analysis

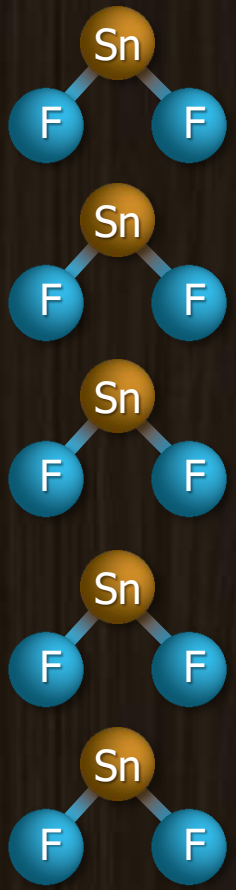
O-R Powerbrushes: Long-Term Effects

- Oscillating-rotating toothbrushes
  - Are better at reducing plaque and gingival inflammation than manual toothbrushes[41*]
  - Were associated with 21% less progression of attachment loss in patients with stage I/II periodontitis over an 11-year period[44]

*denotes a systematic review or meta-analysis


Sn
F
F

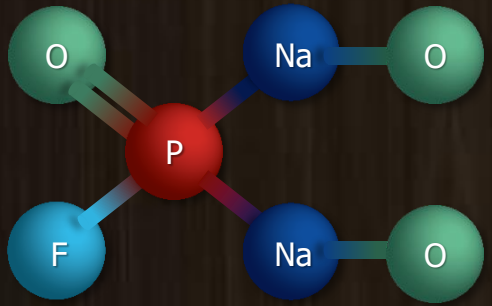

FORMAT ÉCONOMIQUE†
Crest
PRO-HEALTH
DENTIFRICE AU FLUORURE CONTRE LA CARIE ET LA GINGIVITE
GUM
DETOXIFY
Aide à neutraliser les bactéries nocives responsables de la plaque sous la gencive
NETTOYAGE EN PROFONDEUR
DES GENCIVES PLUS SAINES ÉPROUVÉES EN CLINIQUE


Sn
F
F

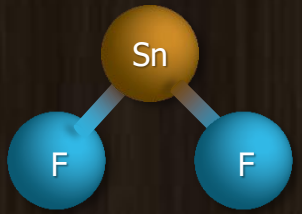
Fluoride and Fluoride Carriers

- In most dentifrices, the active ingredient that provides chemical oral health benefits is fluoride
- The **carrier** of the fluoride molecule is the key to oral health benefit delivery

Sodium Fluoride



Sodium Monofluorophosphate



Stannous Fluoride

Stannous Fluoride's Positive Effects

Inhibition of Plaque Growth

Reduction in Metabolic Production of Toxins

Direct Suppression of Pathogen Virulence

Improved Gingival Health

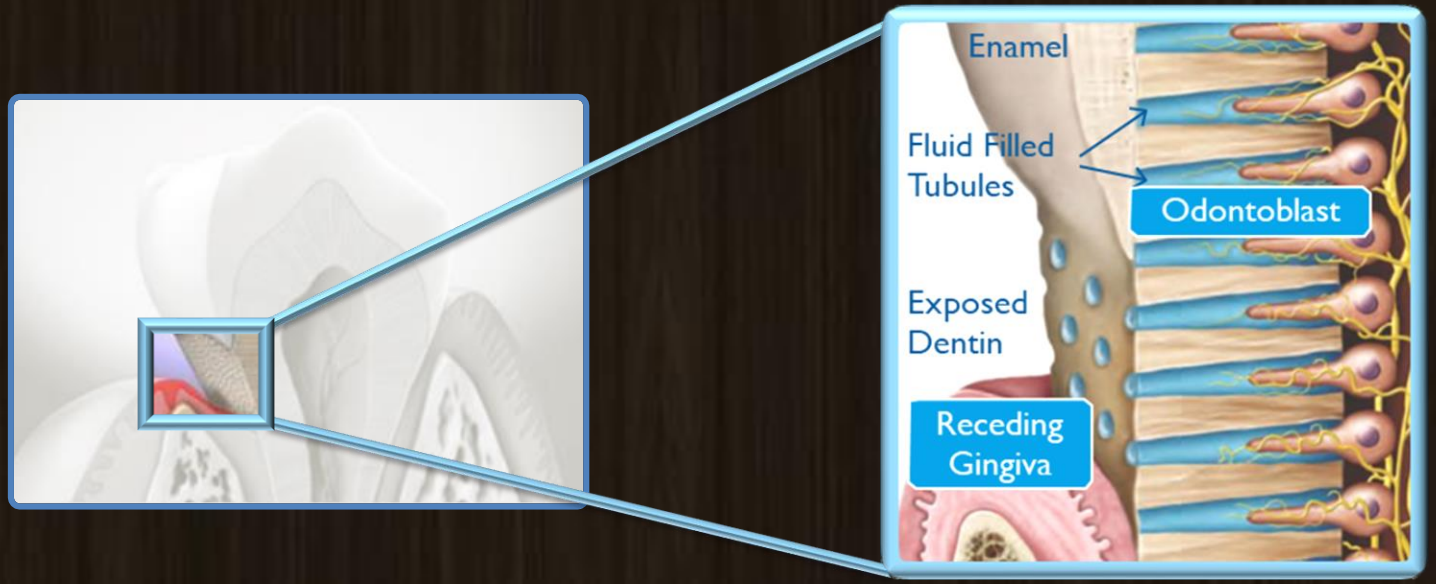
Stannous Fluoride's Positive Effects

- Compared to toothpastes containing sodium fluoride and sodium monofluorophosphate, patients with gingivitis using SnF_2-containing toothpastes:
  - Show a **51% reduction** in gingival bleeding[45*]
  - Show **3.7x better odds** at converting to overall gingival health[45*]

*denotes a systematic review or meta-analysis

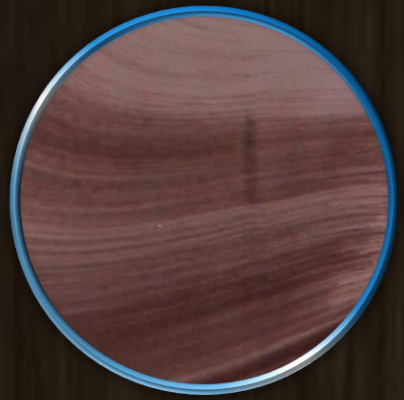
Dentinal Sensitivity

- Dentinal sensitivity[46,47] is the result of gingival recession causing the exposure of dentin tubules



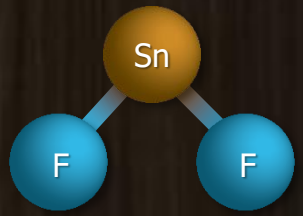
Dentinal Sensitivity Relief

Parallel section of dentin tubules

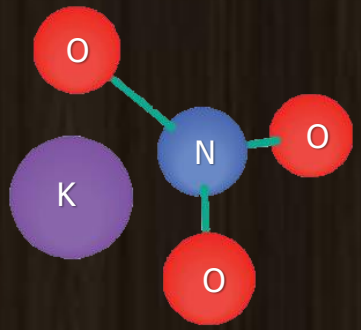


Tin and Potassium Nitrate

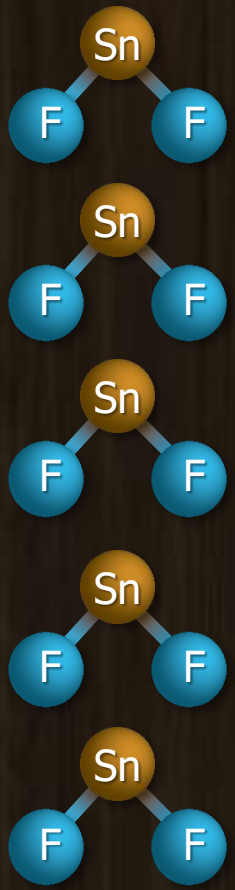
- Tin and potassium nitrate are the active ingredients that contribute to reduction in sensitivity

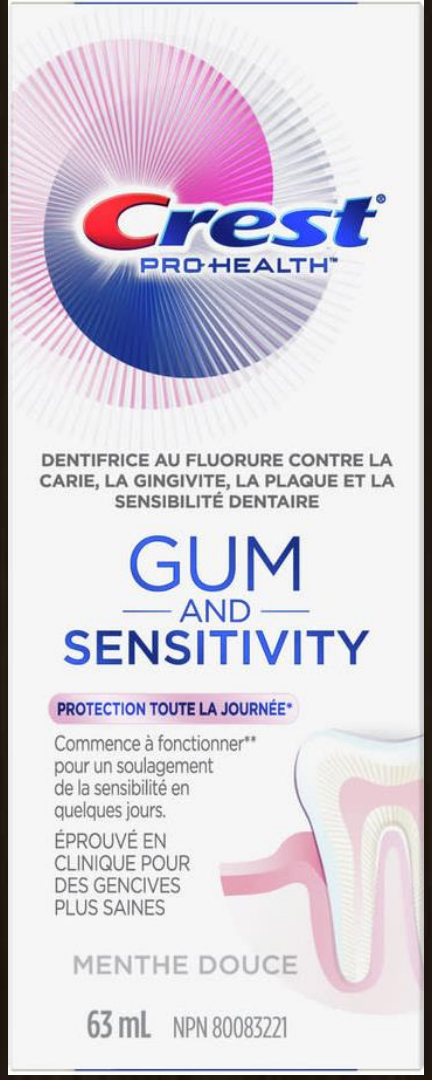


Stannous Fluoride

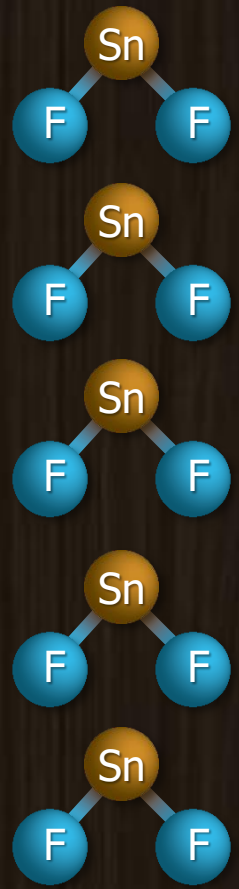


Potassium Nitrate


Sn
F F
Sn
F F
Sn
F F
Sn
F F
Sn
F F

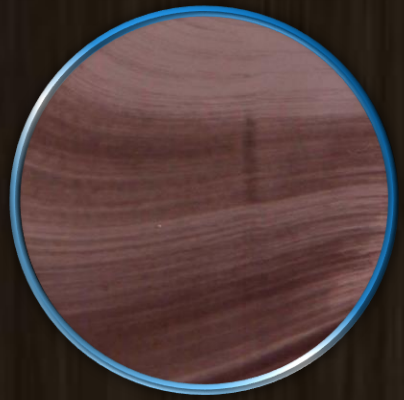

Crest
PRO-HEALTH
DENTIFRICE AU FLUORURE CONTRE LA CARIE, LA GINGIVITE, LA PLAQUE ET LA SENSIBILITÉ DENTAIRE
GUM
AND
SENSITIVITY
PROTECTION TOUTE LA JOURNÉE*
Commence à fonctionner** pour un soulagement de la sensibilité en quelques jours.
ÉPROUVÉ EN CLINIQUE POUR DES GENCIVES PLUS SAINES
MENTHE DOUCE
63 mL NPN 80083221


Oral-B
iO
SERIES 7
RECHARGEABLE TOOTHBRUSH
A.I.
BLACK ONYX
5 SMART MODES
INSIDE
HANDLE, CHARGER, 2 BRUSH HEADS, TRAVEL CASE


Sn
F F
Sn
F F
Sn
F F
Sn
F F
Sn
F F

Dentinal Sensitivity Relief

Parallel section of dentin tubules



Cause Movement

Stimulates

Pain Signal Transmission

Exogenous Stimuli

Fluids in Dentinal Tubules

Nerve Receptor

Transient Tooth Pain

Sn

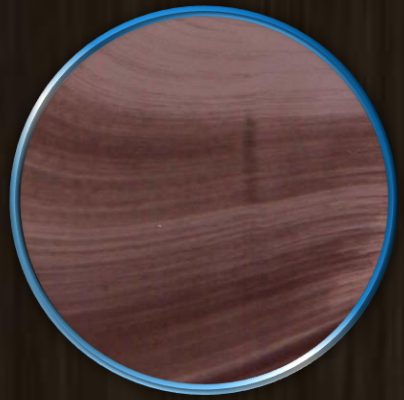
F

F

Stannous Fluoride

Dentinal Sensitivity Relief

Parallel section of dentin tubules



Exogenous Stimuli

ARRÊT STOP

Fluids in Dentinal Tubules

Stimulates

Nerve Receptor

Pain Signal Transmission

Transient Tooth Pain

Sn

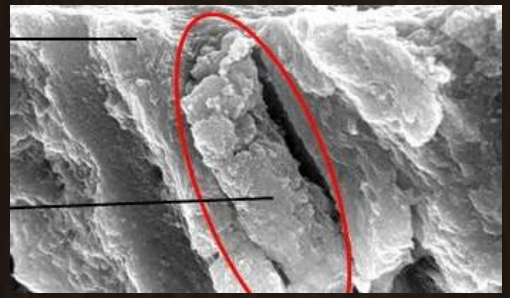
F F

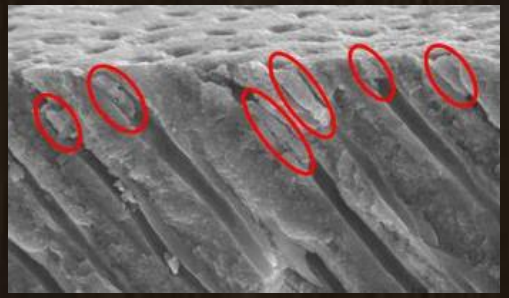
Stannous Fluoride

Dentinal Sensitivity Relief

- Patients with dentinal hypersensitivity who brush with a desensitizing toothpaste like Crest ProHealth Gum and Sensitivity have almost:
  - 25x better odds at having their sensitivity resolve than patients who use NaF toothpaste[48*]
  - 4x better odds at having their sensitivity resolve than patients who use KNO_3 toothpaste[48*]

SnF_2 deposits inside tubules





*denotes a systematic review or meta-analysis


FORMAT ÉCONOMIQUE†
Crest PRO-HEALTH
DENTIFRICE AU FLUORURE CONTRE LA CARIE ET LA GINGIVITE
GUM DETOXIFY
Aide à neutraliser les bactéries nocives responsables de la plaque sous la gencive
NETTOYAGE EN PROFONDEUR
DES GENCIVES PLUS SAINES ÉPROUVÉES EN CLINIQUE
110 mL NPN 80083221
Crest PRO-HEALTH™
DENTIFRICE AU FLUORURE CONTRE LA CARIE, LA GINGIVITE, LA PLAQUE ET LA SENSIBILITÉ DENTAIRE
GUM AND SENSITIVITY
PROTECTION TOUTE LA JOURNÉE*
Commence à fonctionner** pour un soulagement de la sensibilité en quelques jours.
ÉPROUVÉ EN CLINIQUE POUR DES GENCIVES PLUS SAINES
MENTHE DOUCE
63 mL NPN 80083221
Oral-B iO
Oral-B
iO™
SERIES 7
RECHARGEABLE TOOTHBRUSH
A.I.
BLACK ONYX
5 SMART MODES
INSIDE
HANDLE, CHARGER, 2 BRUSH HEADS, TRAVEL CASE


FORMAT ÉCONOMIQUE†
Crest PRO-HEALTH
DENTIFRICE AU FLUORURE CONTRE LA CARIE ET LA GINGIVITE
NETTOYAGE EN PROFONDEUR
DES GENCIVES PLUS SAINES ÉPROUVÉES EN CLINIQUE
Crest PRO-HEALTH™
pour un soulagement de la sensibilité en quelques jours.
ÉPROUVÉ EN CLINIQUE POUR DES GENCIVES PLUS SAINES
MENTHE DOUCE
63 mL NPN 80083221
Oral-B
iO™
SERIES 7
RECHARGEABLE TOOTHBRUSH
CANADIAN DENTAL ASSOCIATION VALIDATED
ASSOCIATION DENTAIRE CANADIENNE VALIDÉ
A.I.
BLACK ONYX
5 SMART MODES
INSIDE
HANDLE, CHARGER, 2 BRUSH HEADS, TRAVEL CASE


FORMAT ÉCONOMIQUE†
Crest PRO-HEALTH
DENTIFRICE AU FLUORURE CONTRE LA CARIE ET LA GINGIVITE
GUM DETOXIFY
NETTOYAGE EN PROFONDEUR
DES GENCIVES PLUS SAINES ÉPROUVÉES EN CLINIQUE
110 mL NPN 80083221
Crest PRO-HEALTH™
DENTIFRICE AU FLUORURE CONTRE LA CARIE, LA GINGIVITE, LA PLAQUE ET LA SENSIBILITÉ DENTAIRE
GUM AND SENSITIVITY
PROTECTION TOUTE LA JOURNÉE*
Commence à fonctionner** pour un soulagement de la sensibilité en quelques jours.
ÉPROUVÉ EN CLINIQUE POUR DES GENCIVES PLUS SAINES
MENTHE DOUCE
63 mL NPN 80083221
CANADIAN DENTAL ASSOCIATION VALIDATED ASSOCIATION DENTAIRE CANADIENNE VALIDÉ
Oral-B iO
Oral-B
iO™
SERIES 7
RECHARGEABLE TOOTHBRUSH
A.I.
2 MIN
BLACK ONYX
5 SMART MODES
INSIDE
HANDLE, CHARGER, 2 BRUSH HEADS, TRAVEL CASE

Questions?

Thanks for being a wonderful audience!

References

1. Jepsen S, Caton JG, Albandar JM, Bissada NF, Bouchard P, Cortellini P, Demirel K, de Sanctis M, Ercoli C, Fan J, Geurs NC, Hughes FJ, Jin L, Kantarci A, Lalla E, Madianos PN, Matthews D, McGuire MK, Mills MP, Preshaw PM, Reynolds MA, Sculean A, Susin C, West NX, Yamazaki K. Periodontal manifestations of systemic diseases and developmental and acquired conditions: Consensus report of workgroup 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol. 2018 Jun;89 Suppl 1:S237-S248.
2. Tal H, Soldinger M, Dreiangel A, Pitaru S. Periodontal response to long-term abuse of the gingival attachment by supracrestal amalgam restorations. J Clin Periodontol. 1989 Nov;16(10):654-9.
3. Karring T, Lang NP, Löe H. The role of gingival connective tissue in determining epithelial differentiation. J Periodontal Res. 1975 Feb;10(1):1-11.
4. Melker DJ, Richardson CR. Root reshaping: an integral component of periodontal surgery. Int J Periodontics Restorative Dent. 2001 Jun;21(3):296-304.
5. Leempoel PJ, Käyser AF, Van Rossum GM, De Haan AF. The survival rate of bridges. A study of 1674 bridges in 40 Dutch general practices. J Oral Rehabil. 1995 May;22(5):327-30.
6. Yassir YA, McIntyre GT, Bearn DR. Orthodontic treatment and root resorption: an overview of systematic reviews. Eur J Orthod. 2021 Aug 3;43(4):442-456. doi: 10.1093/ejo/cjaa058. PMID: 33215186.
7. Van der Weijden F, Dell'Acqua F, Slot DE. Alveolar bone dimensional changes of post-extraction sockets in humans: a systematic review. J Clin Periodontol. 2009 Dec;36(12):1048-58.
8. Fu JH, Yeh CY, Chan HL, Tatarakis N, Leong DJ, Wang HL. Tissue phenotype and its relation to the underlying bone morphology. J Periodontol. 2010 Apr;81(4):569-74.
9. Cook DR, Mealey BL, Verrett RG, Mills MP, Noujeim ME, Lasho DJ, Cronin RJ Jr. Relationship between clinical periodontal phenotype and labial plate thickness: an in vivo study. Int J Periodontics Restorative Dent. 2011 Jul-Aug;31(4):345-54.
10. Stein JM, Lintel-Höping N, Hammächer C, Kasaj A, Tamm M, Hanisch O. The gingival phenotype: measurement of soft and hard tissue dimensions - a radiographic morphometric study. J Clin Periodontol. 2013 Dec;40(12):1132-9.
11. Kao RT, Fagan MC, Conte GJ. Thick vs. thin gingival phenotypes: a key determinant in treatment planning for dental implants. J Calif Dent Assoc. 2008 Mar;36(3):193-8.
12. De Rouck T, Eghbali R, Collys K, De Bruyn H, Cosyn J. The gingival phenotype revisited: transparency of the periodontal probe through the gingival margin as a method to discriminate thin from thick gingiva. J Clin Periodontol. 2009 May;36(5):428-33.
13. Zuiderveld EG, den Hartog L, Vissink A, Raghoebar GM, Meijer HJ. Significance of buccopalatal implant position, phenotype, platform switching, and pre-implant bone augmentation on the level of the midbuccal mucosa. Int J Prosthodont. 2014 Sep-Oct;27(5):477-9.
14. Papaioannou W, Quirynen M, Nys M, van Steenberghe D. The effect of periodontal parameters on the subgingival microbiota around implants. Clin Oral Implants Res. 1995 Dec;6(4):197-204.

References

15. Canullo L, Peñarrocha-Oltra D, Covani U, Botticelli D, Serino G, Penarrocha M. Clinical and microbiological findings in patients with peri-implantitis: a cross-sectional study. Clin Oral Implants Res. 2015 Jan 26.
16. Cecchinato D, Parpaiola A, Lindhe J. A cross-sectional study on the prevalence of marginal bone loss among implant patients. Clin Oral Implants Res. 2013 Jan;24(1):87-90.
17. Hanser T, Khoury F. Extraction site management in the esthetic zone using autogenous hard and soft tissue **grafts**: a 5-year consecutive clinical study. Int J Periodontics Restorative Dent. 2014 May-Jun;34(3):305-12.
18. Cummings LC, Kaldahl WB, Allen EP. Histologic evaluation of autogenous connective tissue and acellular dermal matrix grafts in humans. J Periodontol. 2005 Feb;76(2):178-86.
19. Ioannou AL, Kotsakis GA, Kumar T, Hinrichs JE, Romanos G. Evaluation of the bone regeneration potential of bioactive glass in implant site development surgeries: a systematic review of the literature. Clin Oral Investig. 2015 Mar;19(2):181-91.
20. Barallat L, Ruíz-Magaz V, Levi PA Jr, Mareque-Bueno S, Galindo-Moreno P, Nart J. Histomorphometric results in ridge preservation procedures comparing various graft materials in extraction sockets with nongrafted sockets in humans: a systematic review. Implant Dent. 2014 Oct;23(5):539-54.
21. Collins JR, Jiménez E, Martínez C, Polanco RT, Hirata R, Mousa R, Coelho PG, Bonfante EA, Tovar N. Clinical and histological evaluation of socket grafting using different types of bone substitute in adult patients. Implant Dent. 2014 Aug;23(4):489-95.
22. Avila-Ortiz G, Rodriguez JC, Rudek I, Benavides E, Rios H, Wang HL. Effectiveness of three different alveolar ridge preservation techniques: a pilot randomized controlled trial. Int J Periodontics Restorative Dent. 2014 Jul-Aug;34(4):509-21.
23. Kim YJ, Lee JY, Kim JE, Park JC, Shin SW, Cho KS. Ridge preservation using demineralized bone matrix gel with recombinant human bone morphogenetic protein-2 after tooth extraction: a randomized controlled clinical trial. J Oral Maxillofac Surg. 2014 Jul;72(7):1281-90.
24. Geurs N, Ntounis A, Vassilopoulos P, Van der Velden U, Loos BG, Reddy M. Using growth factors in human extraction sockets: a histologic and histomorphometric evaluation of short-term healing. Int J Oral Maxillofac Implants. 2014 Mar-Apr;29(2):485-96.
25. Schneider D, Schmidlin PR, Philipp A, Annen BM, Ronay V, Hämmerle CH, Attin T, Jung RE. Labial soft tissue volume evaluation of different techniques for ridge preservation after tooth extraction: a randomized controlled clinical trial. J Clin Periodontol. 2014 Jun;41(6):612-7.
26. Kotsakis GA, Salama M, Chrepa V, Hinrichs JE, Gaillard P. A randomized, blinded, controlled clinical study of particulate anorganic bovine bone mineral and calcium phosphosilicate putty bone substitutes for socket preservation. Int J Oral Maxillofac Implants. 2014 Jan-Feb;29(1):141-51.
27. Alkan EA, Parlar A, Yildirim B, Sengüven B. Histological comparison of healing following tooth extraction with ridge preservation using enamel matrix derivatives versus Bio-Oss Collagen: a pilot study. Int J Oral Maxillofac Surg. 2013 Dec;42(12):1522-8.
28. Eskow AJ, Mealey BL. Evaluation of healing following tooth extraction with ridge preservation using cortical versus cancellous freeze-dried bone allograft. J Periodontol. 2014 Apr;85(4):514-24.
29. Wood RA, Mealey BL. Histologic comparison of healing after tooth extraction with ridge preservation using mineralized versus demineralized freeze-dried bone allograft. J Periodontol. 2012 Mar;83(3):329-36.

References

30. Clark D, Rajendran Y, Paydar S, Ho S, Cox D, Ryder M, Dollard J, Kao RT. Advanced platelet-rich fibrin and freeze-dried bone allograft for ridge preservation: A randomized controlled clinical trial. J Periodontol. 2018 Apr;89(4):379-387.
31. Castro AB, Meschi N, Temmerman A, Pinto N, Lambrechts P, Teughels W, Quirynen M. Regenerative potential of leucocyte- and platelet-rich fibrin. Part B: sinus floor elevation, alveolar ridge preservation and implant therapy. A systematic review. J Clin Periodontol. 2017 Feb;44(2):225-234.
32. Miron RJ, Fujioka-Kobayashi M, Moraschini V, Zhang Y, Gruber R, Wang HL. Efficacy of platelet-rich fibrin on bone formation, part 1: Alveolar ridge preservation. Int J Oral Implantol (Berl). 2021 May 12;14(2):181-194.
33. Atieh MA, Al-Ali B, Shah M, Amir-Rad F, Baqain ZH, Al-Suwaidi S, Alsabeeha NHM. Enamel matrix derivative for alveolar ridge preservation: A randomized controlled trial. Clin Oral Implants Res. 2023 Aug;34(8):802-812.
34. Barone A, Toti P, Piattelli A, Iezzi G, Derchi G, Covani U. Extraction socket healing in humans after ridge preservation techniques: comparison between flapless and flapped procedures in a randomized clinical trial. J Periodontol. 2014 Jan;85(1):14-23.
35. Cardaropoli D, Tamagnone L, Roffredo A, Gaveglio L. Relationship between the buccal bone plate thickness and the healing of postextraction sockets with/without ridge preservation. Int J Periodontics Restorative Dent. 2014 Mar-Apr;34(2):211-7.
36. Caiazzo A, Brugnami F, Mehra P. Buccal plate augmentation: a new alternative to socket preservation. J Oral Maxillofac Surg. 2010 Oct;68(10):2503-6.
37. Kim DM, De Angelis N, Camelo M, Nevins ML, Schupbach P, Nevins M. Ridge preservation with and without primary wound closure: a case series. Int J Periodontics Restorative Dent. 2013 Jan-Feb;33(1):71-8.
38. Darby I, Chen ST, Buser D. Ridge preservation techniques for implant therapy. Int J Oral Maxillofac Implants. 2009;24 Suppl:260-71.
39. Gupta S, Jain A, Singla M. Is saltwater mouth rinse as effective as chlorhexidine following periodontal surgery? Evid Based Dent. 2021 Dec;22(4):130-131.
40. CDHA Position Paper on Tooth Brushing CJDH. 2006; 40(5): 232-248
41. Yaacob M, Worthington HV, Deacon SA, Deery C, Walmsley AD, Robinson PG, Glenny AM. Powered versus manual toothbrushing for oral health. Cochrane Database of Systematic Reviews 2014, Issue 6.
42. Deacon SA, Glenny A-M, Deery C, Robinson PG, Heanue M, Walmsley AD, Shaw WC. Different powered toothbrushes for plaque control and gingival health. Cochrane Database of Systematic Reviews 2010, Issue 12.
43. Zou Y, Grender J, Adam R, Levin L. A Meta-analysis Comparing Toothbrush Technologies on Gingivitis and Plaque. Int Dent J. 2023 Jul 20:S0020-6539(23)00100-4.
44. Pitchika V, Pink C, Völzke H, Welk A, Kocher T, Holtfreter B. Long-term impact of powered toothbrush on oral health: 11-year cohort study. J Clin Periodontol. 2019 Jul;46(7):713-722.
45. Biesbrock A, He T, DiGennaro J, Zou Y, Ramsey D, Garcia-Godoy F. The effects of bioavailable gluconate chelated stannous fluoride dentifrice on gingival bleeding: Meta-analysis of eighteen randomized controlled trials. J Clin Periodontol. 2019 Dec;46(12):1205-1216.
46. Glickman GN. AAE Consensus Conference on Diagnostic Terminology: background and perspectives. J Endod. 2009 Dec;35(12):1619-20.
47. Addy M. Dentin hypersensitivity: new perspectives on an old problem. Int Dent. J. 2002 October; 52(S5P2). 367-375.
48. West NX, He T, Zou Y, DiGennaro J, Biesbrock A, Davies M. Bioavailable gluconate chelated stannous fluoride toothpaste meta-analyses: Effects on dentine hypersensitivity and enamel erosion. J Dent. 2021 Feb;105:103566.