External Resorption

Prof. Paul V. Abbott *AO*
BDSc, MDS, FRACDS(Endo), FPFA, FADI, FICD, FACD, FIADT

Specialist Endodontist
Winthrop Professor of Clinical Dentistry
UWA Dental School
The University of Western Australia

1

External Resorption



2

Root Resorption

Internal

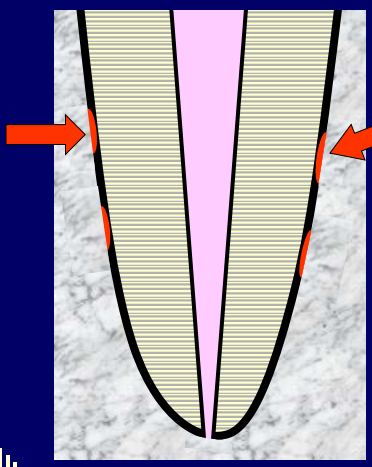
1. Surface ✓
2. Inflammatory ✓
3. Replacement ✓

External

1. Surface
2. Inflammatory ★
3. Replacement
4. Invasive ★
5. Orthodontic
6. Pressure
7. Physiological
8. Idiopathic

3

Root Resorption



External

1. Surface
2. Inflammatory
3. Replacement
4. Invasive
5. Orthodontic
6. Pressure
7. Physiological
8. Idiopathic

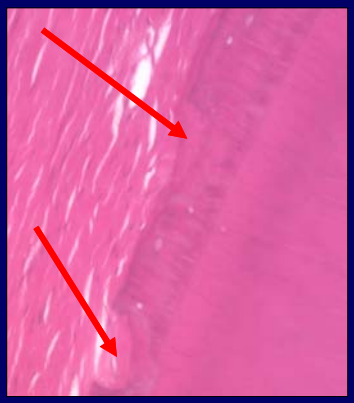
4

External Surface Resorption

Features



- Small resorption areas
  - Usually only in cementum
  - But may extend into dentine to a shallow depth



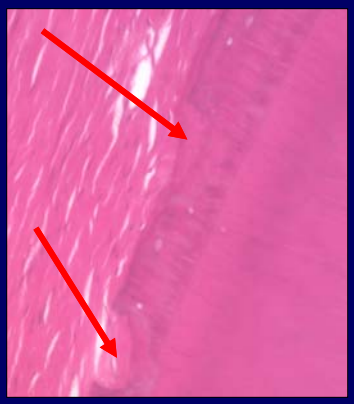
5

External Surface Resorption

Features



- Due to a localised injury to the cementum and the periodontal ligament
- Unlikely to be seen on radiographs
  - Because too small and only proximal is visible



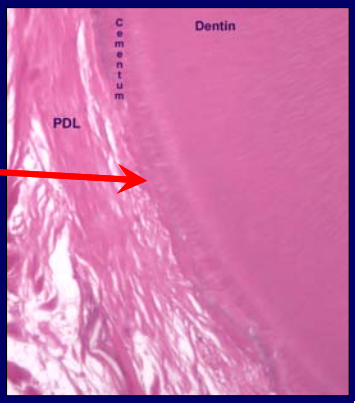
6

External Surface Resorption

Management



- A self-limiting process
- Usually heals with new cementum

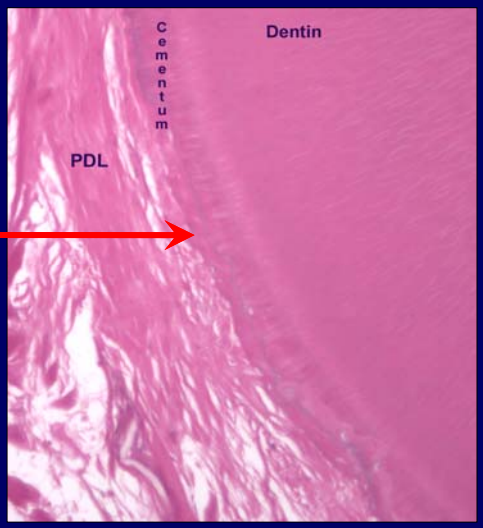


- *No treatment required*

7

External Surface Resorption



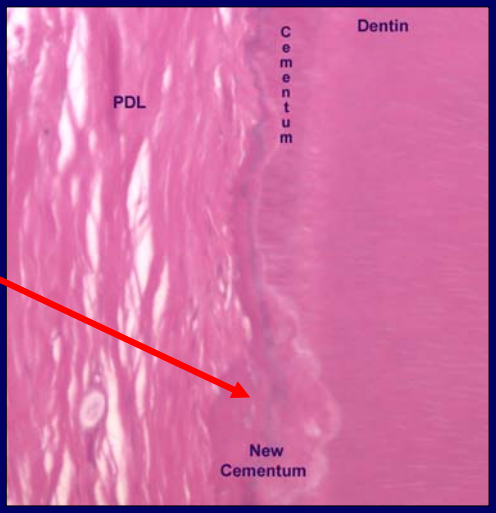


Surface resorption healed with new cementum

8

External Surface Resorption

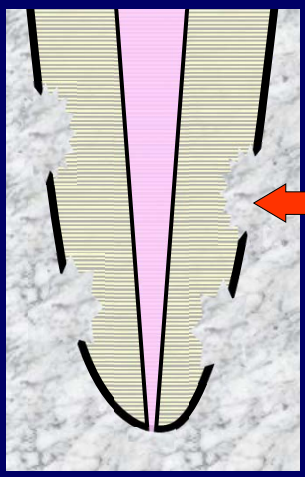




Surface resorption healed with new cementum

9

Root Resorption



External

1. Surface
2. Inflammatory
3. **Replacement**
4. Invasive
5. Orthodontic
6. Pressure
7. Physiological
8. Idiopathic

10

External Replacement Resorption



"Ankylosis-related resorption"

- Alternate terminology suggested by some authors
- BUT: The name of any disease/condition should reflect what is happening in the tissues
  - Not what it is related to
- AND: ankylosis can also be related to other types of external resorption

➔ Hence this term is confusing and inappropriate

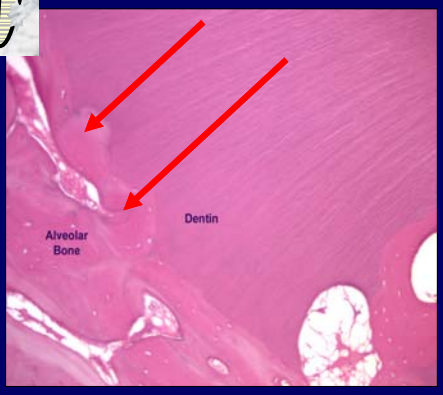
11

External Replacement Resorption



Features

- Loss of tooth structure
- Root is replaced by bone



12

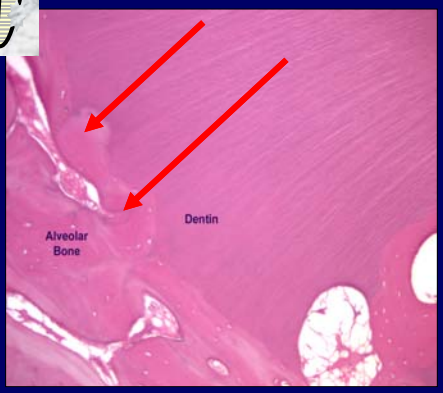
External Replacement Resorption



Features

- Loss of tooth structure
- Root is replaced by bone

- Also have ankylosis - since there is:
  - Loss of periodontal ligament AND
  - Bone "fuses" to tooth root



13

External Replacement Resorption



Features

- Loss of tooth structure
- Root is replaced by bone

- Also have ankylosis - since there is:
  - Loss of periodontal ligament AND
  - Bone "fuses" to tooth root



14

External Replacement Resorption



Features

- Loss of tooth structure
- Root is replaced by bone

- Also have ankylosis - since there is:
  - Loss of periodontal ligament AND
  - Bone "fuses" to tooth root

Ankylosis

- "Fusion" of bone & root
- No periodontal ligament
- Can occur WITHOUT any resorption
- Can occur after *ALL* forms of resorption

15

Replacement resorption usually follows - eventually



Ankylosis

- "Fusion" of bone & root
- No periodontal ligament
- Can occur WITHOUT any resorption
- Can occur after *ALL* forms of resorption

16

External Replacement Resorption

Types



1. **Progressive**
   - Associated with drying or removal of PDL
   - Gradually involves the whole root

* Typically : in avulsion, intrusion, lateral luxation

2. **Transient**
   - Minor areas of damage
   - Later disappear - normal PDL forms

17

External Replacement Resorption



18

External Replacement Resorption

Factors



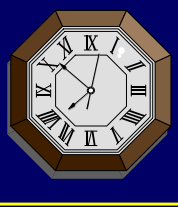
- Extra-alveolar time
- Storage conditions
- Damage during injury and repositioning
- Splinting
- Endodontic treatment

19

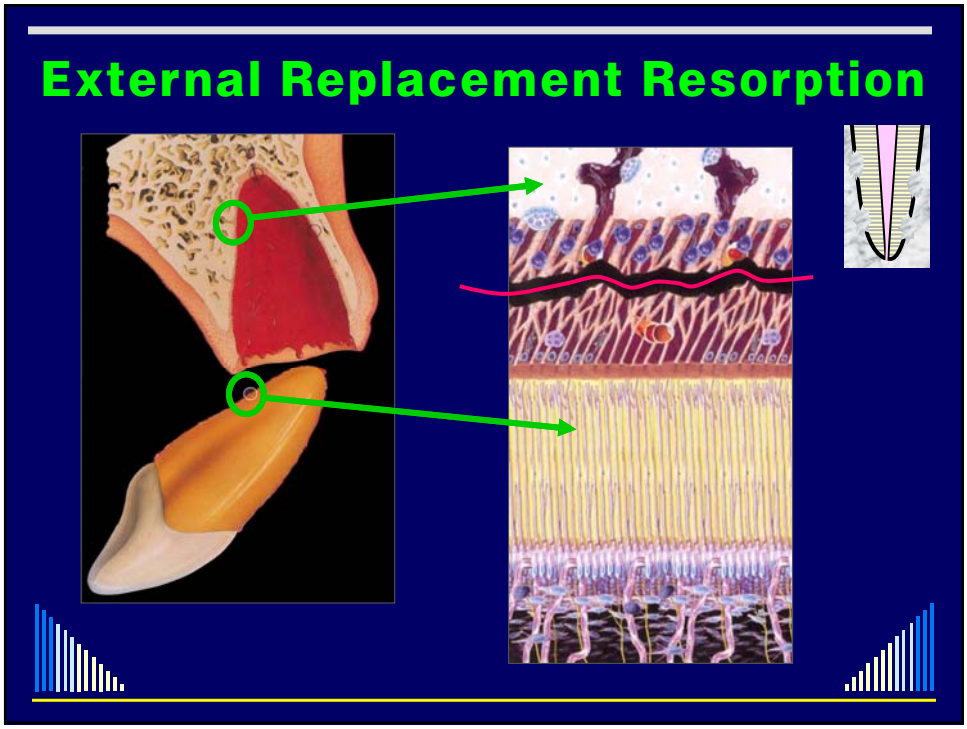
External Replacement Resorption



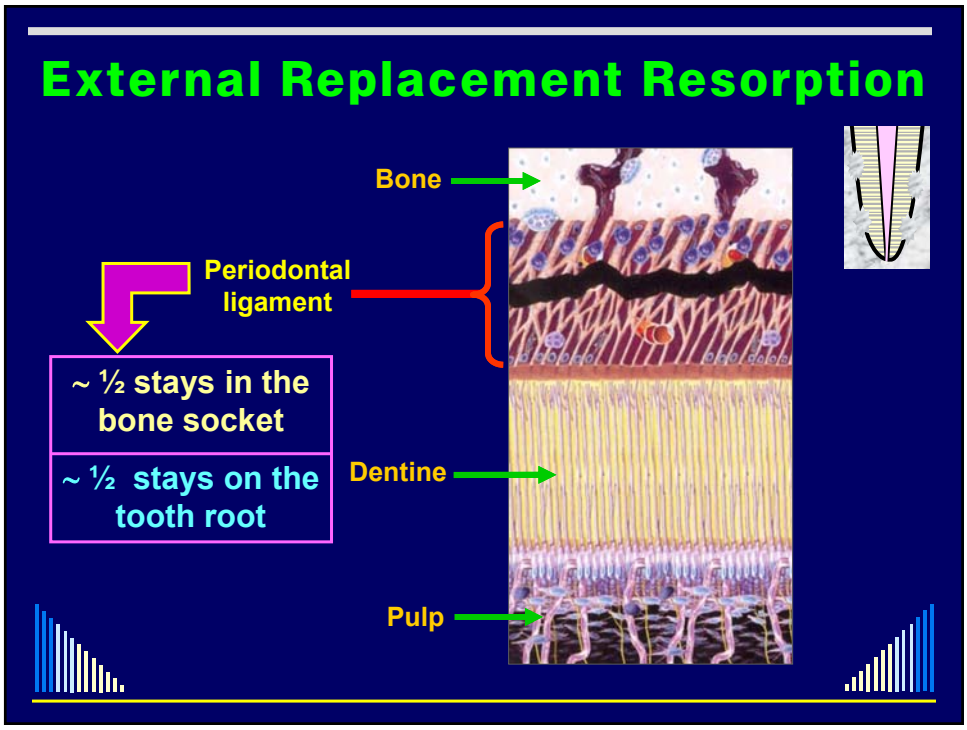
- Factors
  - Extra-alveolar time
    - → As short as possible
      - To keep periodontal ligament cells on the tooth root alive
    - → 12 - 15 minutes critical
      - If dry storage



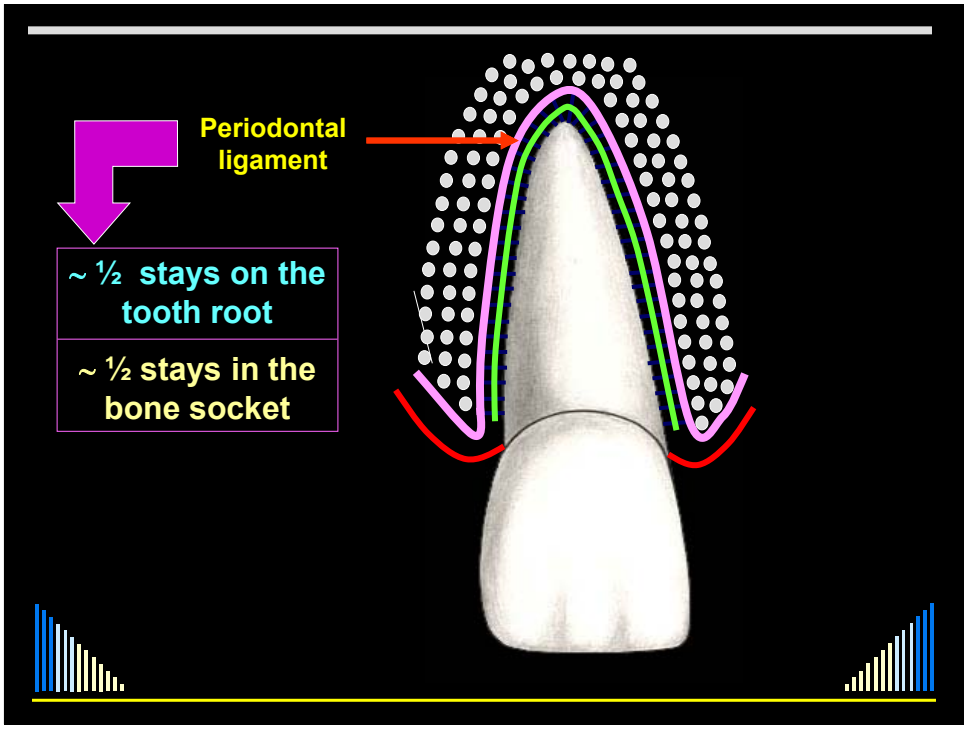
20


External Replacement Resorption

21


External Replacement Resorption
Bone
Periodontal ligament
~ ½ stays in the bone socket
~ ½ stays on the tooth root
Dentine
Pulp

22



23

External Replacement Resorption



- Storage media
  - Factors associated with maintaining the viability of periodontal cells
    - Osmolarity
    - pH
    - Temperature

24

Storage Media for Avulsed Teeth

- Tap water
  - → Rapid cell lysis
  - → Only quick rinse if nothing else available
    - *But saliva is usually available !!!*





25

Storage Media for Avulsed Teeth



- Tap water
  - → Rapid cell lysis
  - → Only quick rinse if nothing else available
    - *But saliva is usually available !!!*



- Saliva
  - → Max. 1 hour
  - → No nutrients



26

Storage Media for Avulsed Teeth



- Tap water
  - Rapid cell lysis
  - Only quick rinse if nothing else available
    - *But saliva is usually available !!!*





- Saline
  - Max. 1 hour; no nutrients



- Saliva
  - Max. 2 hours
    - PDL cells have low resistance to salivary bacteria

27

Storage Media for Avulsed Teeth

- Plastic Wrap
  - Max. 1 hour - prevents dehydration
  - Combine with saliva, if possible





28

Storage Media for Avulsed Teeth

- Plastic Wrap
  - → Max. 1 hour - prevents dehydration
  - → Combine with saliva, if possible



- Milk
  - → Max. 6 hours
    - pH and osmolarity suitable
  - → Temperature not important
    - If < 37°C
  - → NOT yoghurt or sour milk
    - pH too low





29

Storage Media for Avulsed Teeth

- Plastic Wrap
  - → Max. 1 hour - prevents dehydration
  - → Combine with saliva, if possible



- Milk
  - → Max. 6 hours
    - pH and osmolarity suitable
  - → Temperature not important - if < 37°C
  - → Not yoghurt or sour milk
    - pH too low



- Tissue culture media
  - → Ideal
  - → But rarely available



30

External Replacement Resorption

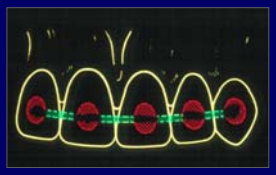


- Factors
  - Damage during the injury
    - → Mechanical damage
      - Can not be controlled
  - During repositioning/replant procedure
    - → Minimise trauma
      - If replanted by the dentist
    - → ***BUT*** - can not always be controlled
      - e.g. If replanted by patient, parent or other person at the accident scene

31

External Replacement Resorption

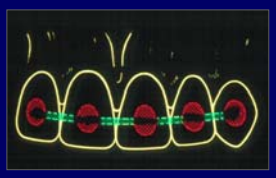
- Factors
  - Splinting





32

External Replacement Resorption

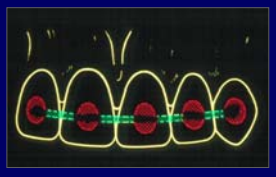




- Factors
  - Splinting
    - → Two types of splints:
      - Flexible
      - Rigid

33

External Replacement Resorption

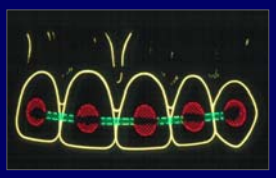




- Factors
  - Splinting
    - → Flexible splint:
      - *If NO root or bone fractures*
      - Allows "functional" healing of p.d.l.
      - Reduces ankylosis & replacement resorption
        - 7 - 10 days only

34

External Replacement Resorption





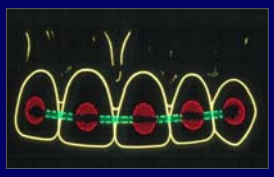
- Factors
  - Splinting
    - ➔ Rigid splint
      - *ONLY* use if:
        - A bone fracture ➔ 6 weeks

      OR if:

        - A root fracture ➔ 3 months

35

Requirements of a Splint



- Keep it simple
- Avoid gingival tissues
- Allow interproximal cleaning
  - Instruct the patient how to clean
- Check tooth position radiographically
- Relieve from occlusion
  - Check with articulating paper



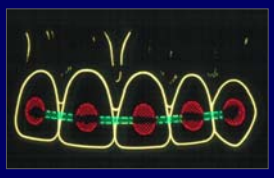


radiogram to check if splint is right path

36

Flexible Splint

Fishing line +
Composite resin



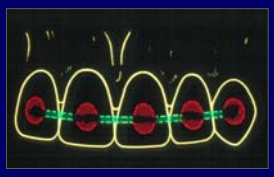




37

Rigid Splint

SS wire +
Composite resin

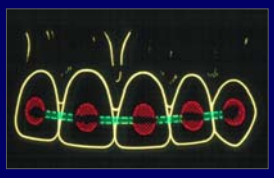




38

Rigid Splint

SS wire +
Composite resin







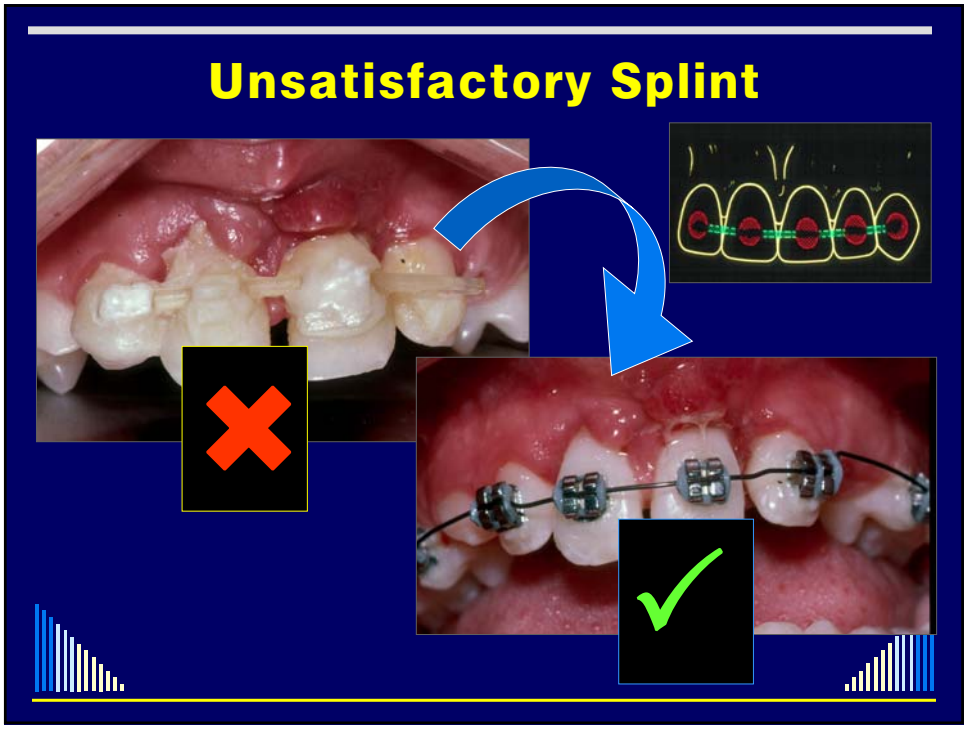
39

Unsatisfactory Splint





40



41



42

External Replacement Resorption



- **Factors**
  - **Endodontic treatment**
    - ➔ Use of toxic materials may destroy more PDL cells
      - hence ***more*** replacement resorption occurs

∴ ***AVOID*** - early use of $Ca(OH)_2$ → early means within 3 months)
- immediate root filling
- extra-oral endodontic treatment

✓ ***Instead USE:*** a corticosteroid-antibiotic mixture
- ➢ e.g. Ledermix paste



43

External Replacement Resorption



Management

- Endodontic treatment can ***NOT*** arrest or treat external replacement resorption
  - ***Since this resorption is due to damage to the PDL and root surface***
    - ➔ ***i.e. It is NOT due to pulp disease***

- Only do endodontics to prevent or treat external inflammatory resorption
  - ➢ Some added benefits from using intracanal medicaments that inhibit clastic cells
    - ➔ Corticosteroid / tetracycline paste

44

External Replacement Resorption

Factors - Summary



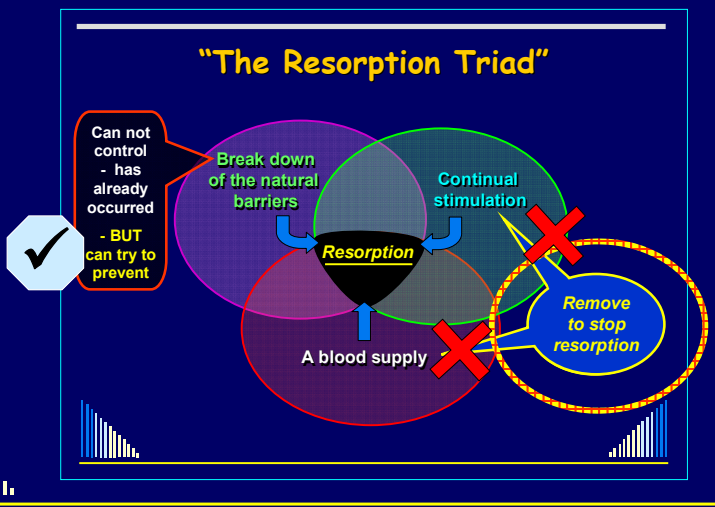
- Extra-alveolar time
  - Keep as short as possible (ideally < 12 mins)
- Storage conditions
  - Milk > saliva = plastic wrap ≠ water = dry
- Damage during injury and repositioning
  - Avoid mechanical damage
- Splinting
  - Flexible > Rigid
- Endodontic treatment
  - Avoid toxic materials; use CS-AB's

45

External Replacement Resorption

Management





46