Emergency Management of Traumatic Dental Injuries

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Emergency Management of Traumatic Dental Injuries



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General Principles for Managing Trauma

- History, examination and assessment
  - Establish priorities
- Protection
  - Pulp (if exposed)
  - Root surface (e.g. during repositioning)
- Reposition - *Immediately:* Teeth, bone, soft tissues
- Stabilisation
  - Bone and teeth: splint (rigid or flexible)
  - Soft tissues: sutures
- Temporary restorations
- Medications
  - Systemic: tetanus, antibiotics, analgesics, anti-inflammatory
  - Local: intra-canal dressings, chlorhexidine m/w, gel
- Follow-up

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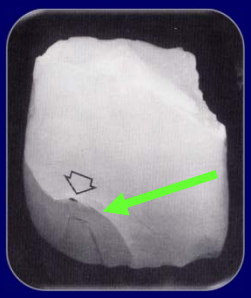
Emergency Management of Traumatic Dental Injuries

- Infractions
- Crown Fractures
- Crown : Root Fractures
- Root Fractures ← See separate lecture

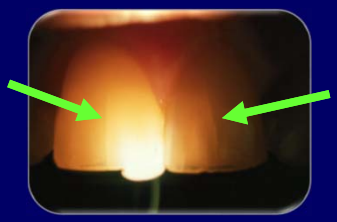
- Concussion + Subluxation
- Extrusive Luxation
- Lateral Luxation
- Intrusive Luxation
- Avulsion

4

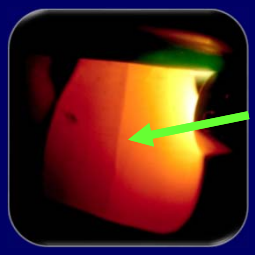
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- Avulsion



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Infractions

- Coat tooth surface with light-cured unfilled resin bonding agent
  - To minimise chances of bacterial ingress while pulp possibly damaged or inflamed from trauma
    - → Love 1996

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Bacterial Penetration of the Root Canal of Intact Incisor Teeth after a Simulated Traumatic Injury

Robert M. Love

Endod Dent Traumatol 1996; 12: 289-93.

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Bacterial Penetration of the Root Canal of Intact Incisor Teeth after a Simulated Traumatic Injury Love EDT 1996

- Investigated whether enamel / dentine cracks are possible pathways for bacterial penetration in to pulp chambers and root canals
- Important aspect following trauma to teeth:
  - 1.7 - 3.5% of teeth with enamel infractions demonstrated pulp necrosis (Ravn 1985a, b)
  - Bacteria in the pulp system will prevent revascularisation (Cvek *et al* 1990)

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Bacterial Penetration of the Root Canal of Intact Incisor Teeth after a Simulated Traumatic Injury Love EDT 1996

Outline of Study

- **20 intact teeth without cracks:**
  - **Tested for bacterial penetration -**
    - ➔ **16 negative**
- **Impact blow applied to these 16 teeth:**
  - **Re-tested for bacterial penetration -**
    - ➔ **7 positive**

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Bacterial Penetration of the Root Canal of Intact Incisor Teeth after a Simulated Traumatic Injury Love EDT 1996

Outline of Study

- **2 coats of light-cured unfilled resin applied to 5 of these teeth and the other 2 were used as positive controls**
  - **Re-tested for bacterial penetration -**
    - ➔ **ALL 5 experimental teeth had NO bacteria**
    - ➔ **ALL controls had bacterial penetration**

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Bacterial Penetration of the Root Canal of Intact Incisor Teeth after a Simulated Traumatic Injury Love EDT 1996

Summary and Conclusions

- **Enamel / dentine cracks:** are possible pathways for bacterial penetration into the root canal system of teeth
- **Unfilled resin:** may help prevent infection of the pulp system:
  - Apply as soon as possible after trauma to minimise bacterial penetration
  - May help to allow healing of the compromised pulp
  - *Resin will wear away - so this effect is not permanent*

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- Avulsion





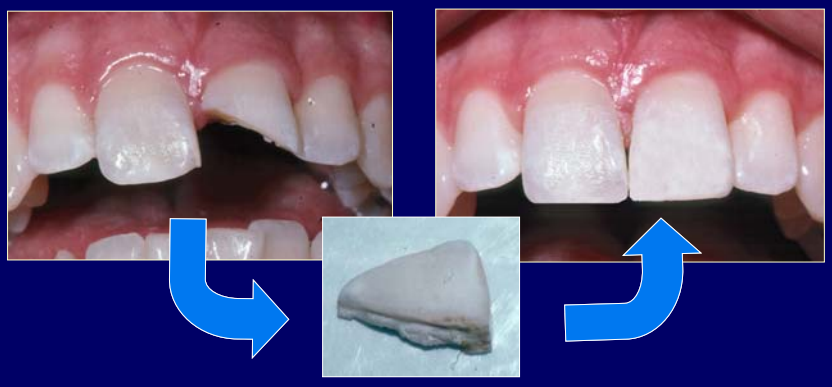
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Crown Fractures

- Protect the pulp
  - If pulp IS exposed
    - → Partial pulpotomy or pulpectomy
      - Depends on stage of root development
  - If pulp is NOT exposed
    - → Indirect pulp cap / lining
    - → Use glass ionomer
      - "Base" or "dentine replacement"
- Restore the fractured portion of the tooth
  - Composite resin "bandage" / GIC / bond fragment
  - Definitive restoration later
    - → When pulp status clear

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Crown Fractures



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→ Uncomplicated



→ Complicated



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Crown : Root Fractures

→ Vertical



→ Uncomplicated



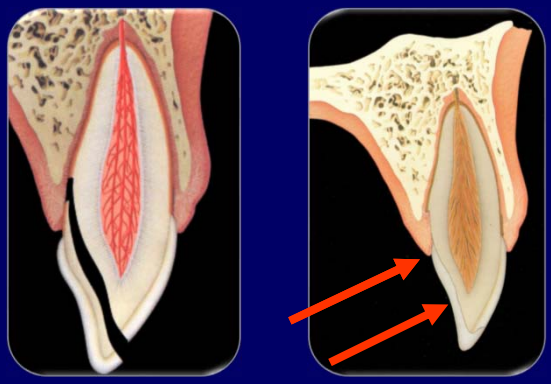
→ Complicated



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Crown : Root Fractures

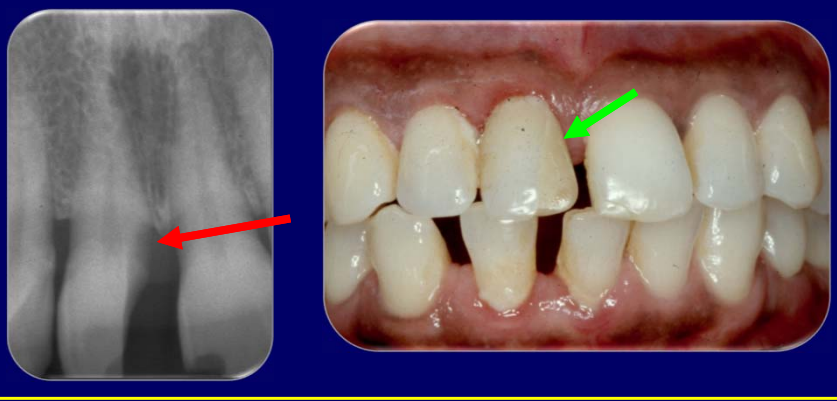
- Uncomplicated
  - Minor involvement of root
  - Restore as for crown fracture



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Crown : Root Fractures

- Uncomplicated
  - Minor involvement of root
  - Restore as for crown fracture



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Crown : Root Fractures

- Uncomplicated
  - Minor involvement of root
  - Restore as for crown fracture
- Complicated
  - Major involvement of root
  - Treat as for a supra-crestal root fracture in the coronal third of the root



See separate lecture Re: Root Fractures

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Crown : Root Fractures

- Uncomplicated
  - Minor involvement of root:
  - Restore as for crown fracture
- Complicated
  - Major involvement of root
  - Treat as for a supra-crestal root fracture in the coronal third of the root
- Vertical crown:root fractures
  - Extraction

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Crown : Root Fractures




- Vertical crown:root fractures
  - Extraction

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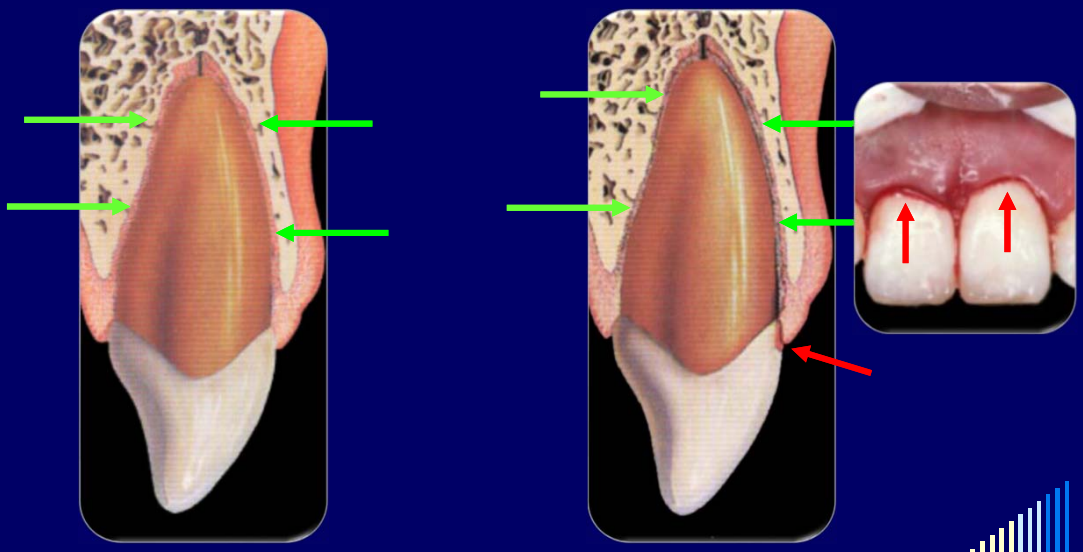
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Concussion & Subluxation



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Concussion & Subluxation

- Splinting is NOT required
  - Unless the tooth is very loose
    (i.e. only a severe subluxation)
- Relieve the occlusion
  - Check with articulating paper
- Review
  - As per recommended review schedule if no other injuries





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Concussion & Subluxation

- Prognosis - is generally very good

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

- These figures are a general guide ONLY
- They are based on retrospective analyses of many teeth
- They should NOT be used to predict the outcome for an individual tooth
- They are NOT the probability of any of the listed outcomes / sequelae

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Concussion

- Prognosis - is generally very good

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

	Concussion
Pulp Necrosis	2 %
PCC	2.2 %
TAB	0.1 %
Resorption	-

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Subluxation

- Prognosis - is generally very good

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

	Subluxation
Pulp Necrosis	6 - 47 %
PCC	26 %
TAB	2.2 %
Resorption	4 %

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Emergency Management of Traumatic Dental Injuries



- Infractions
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- Root Fractures

- Concussion + Subluxation
- Extrusive Luxation
- Lateral Luxation
- Intrusive Luxation
- Avulsion



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Extrusive Luxation

- Reposition immediately
- Mould bone back into position
- Splint
  - *Flexible*
    - → 7 - 10 days
- Suture soft tissues
- Review regularly



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Extrusive Luxation

- **Prognosis - is generally good**

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

Pulp Necrosis	64 - 98 %
PCC	24 %
TAB	11%
Resorption	7 %
Bone loss	-

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- Infractions
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- Crown : Root Fractures
- Root Fractures

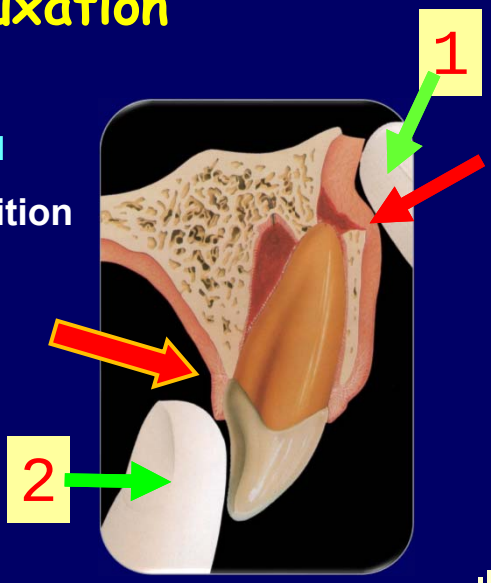
- Concussion + Subluxation
- Extrusive Luxation
- Lateral Luxation
- Intrusive Luxation
- Avulsion



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Lateral Luxation

- Reposition immediately
  - TWO movements required
- Mould bone back into position
  - NB: fractured socket wall
- Splint - Rigid
  - Since also bone fracture
    - → 6 weeks
- Suture soft tissues
- Review regularly



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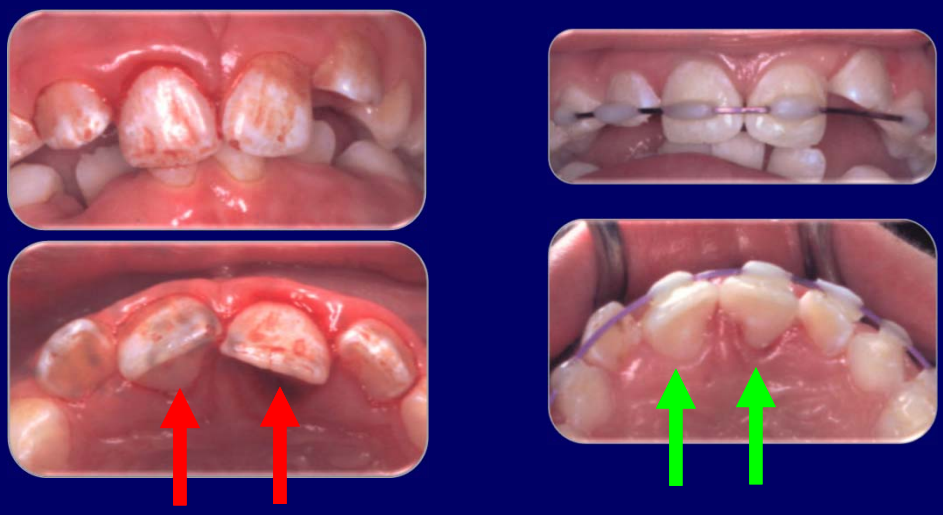
Lateral Luxation





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Lateral Luxation



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Lateral Luxation

- **Prognosis - is generally good**

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

Pulp Necrosis	58 %
PCC	24 %
TAB	12%
Resorption	7 %
Bone loss	6 - 31 %

- These figures are a general guide ONLY
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- They are NOT the probability of any of the listed outcomes / sequelae

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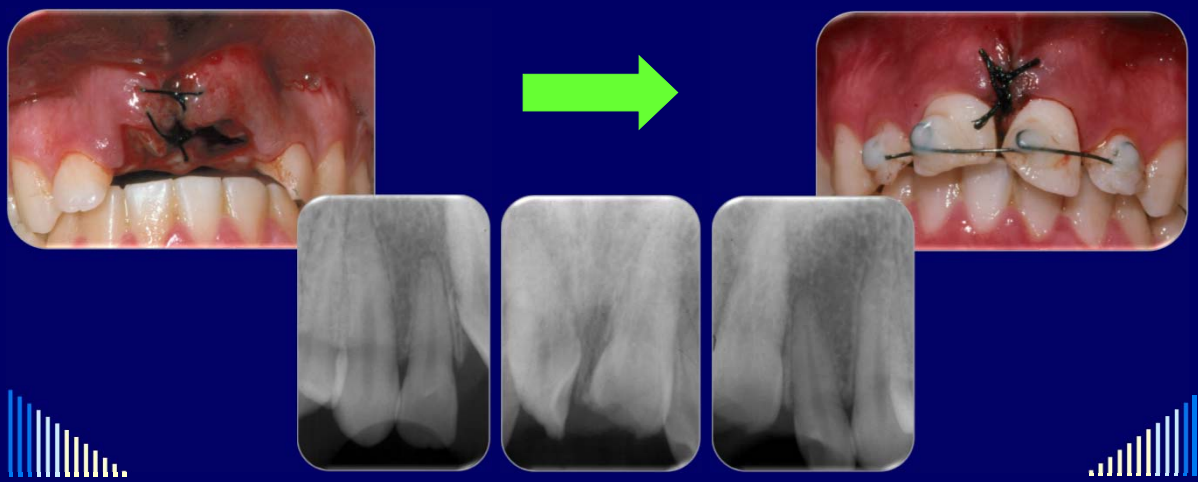
Intrusive Luxation

- Reposition immediately
  - Other options:
    - → Allow to re-erupt spontaneously
    - → Orthodontic extrusion

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Intrusive Luxation

- Reposition immediately



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Intrusive Luxation

- Reposition immediately
  - Other options:
    - → Allow to re-erupt spontaneously
      - Only likely if incompletely developed tooth
    - → Orthodontic extrusion
      - Later - if no re-eruption spontaneously
      - BUT this complicates other early management
        - ➢ Endodontic treatment

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Intrusive Luxation

- Reposition immediately
  - Reasons:
    - → Avoids pressure necrosis of the PDL
      - Reduce chances of external replacement resorption
    - → Fully developed teeth are not very likely to erupt
    - → Allows access to the root canal
      - NB: Some teeth need IMMEDIATE endodontic treatment to prevent inflammatory resorption
        - All MATURE teeth
        - IMMATURE teeth with concurrent crown fracture
    - → Avoids surgery for orthodontic extrusion
      - To attach brackets, wires

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Intrusive Luxation

- Reposition immediately
  - Be careful not to damage the CEJ region
    - → Avoid using extraction forceps in this region !!
  - HINT: use diamond-tipped tweezers





Intensiv
"Tweezers with diamond-tipped points"
Code: 1001A

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Intrusive Luxation

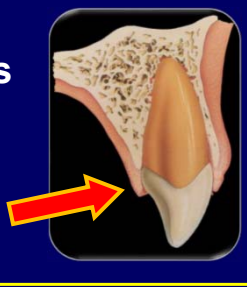
- Reposition immediately
  - Be careful not to damage the CEJ region
    - → Avoid using extraction forceps in this region !!
  - HINT: use diamond-tipped tweezers
  - Acid-etch/bond a small amount of composite to the labial and palatal surfaces to allow forceps or tweezers to hold the tooth without slipping
  - Often intruded teeth are also rotated
    - → May be able to hold the Mesial and Distal surfaces of the crown without slipping as they are almost parallel

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Intrusive Luxation

- Reposition immediately
- Mould bone back into position
  - NB: fractured socket wall
- Splint - *Rigid*
  - Since also have a bone fracture
    - → 6 weeks
- Suture soft tissues





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Intrusive Luxation



- Endodontic treatment
  - Immediately - to prevent external inflammatory resorption - for:
    - → *MATURE teeth*
    - → *IMMATURE teeth WITH a crown fracture*
  - ALSO: Antibiotics for these cases (for 1 week)
- If IMMATURE tooth and NO crown fracture
  - Monitor the pulp to assess if it recovers / heals
- Review regularly

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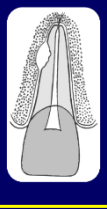
Injuries Where Root Surface and PDL Damage, PLUS Pulp Necrosis and Infection are PREDICTABLE



FULLY DEVELOPED TEETH

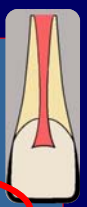
- Avulsion
- Intrusion
- Lateral Luxation + Crown Fracture
- Extrusion + Crown Fracture

HENCE - in ALL these cases, a *"preventive approach"* should be taken to prevent external inflammatory resorption



INCOMPLETELY DEVELOPED TEETH

- Intrusion + Crown Fracture
- Avulsion + Crown Fracture



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External Inflammatory Resorption

Preventive Management

Mature and Immature Teeth

- ***IMMEDIATELY*** **after the emergency treatment**
  - Start Systemic antibiotics - *Tetracycline preferred*
    - *e.g. Doxycycline 100mg, 2 tabs. on 1st day, then 1 tab. daily for 1 week*
- ***IMMEDIATELY*** ***after replanting / repositioning & splinting***
  - Remove the pulp
  - Prepare the canal if time available - otherwise do it at the next visit
  - Place a CS-AB paste dressing



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External Inflammatory Resorption

Preventive Management

- **MATURE teeth - After *6 weeks***
  - Re-dress canal with the CS-AB paste



- **MATURE teeth - After another *6 weeks***
  - Take PA radiograph
    - If resorption present: Re-dress canal with the CS-AB paste
    - If no resorption: Place new dressing using 50:50 CS-AB + $Ca(OH)_2$
- **MATURE teeth - After a further *2 months***
  - Take PA radiograph
    - If no resorption: Complete the Root Canal Filling (GP + cement)



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External Inflammatory Resorption

Preventive Management

- **IMMATURE teeth - After *4 weeks***
  - → Re-dress canal with the **CS-AB paste**



- **IMMATURE teeth - After a further *4 weeks***
  - → Re-dress canal with the **CS-AB paste**



- **IMMATURE teeth - After another *4 weeks***
  - → Take PA radiograph
    - If resorption present: Re-dress canal with the CS-AB paste
    - If no resorption: Place new dressing using 50:50 CS-AB + $Ca(OH)_2$



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External Inflammatory Resorption

Preventive Management

- **IMMATURE teeth - After a further *2 months***
  - → Take PA radiograph
    - If no resorption:
      - An apical hard tissue barrier is desirable
        - Re-dress canal with $Ca(OH)_2$ paste



        - Change $Ca(OH)_2$ dressing *every 3 months*
          - Until hard tissue repair / apexification evident
        - Complete the Root Canal Filling (GP + cement)

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External Inflammatory Resorption

Preventive Management

- **ALL Cases**
  - Clinical and radiographic reviews are essential
  - At 6 months after the RCF is completed
  - Then every 3-4 years
    - ➔ For as long as possible !!!

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Intrusive Luxation

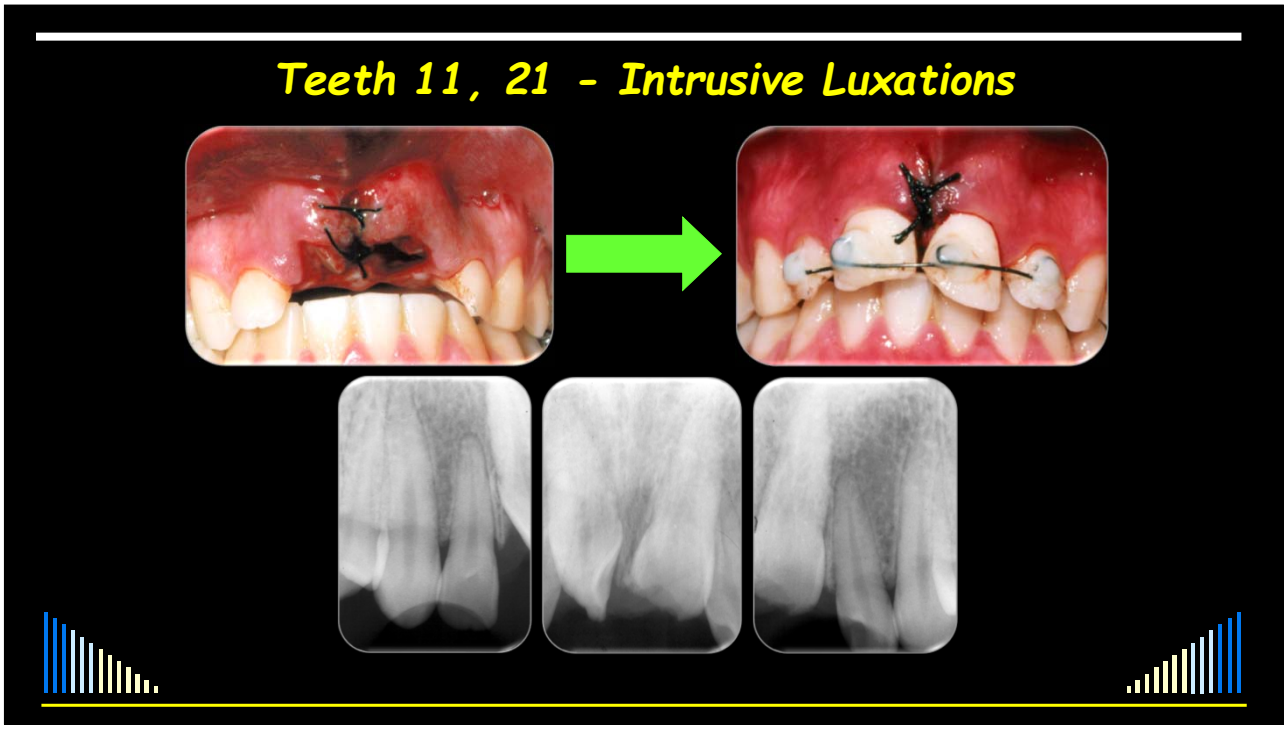
Prognosis - is generally fair

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

Pulp Necrosis	96 %
PCC	4 %
TAB	12%
Resorption	52 %
Bone loss	6 - 31 %
Arrested root develᵐ	16 %

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Teeth 11, 21 - Intrusive Luxations

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Teeth 11, 21 - Intrusive Luxations
2 mths
12 mths
5 years

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- Crown : Root Fractures
- Root Fractures



- Concussion + Subluxation
- Extrusive Luxation
- Lateral Luxation
- Intrusive Luxation
- Avulsion



55

Avulsion

- Reposition immediately





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Avulsion

- Reposition immediately
- Mould bone back into position
  - May be socket wall fracture
- Splint
  - Flexible - if no bone fracture
    - → 7 – 10 days
- Suture soft tissues





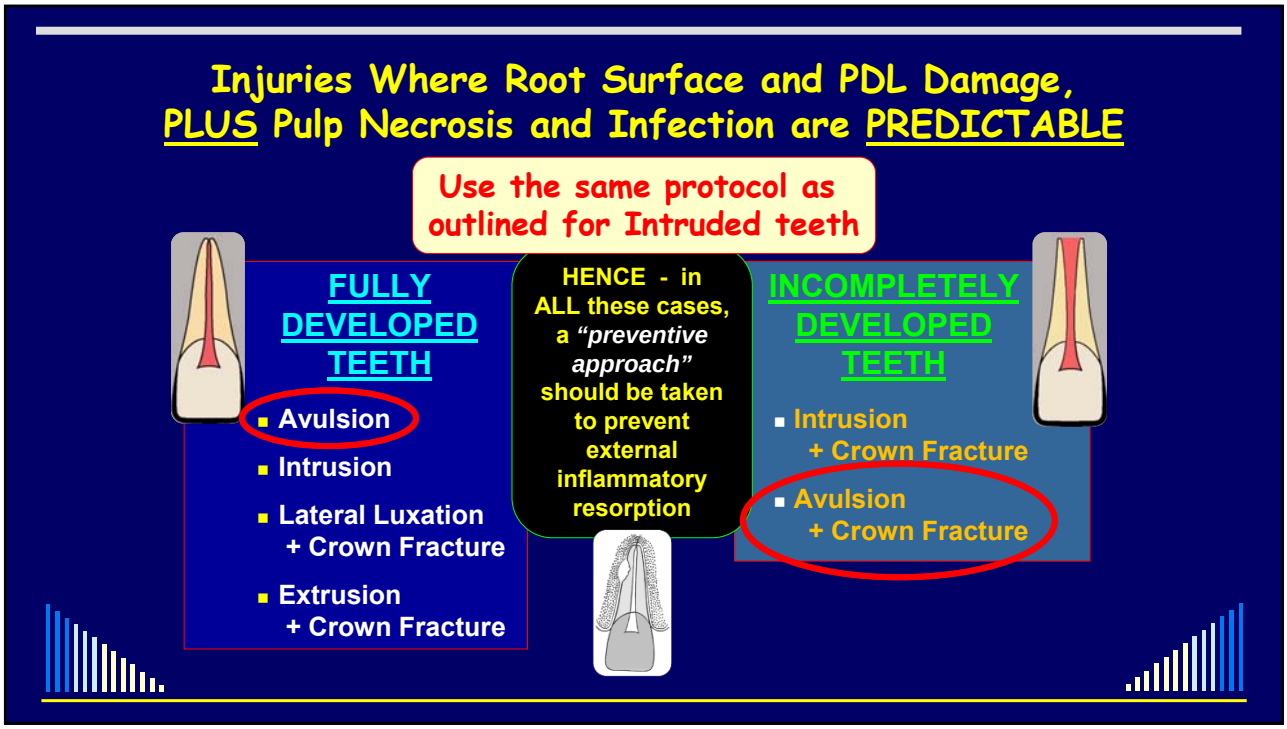
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Avulsion

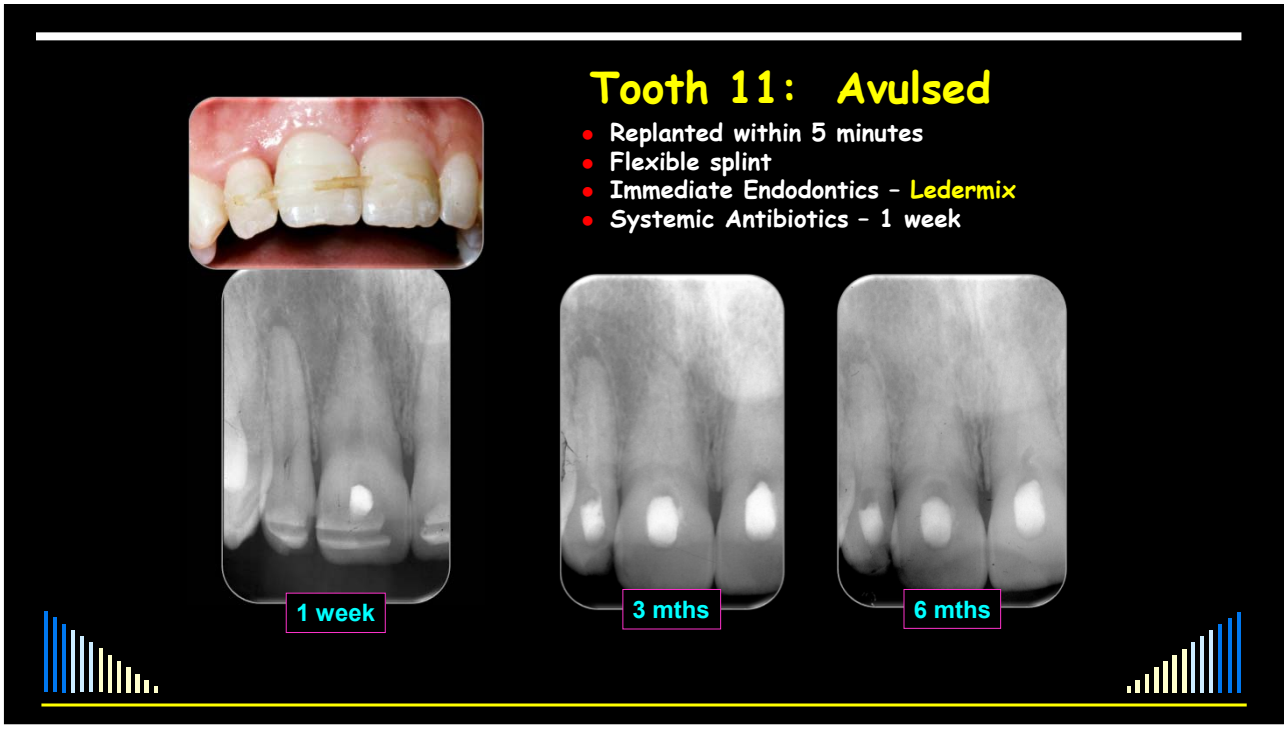
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  - ALSO: Antibiotics for these cases (for 1 week)
- If IMMATURE tooth and NO crown fracture
  - Monitor pulp to assess if it recovers / heals
- Review regularly



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Injuries Where Root Surface and PDL Damage,
PLUS Pulp Necrosis and Infection are PREDICTABLE
Use the same protocol as outlined for Intruded teeth
FULLY DEVELOPED TEETH
Avulsion
Intrusion
Lateral Luxation + Crown Fracture
Extrusion + Crown Fracture
HENCE - in ALL these cases, a "preventive approach" should be taken to prevent external inflammatory resorption
INCOMPLETELY DEVELOPED TEETH
Intrusion + Crown Fracture
Avulsion + Crown Fracture

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Tooth 11: Avulsed
Replanted within 5 minutes
Flexible splint
Immediate Endodontics – Ledermix
Systemic Antibiotics – 1 week
1 week
3 mths
6 mths

60

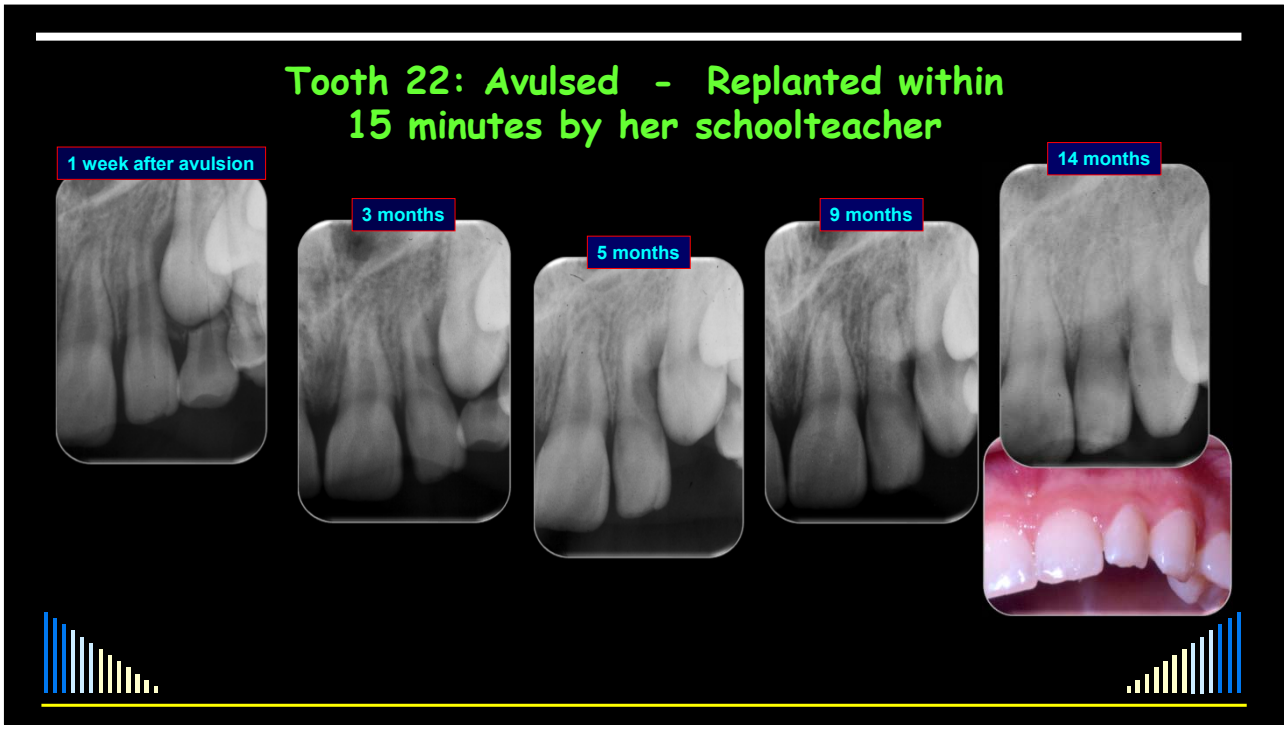


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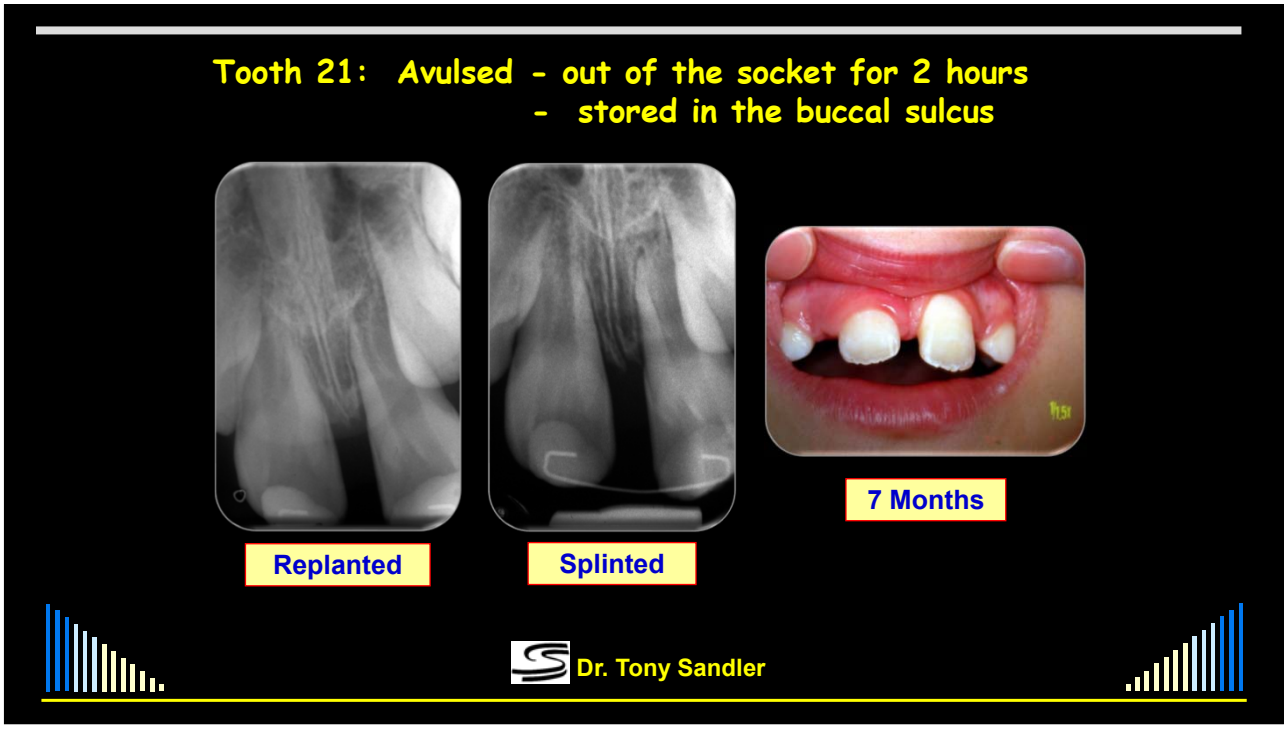
Avulsion

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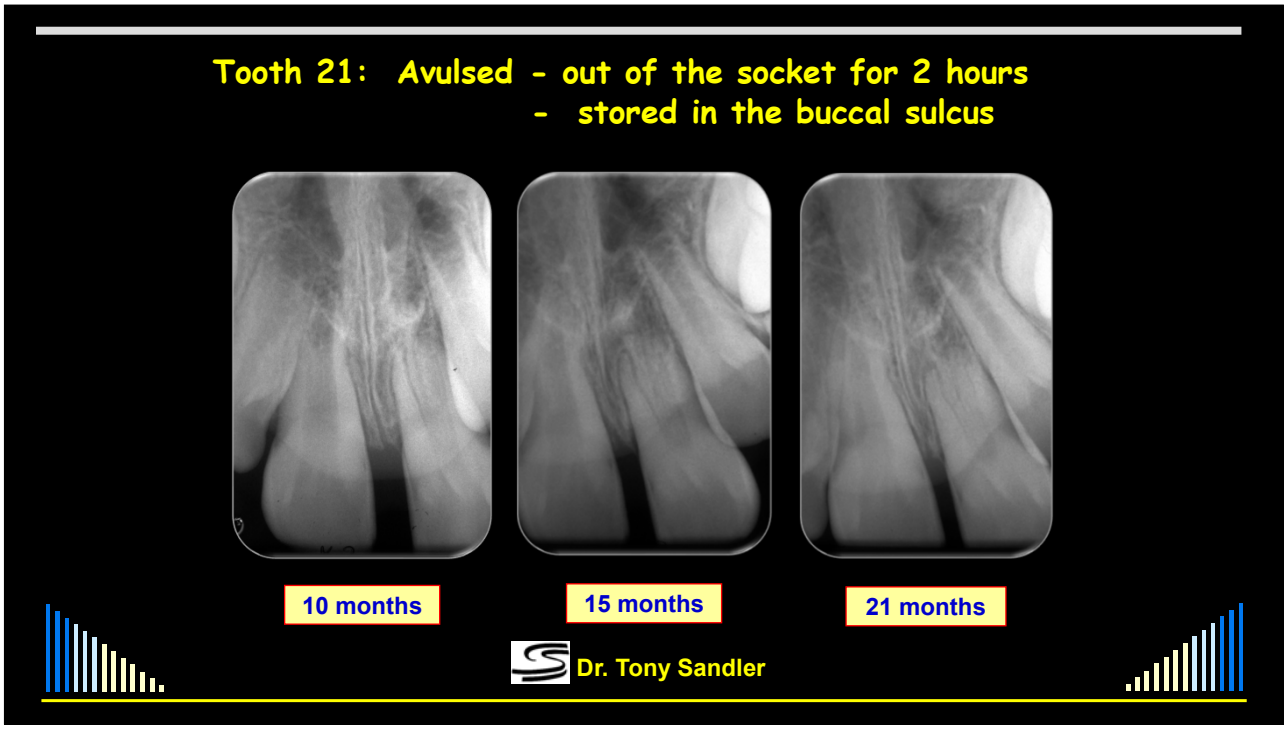
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Tooth 22: Avulsed - Replanted within 15 minutes by her schoolteacher
1 week after avulsion
3 months
5 months
9 months
14 months

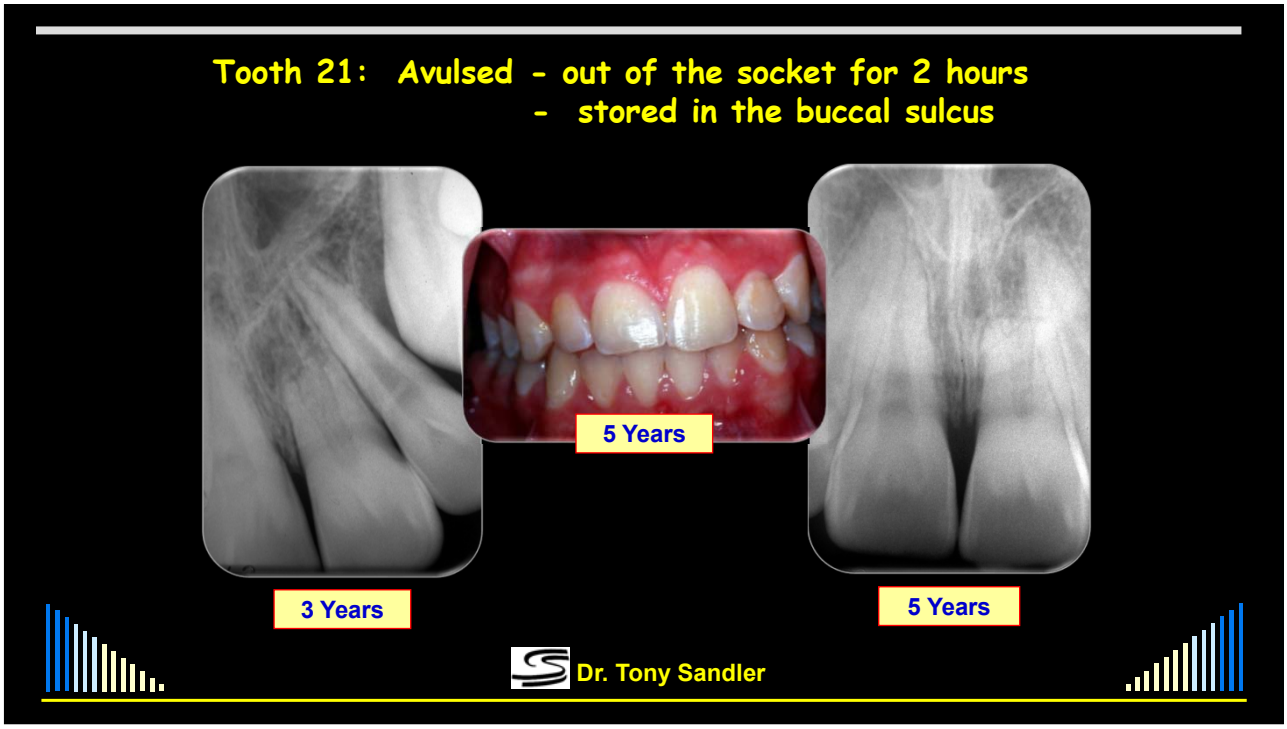
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Tooth 21: Avulsed - out of the socket for 2 hours
- stored in the buccal sulcus
Replanted
Splinted
7 Months
Dr. Tony Sandler

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Tooth 21: Avulsed - out of the socket for 2 hours
- stored in the buccal sulcus
10 months
15 months
21 months
Dr. Tony Sandler

65


Tooth 21: Avulsed - out of the socket for 2 hours
- stored in the buccal sulcus
5 Years
3 Years
5 Years
Dr. Tony Sandler

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Avulsion

- Prognosis - is fair

Depends on the many mechanical and biological factors - such as the stage of root development, pulp involvement, concurrent injuries, etc. - as previously discussed

Pulp Necrosis	up to 100 %
PCC	4 %
Resorption	74 - 96 %
Bone loss	6 - 31 %

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Emergency Management of Traumatic Dental Injuries

- Infractions
- Crown Fractures
- Crown : Root Fractures
- Root Fractures ← See separate lecture

- Concussion + Subluxation
- Extrusive Luxation
- Lateral Luxation
- Intrusive Luxation
- Avulsion

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Summary

- Full assessment of the injury is essential
  - How, when, why, and where it happened
  - History, examination, tests, radiographs
  - Assess priorities for treatment
- Reposition and stabilise ***ALL*** tissues
  - Assess priorities for each tooth / injury
- Allow time for healing
  - PDL: 3 - 6 months
  - Pulp: 3 - 24 months

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Summary

- Correct *IMMEDIATE* and *EARLY* management of traumatised teeth will significantly improve their long-term prognosis
- Correct FOLLOW-UP management is also important to improve prognosis
- DEFER all irreversible treatment and final restorations for as long as possible
  - → To improve the prognosis, and
  - → To allow the prognosis to be reassessed and confirmed

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