Cracked cusp and its management

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DCP 4 – Semester 1

Classification

From least severe to very severe they are classified as

-craze lines

-fractured cusp

-cracked tooth

-split tooth

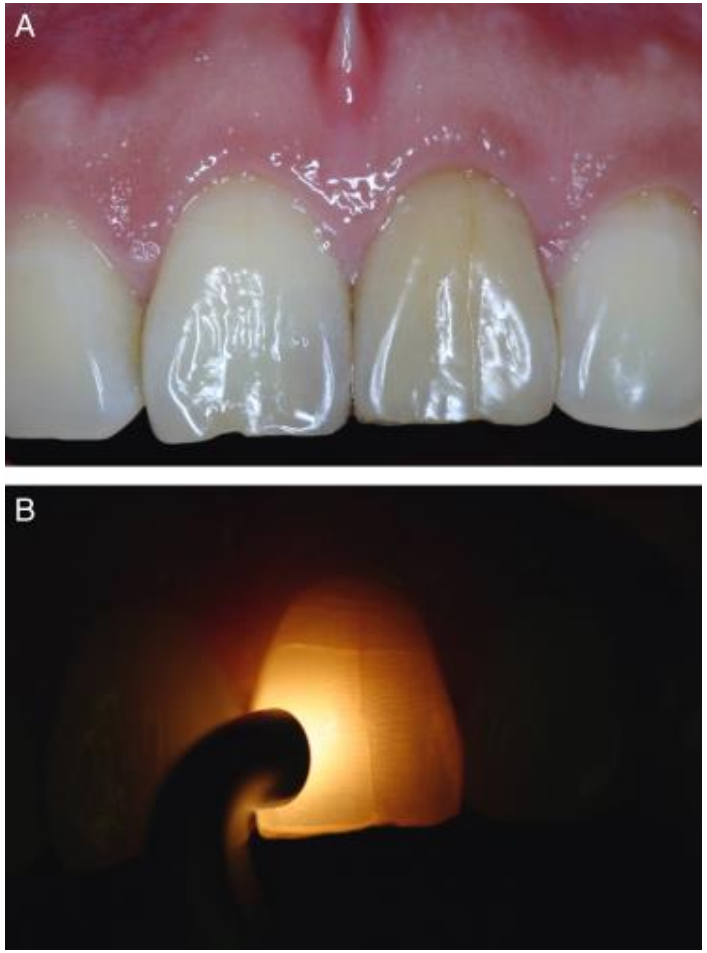
-vertical root fracture

	Craze line	Fractured cusp	Cracked tooth	Split tooth	Vertical root fracture
Location	Enamel only	Crown+cervical margin	Crown/crown-root	Crown+root	Root only
Symptoms	None	Sharp pain with cold and mastication	Variable	Pain on mastication	None to slight
Identification	Transillumination/direct vision	Visualise/remove restoration	Biting, remove restoration	Remove restoration	Reflect flap and transillumina te
Diagnostic test	None	Bite test, transillumination	Transillumination, bite test, perio-probing, magnification	Wedge the segments	“
Treatment	None	Remove # seg. and restore	RCT+ full cusp coverage	Variable-remove one segment,extract	Extract
Prognosis	V.good	V.good	Questionabl	Poor	Poor

Cracked Tooth Syndrome

- Means incomplete fracture of a tooth with a vital pulp
- Commonly involves enamel and dentin but sometimes pulp and periodontal structures may be involved

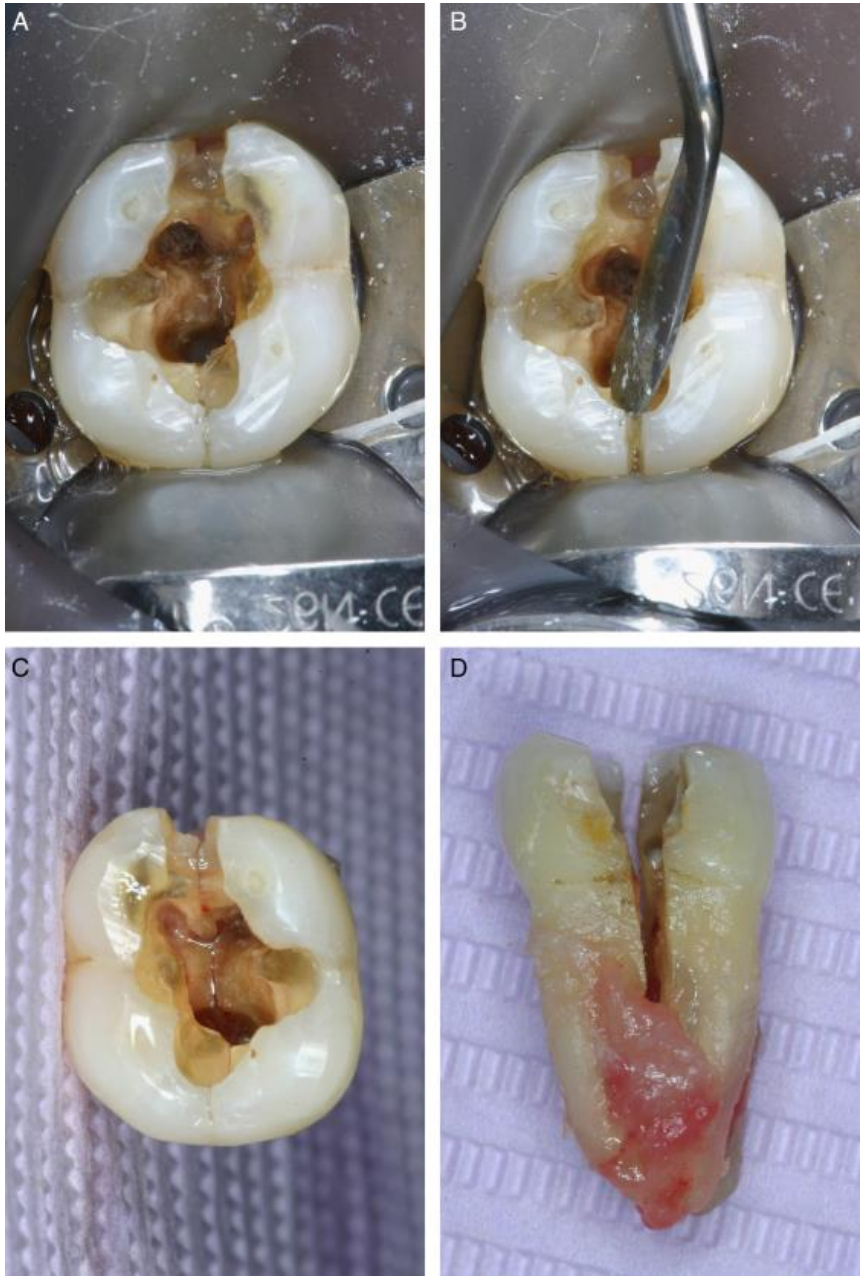
Craze lines



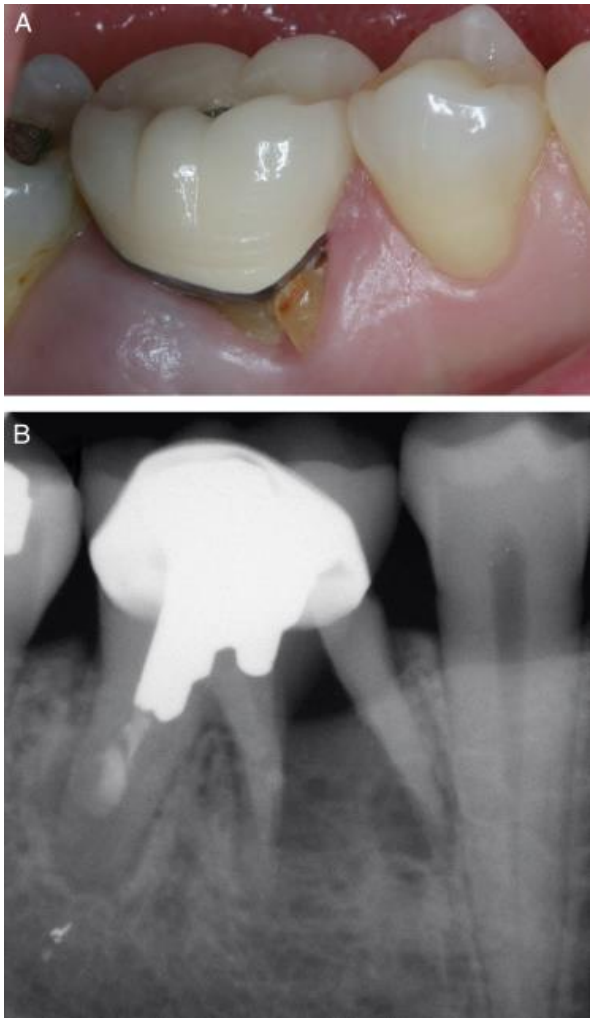
Fractured cusp

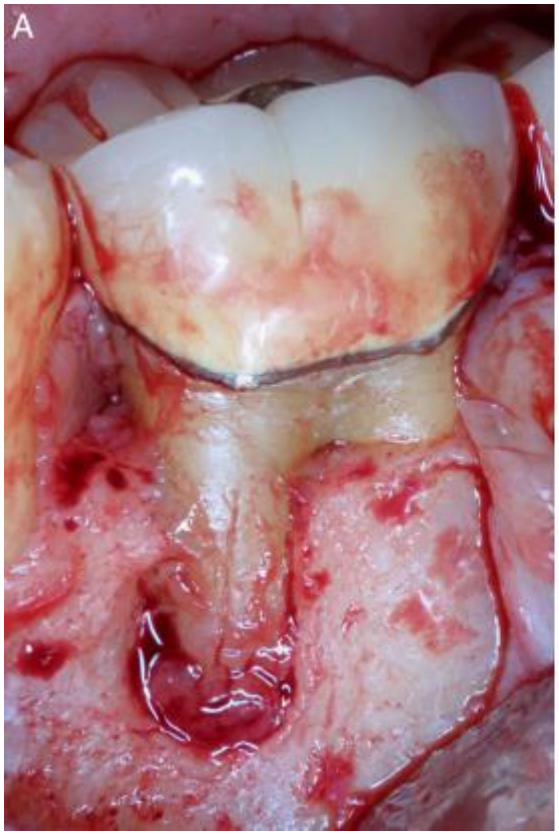
Cracked tooth

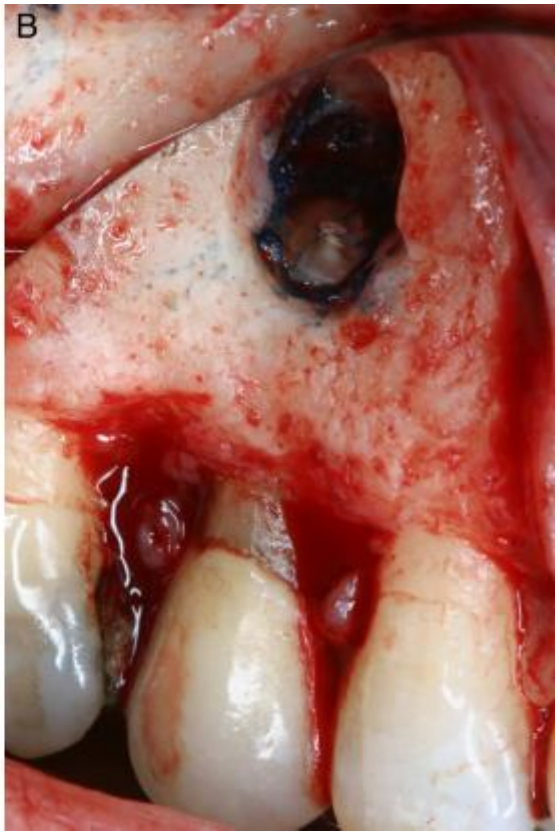
Split teeth



Vertical root fracture







Signs and symptoms

- Erratic pain on mastication especially with release of biting pressure
- Sensitive to thermal changes
- Generally tooth not T.O.P
- If pulp involved,signs of irreversible pulpitis or pulpal necrosis with periapical pathology

Diagnosis

- History of patient
- Visual examination:wear facets,steep cusps,cracked restorations
- Periodontal probing
- Tactile examination: with a sharp explorer
- Bite test:Tooth sloth

Pain during chewing/biting especially upon release of pressure is a classic sign of cracked tooth.

Diagnosis contd..

- Transillumination
- Use of dyes
- Radiographs

-not much help especially if crack is mesio-distal

-radiograph should be from more than 1 angle

-Thickened PL space,diffused radioluscency may indicate a crack

Differential Diagnosis

- If crack has progressed to pulp,pt may have thermal sensitivity which lingers after stimulus is removed /spontaneous pain consistent with irreversible pulpitis,pulp necrosis or apical periodontitis
- When crack is mesio-distal,splitting the tooth into 2 segments,pt may have pain on chewing,soreness of gums in affected area,should be differentiated from periodontal abcess

Endodontically treated tooth

- Symptoms of vague tenderness when chewing.
- Symptoms tend to occur only after involvement of the periodontal ligament, and may therefore be nonrestorable by the time the symptoms occur.

Chewing

- Movement of dentinal fluid, which occurs when the fractured portions of the tooth move independently of one another under occlusal load
- Sudden dentinal fluid movement activates myelinated A-type pain fibres within the pulp, creating a rapid and acute pain response.

Etiology

- Teeth with large complex restorations
- Stressful lifestyle
- Parafunctional habits
- High masticatory forces
- Preparations with wide or deep isthmus
- Fatigue produced by repeated flexure of the cusps

Contributing Factors

- Age!!
- Change in structure of dentine
- More & larger restorations
- Development of occusal habits as patients age
- Unrestored teeth
- Occlusal interferences - nonaxial forces directed on cuspal inclines

Contributing factors

- Other habits!!
- Preparations with wide or deep isthmus
- High impact force
- Fatigue produced by repeated flexure of the cusp

Biomechanics of the intact, prepared and restored tooth – (Hood)

Vale (1956): When the isthmus width was 1/4 the intercuspal dimension, the fracture force was the same for intact controls.
When the isthmus width was 1/3 - the fracture force was 2/3 that of intact controls.

No difference between empty cavity and a similar one restored with amalgam or gold
Gold overlays 2x as strong as unrestored teeth with the same cavity preparation.
Cavity preparation weakens the tooth.

Grimaldi and Hood

Breaking the continuity of enamel layer significantly reduces tooth rigidity.

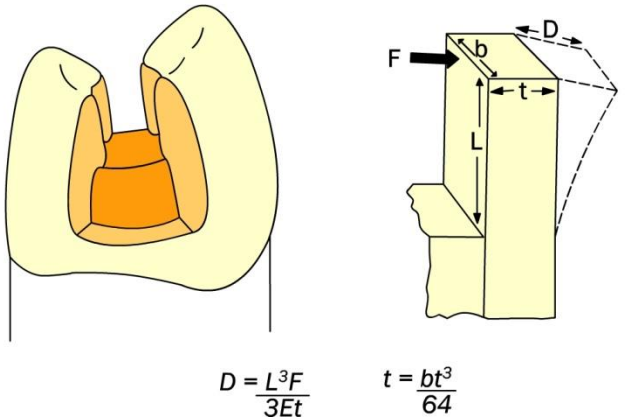
Progressive tooth removal increases cusp flexibility

Teeth with wide isthmus class II MOD cavities and/or pulpotomies should have some form of cuspal protection.

Cantilever Beams

If cusp height doubles as the cavity floor drops, then the deflection will increase by a factor of eight

High stresses are induced at the internal line angles of the cavity and fatigue fracture eventually occurs -> rounded internal line angles and stabilisation of the cusps to prevent flexion.



$$D = \frac{L^3 F}{3Et}$$

$$t = \frac{bt^3}{64}$$

Restoration Conclusions

Prevention ->minimal ideal

Optimal restorations for teeth with very large class II MOD cavities or endodontically involved -> onlay. The design should prevent flexion under load and may be amalgam, resin, porcelain or metal.

It is the biomechanical interactions that ultimately determine success or failure of the restored tooth The material is of lesser importance, but must be based on rational grounds. No one material is the universal restorative.

Treatment options

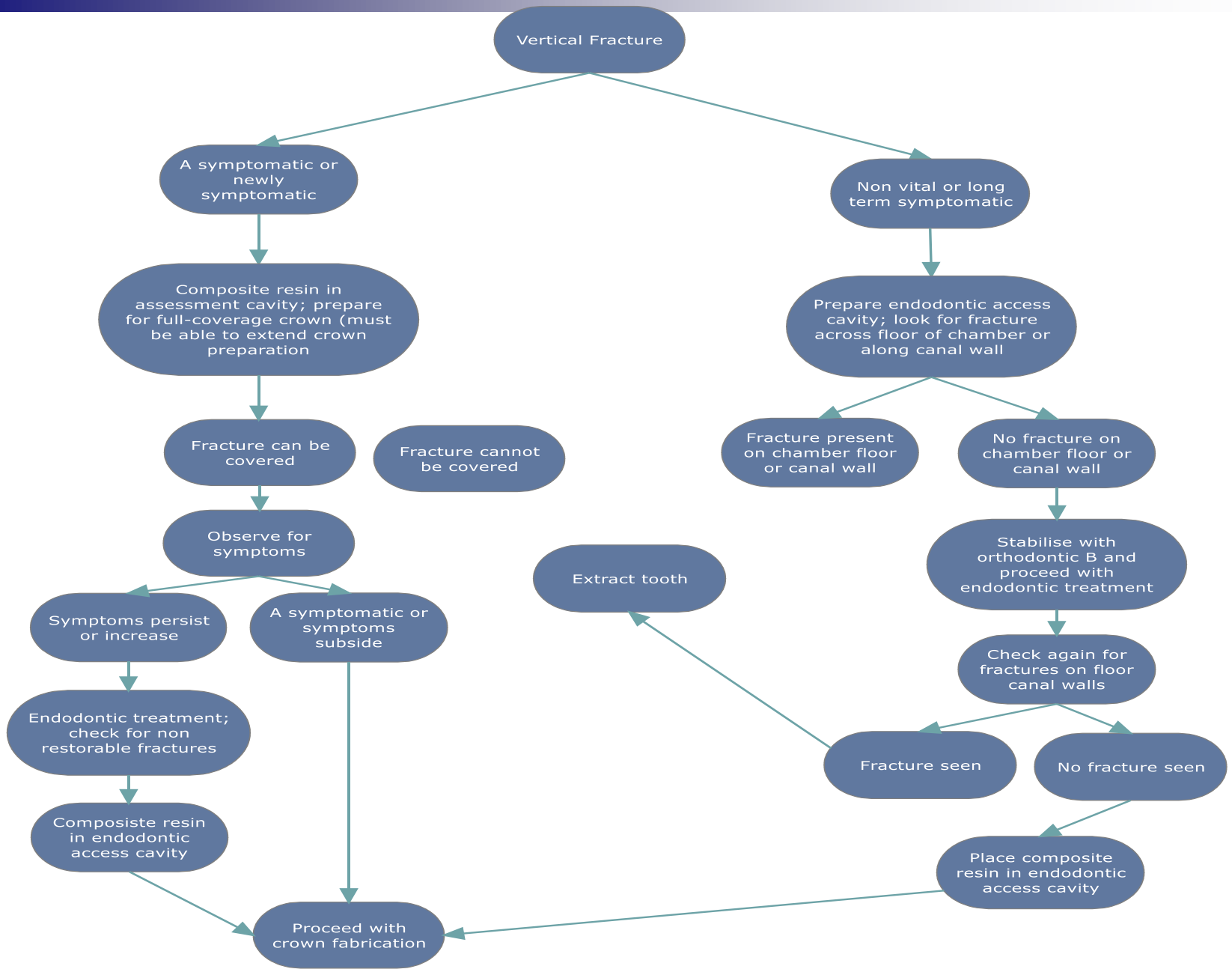
- Urgent care-immediate reduction of the occlusal contacts by selective grinding at the site of the crack or its antagonist
- Definitive treatment:Preserve pulp vitality by full occlusal coverage for cusp protection
- If crack is visible across the floor of the chamber,tooth may be bonded with the temporary crown or orthodontic band-this will protect the teeth till the endodontic therapy is completed

Treatment options contd.

- Future migration of the crack apically will determine the prognosis-either extraction,root resection or hemisection
- If you need a crown preparation,margins should be apical to any fracture line

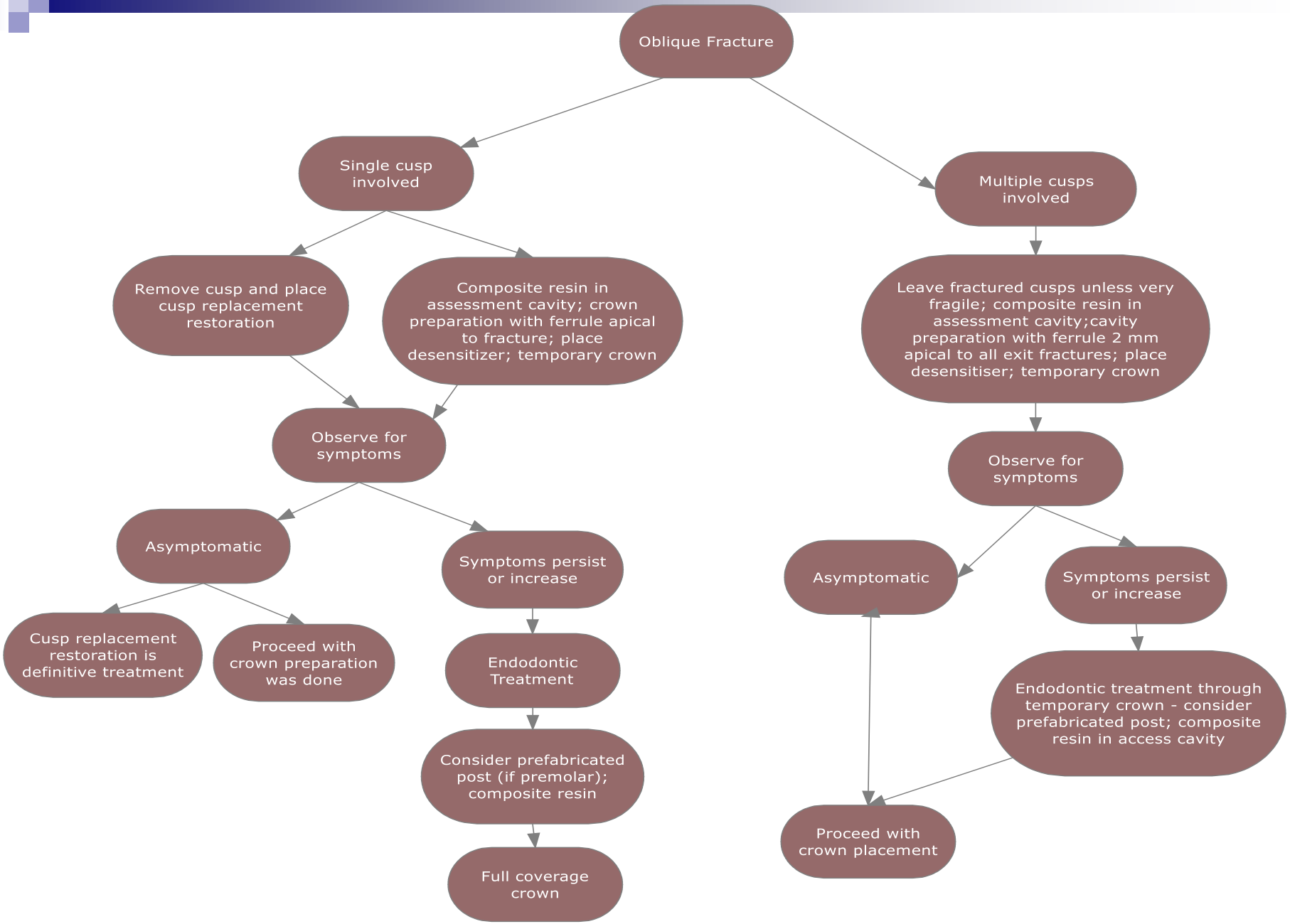
Treatment - Vertical

- Vital & either aysmptomatic or newly -> bonded composite in assessment cavity
  - Crown preparation (ideally want crown margins apical to any fracture)
  - Need for endo. tx. Determined on the basis of the presence or absence of symptoms in temporary crown phase.


Vertical Fracture
A symptomatic or newly symptomatic
Non vital or long term symptomatic
Composite resin in assessment cavity; prepare for full-coverage crown (must be able to extend crown preparation
Prepare endodontic access cavity; look for fracture across floor of chamber or along canal wall
Fracture can be covered
Fracture cannot be covered
Fracture present on chamber floor or canal wall
No fracture on chamber floor or canal wall
Observe for symptoms
Stabilise with orthodontic B and proceed with endodontic treatment
Extract tooth
Symptoms persist or increase
A symptomatic or symptoms subside
Check again for fractures on floor canal walls
Endodontic treatment; check for non restorable fractures
Fracture seen
No fracture seen
Composiste resin in endodontic access cavity
Place composite resin in endodontic access cavity
Proceed with crown fabrication

Treatment - Oblique

- Elimination of fractured cusp and placing a cusp replacement restoration.
- Mutliple fractures - bonded composite restoration followed by full-coverage crown.
- Endo treatment determined on the presence or absence of symptoms after the restoration is placed


Oblique Fracture
Single cusp involved
Multiple cusps involved
Remove cusp and place cusp replacement restoration
Composite resin in assessment cavity; crown preparation with ferrule apical to fracture; place desensitizer; temporary crown
Leave fractured cusps unless very fragile; composite resin in assessment cavity;cavity preparation with ferrule 2 mm apical to all exit fractures; place desensitiser; temporary crown
Observe for symptoms
Observe for symptoms
Asymptomatic
Symptoms persist or increase
Asymptomatic
Symptoms persist or increase
Cusp replacement restoration is definitive treatment
Proceed with crown preparation was done
Endodontic Treatment
Endodontic treatment through temporary crown - consider prefabricated post; composite resin in access cavity
Consider prefabricated post (if premolar); composite resin
Proceed with crown placement
Full coverage crown


Thankyou