IMPROVE YOUR CROWN PREP'S

HANDS-ON-COURSE

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Principles of Modern Restoratve Dentistry

Prevention

- Diet
- Oral Hygiene
- Fluoride
- Sealants

Preservation

- Remineralisation
- Minimal cavity prep
- Smaller volume prep

Conservation

- Smaller restorations
- Increased longevity of restoration

AIMS

- To improve your knowledge of tooth prep's for complete coverage crowns.
    - Top tips and open discussion
- To improve your tooth preparation skills
- Self critical analysis - *aide memoire* available
- Produce high quality work
    - No time constraints
- Non-threatening & enjoyable !

WHY CROWN TEETH ??

- **To improve appearance**
  - **Both anterior and posterior**
- **To prevent further fracture / deterioration**
  - ***'To increase structural integrity'***
- **To improve morphology / restore function**
- **To act as FPD (bridge) retainers**
- **To provide optimal RPD (denture) abutments**
- **To improve coronal seal**
- **To make minor positional changes**

Why Crown Teeth?

- Often because you have to remove a failed crown (or partial crown/veneer) and replace it.
- You need to “Improve” on the previous model!

IMPRESSION TAKING!

An assessment of 50 impressions received at a commercial lab'

- 12 impressions were acceptable.
- 26 impressions regarded as failures.
- 16 defective margins.
- 5 drags in the material.
- 5 totally unsuitable.

CROWN PREPARATION

An assessment of 50 models in a lab'

- Major fault- inadequate space for materials.
- Inadequate occlusal clearance.
- Overtaper.
- Unreadable/ difficult to discern margins.
- Sharp edges.
- Poorly designed crown preparations.

Common errors in tooth preparation

- Interdental preparation too straight
- Insufficient space for crown materials
- No space at the tip
- Single plane reduction
- Irregular margin
- Overtapering
- Continuous palatal taper(no cingulum wall)

‘Standard Faults’

- convergence and length faults
- inclination faults
- insufficient inter-occlusal space
- optimism about the strength of the remaining tooth

“These are not limitations of our equipment and materials, but faults in our skill and judgement”

COMMON ERRORS

- **Flattening of occlusal surface**
- **Cusps too far apart (Normal supporting cusps are all in a straight line)**
- **Damage to adjacent teeth**
- **20 Dentists on MSc course- 19 misjudged amount and evenness of tooth reduction**

Setchell 1988

- **Freeman**

General Considerations

- General oral hygiene / plaque control
- Condition of tooth
  - **Caries / Pulp health / Restorative status / Pre-existing restorations / Periodontal health / Crown height**
  - **Pre-Op periapical radiograph is essential**
- Position
  - **Aesthetic / Alignment / Role in occlusal scheme**
- Use
  - **Single unit / Abutment for FPD or RPD**

Pulpal Effects of Preparation

“ 3 - 23 % of teeth prepared for a single crown or bridge retainer will require subsequent endodontic treatment”

Preservation of Tooth Structure

- Irreversible ‘destruction’ of tooth structure
- Aesthetic quality vs tooth reduction
- The more you take off, the better it can look
  - but, ultimately, a price may be paid

Threat to the pulp

- ↓ thickness of dentine = ↑ risk of pulpal irritation

Hamid & Hume

- Greater density of tubules
- Wider diameter of tubules

→ Greater relative 'porosity'

Pulpal Effects

“ The deeper and more extensive the tooth preparation, the greater the degree of inflammatory pulp responses.”

Bridge abutments > Single units

Kim and Trowbridge. 1987

- **Full Coverage Crowns 2.5x more likely to have a pulpal problem than Partial Veneer Crowns.**

Felton et al 1989

Remaining Dentine Thickness

Cavity RDT	Odontoblast survival (%)	Reactionary Dentine	Pulp Inflam
>1mm	100	Slight	Minimal
0.5-1.0mm	88.9	Slight	Minimal
0.25-0.5mm	82.5	Significant	Increased
<0.25mm	68.3	Slight	Severe

Dental Update 2002; 29: 172-178

Remaining Dentine Thickness

"is the single most important factor in protecting the pulp from insult"

Stanley 1981

What causes pulpal inflammation ?

- Over-drying dentine ('aspiration' of odontoblasts)
- Over-heating dentine (the 'wheat-sheafing' effect)
- Direct irritation effects of cements and materials ?

  No, the effects are mild and transitory **IF**

  subsequent Bacterial contamination is prevented Kakehashi 1965
- **'The stressed pulp'** Abou Rass 1984

Pulpal Consideration Summary

- **Conservation of tooth during preparation**
- **Ensure copious water spray to tip of bur**
- **Keep preparations moist**
- **Bacterial ingress is the cause of adverse pulp reactions under restorations**
  - **Prevent microleakage with provisional restorations**
    - **Minimal time possible**
  - **Prevent microleakage with definitive restorations**
    - **Best fit possible**

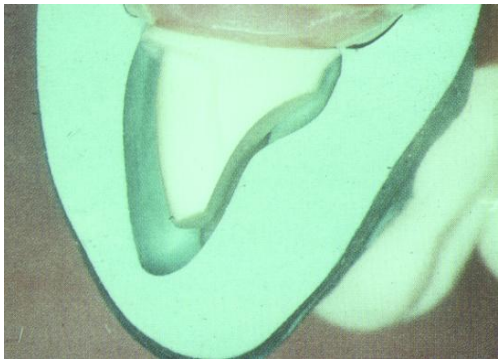
Shillingburg's Five Principles

1. Preservation of tooth structure
2. Retention and resistance form
3. Structural durability
4. Marginal integrity
5. Preservation of the periodontium

Fundamentals of Fixed Prosthodontics

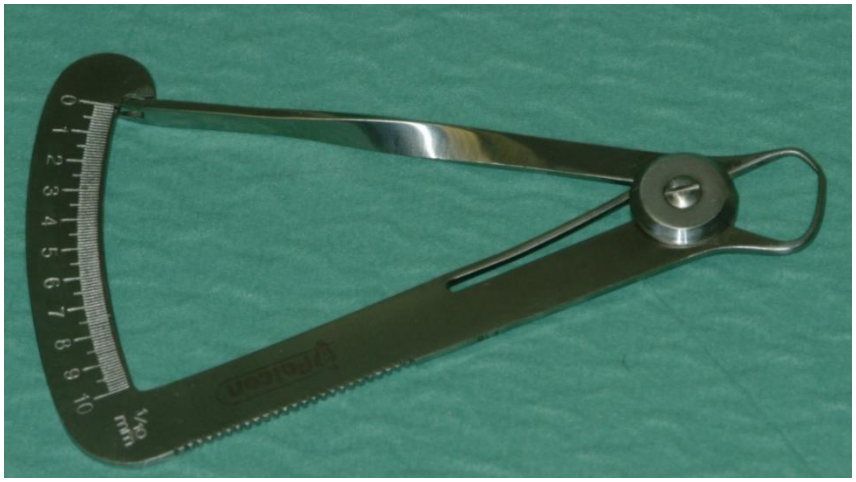
Assessment of reduction

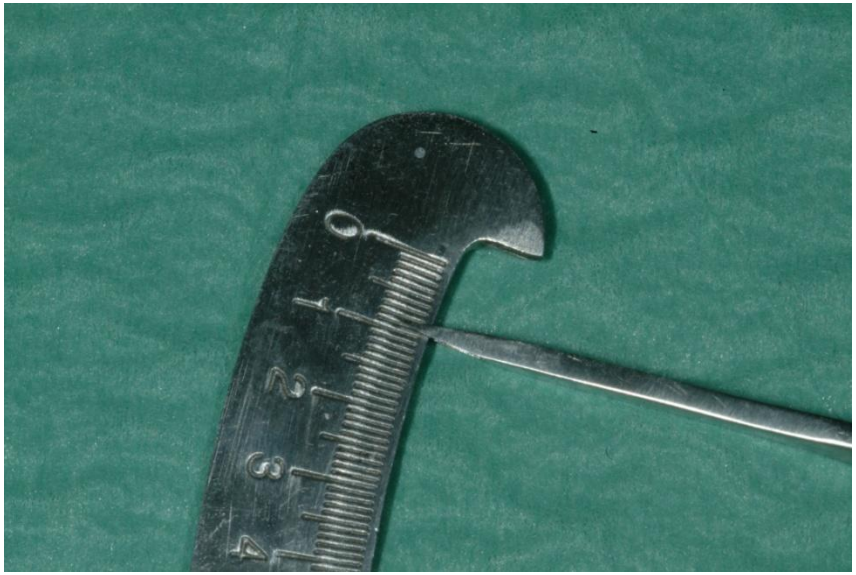
- An experienced eye?
- Depth cuts
- Matrices
- Temporary coverage

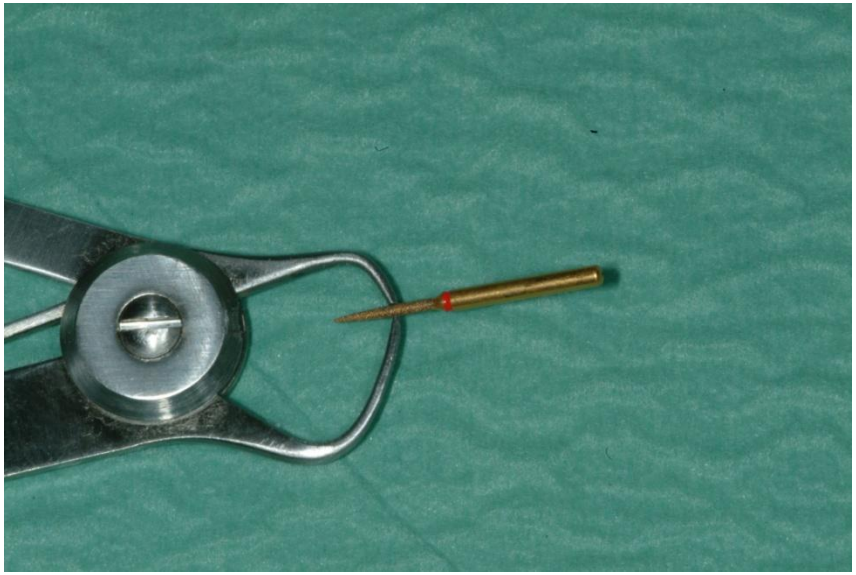


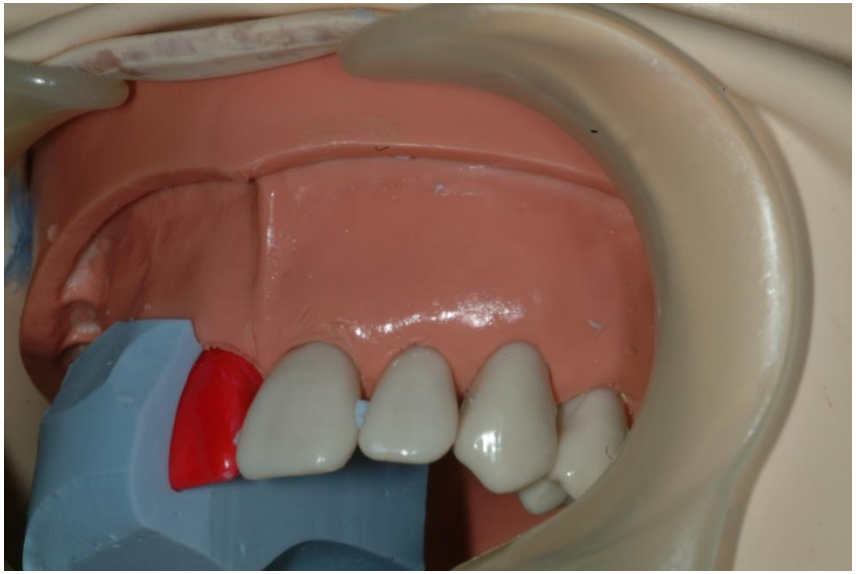
How Much is a Millimetre?

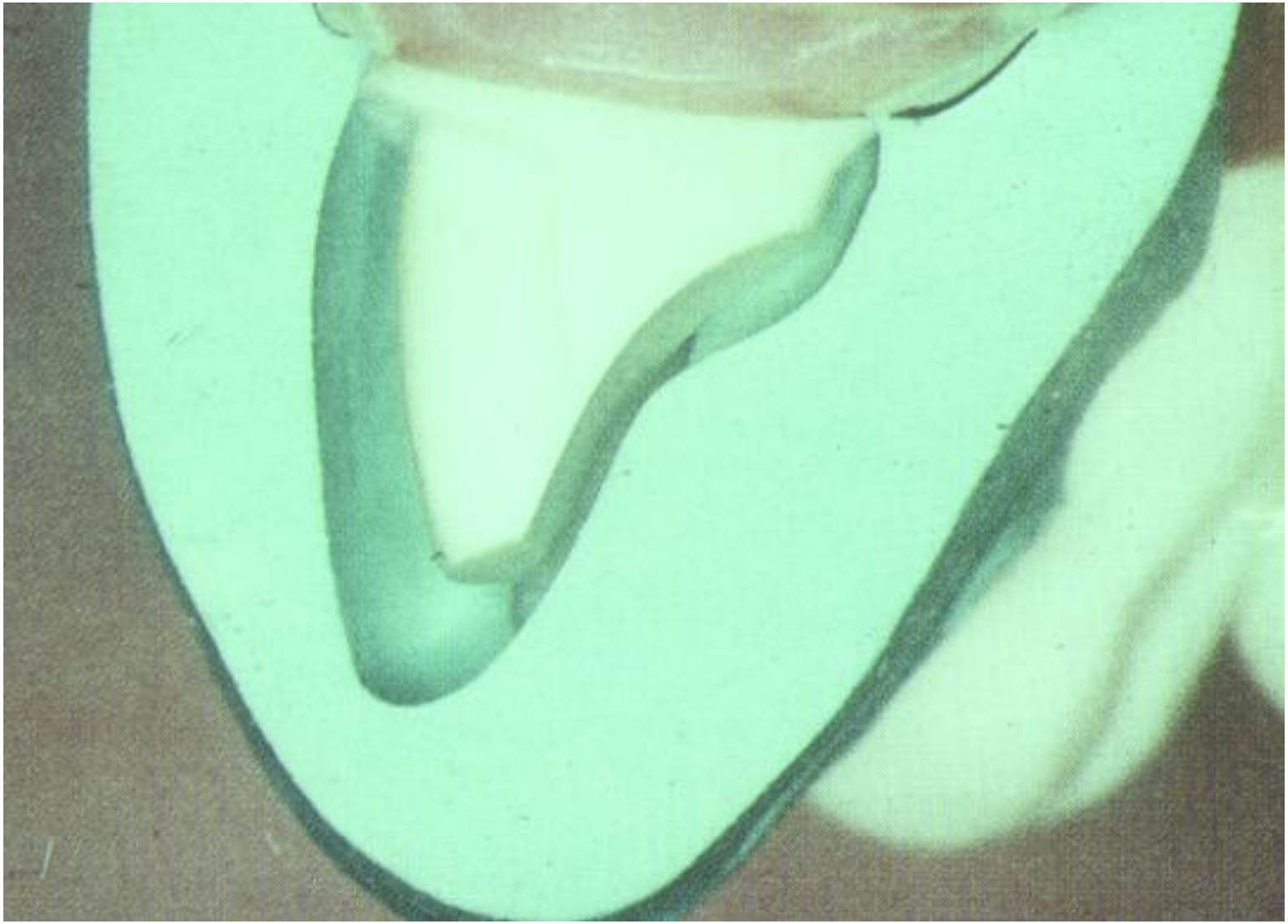
- Don’t guess!
- The shank of a high-speed bur is 1.6 mm in diameter











Material of Choice

Determines “Crown Space & margin requirements”.

- All metal Precious/nonprecious
- Porcelain fused to metal (PFM)
- Cadcam (Dicor)
- Laboratory Composite
- All ceramic
    - **Conventional, aluminous porcelain**
    - **Empress**
    - **Procera**
    - **Lava**
    - **Inceram**
    - **Techceram**

Fracture Resistance

- Residual dentine thickness and volume determine the strength of a tooth.

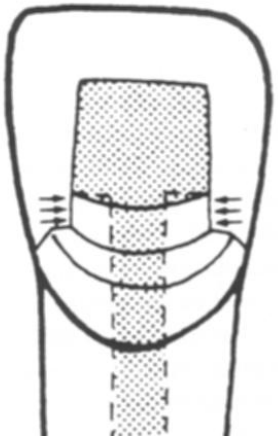
- “The main factor which determines fracture resistance is the amount of preserved dental tissue apical to the core-dentine interface”

  - Milot & Stein J Pros Dent 1992

PROTECTION FROM FRACTURE

- **Ferrule effect – ferrule is a band of cast metal around the coronal surface of the tooth**
- Hoag EP and Dwyer TG, J Prosthet Dent 1982
- **Retain as much coronal tissue as possible even 1mm of dentine significantly increases fracture threshold by 80-139%**

Sorenson JA, Engelman MJ. J Prosthet Dent 1990.



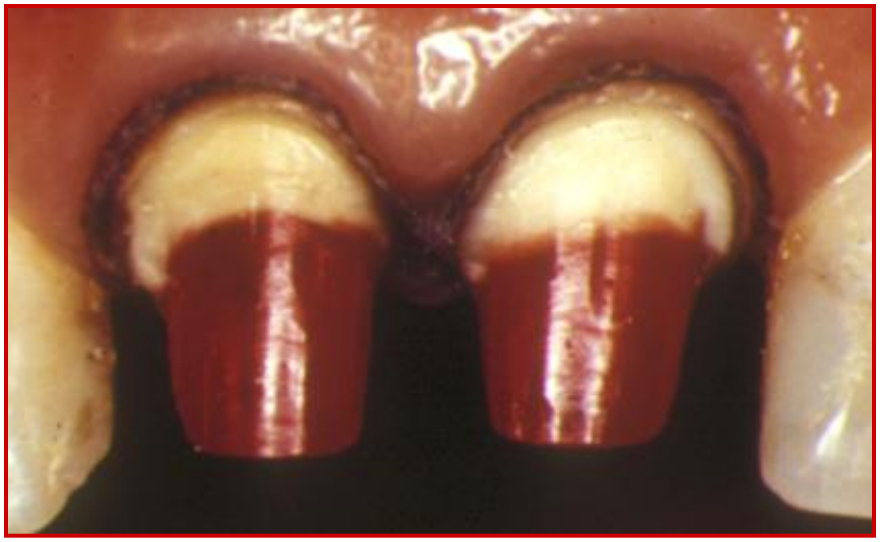
Core / Tooth Fracture

- **Often combined with extensive caries**
- **Avoid over-confidence in remaining tooth structure**
- **Beware root filled teeth**

Ferrule

- Preparation should be at least 2mm onto sound tooth tissue beyond core / dentine junction

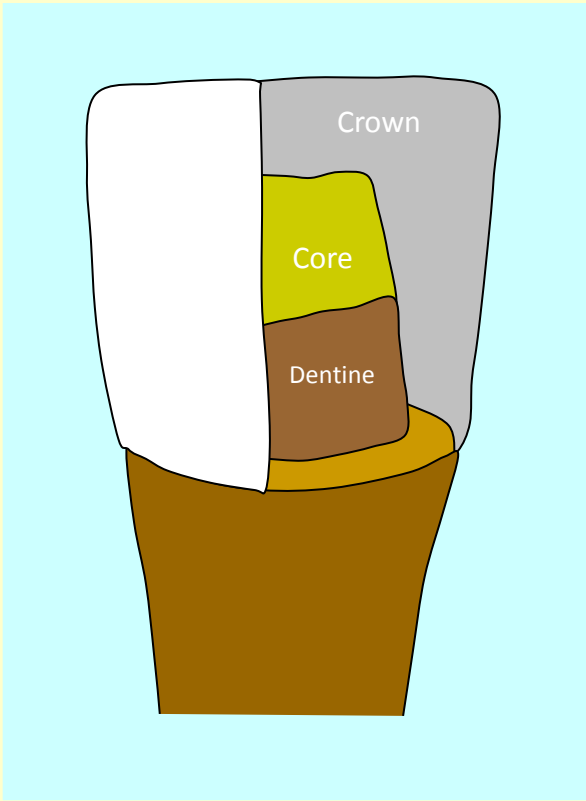
Hoag and Dwyer, 1982



- Plus 3mm biologic width = 5 mm supra-alveolar tooth is ideal

The Ferrule Effect

- **Parallel walls of dentine extending coronal from the margin provide a ferrule that, when encircled by a crown, produces the '*ferrule effect*'.**



Stankiewicz & Wilson

Dental Update 2008; 35: 222-228

CREATING DENTINE!

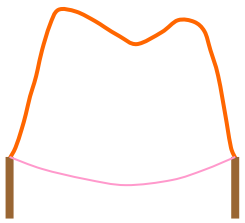
Crown Lengthening
Orthodontic Extrusion
Extraction and Reposition

Should I replace the core ?

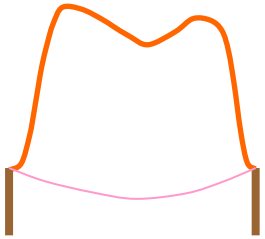
- **Has there been a history of symptoms ?**
  - **When was the core placed ? / Who placed it ? / How old is it ?**
  - **What does it look like clinically and radiographically ?**
  - **What is the material ?**
  - **Is it strong and retentive ?**
- What is the most appropriate design ?
- What material is most appropriate ?

Types of Margins

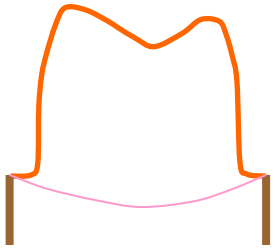
- Dictated by material



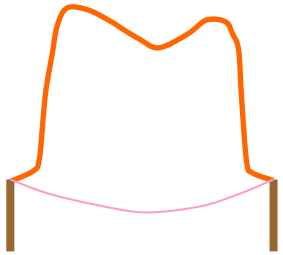
Knife or ‘feather’ edge



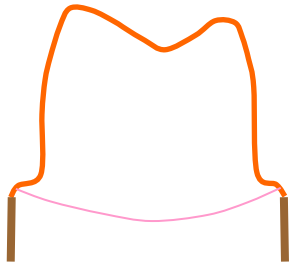
Chamfer



90˚ shoulder



135˚ shoulder



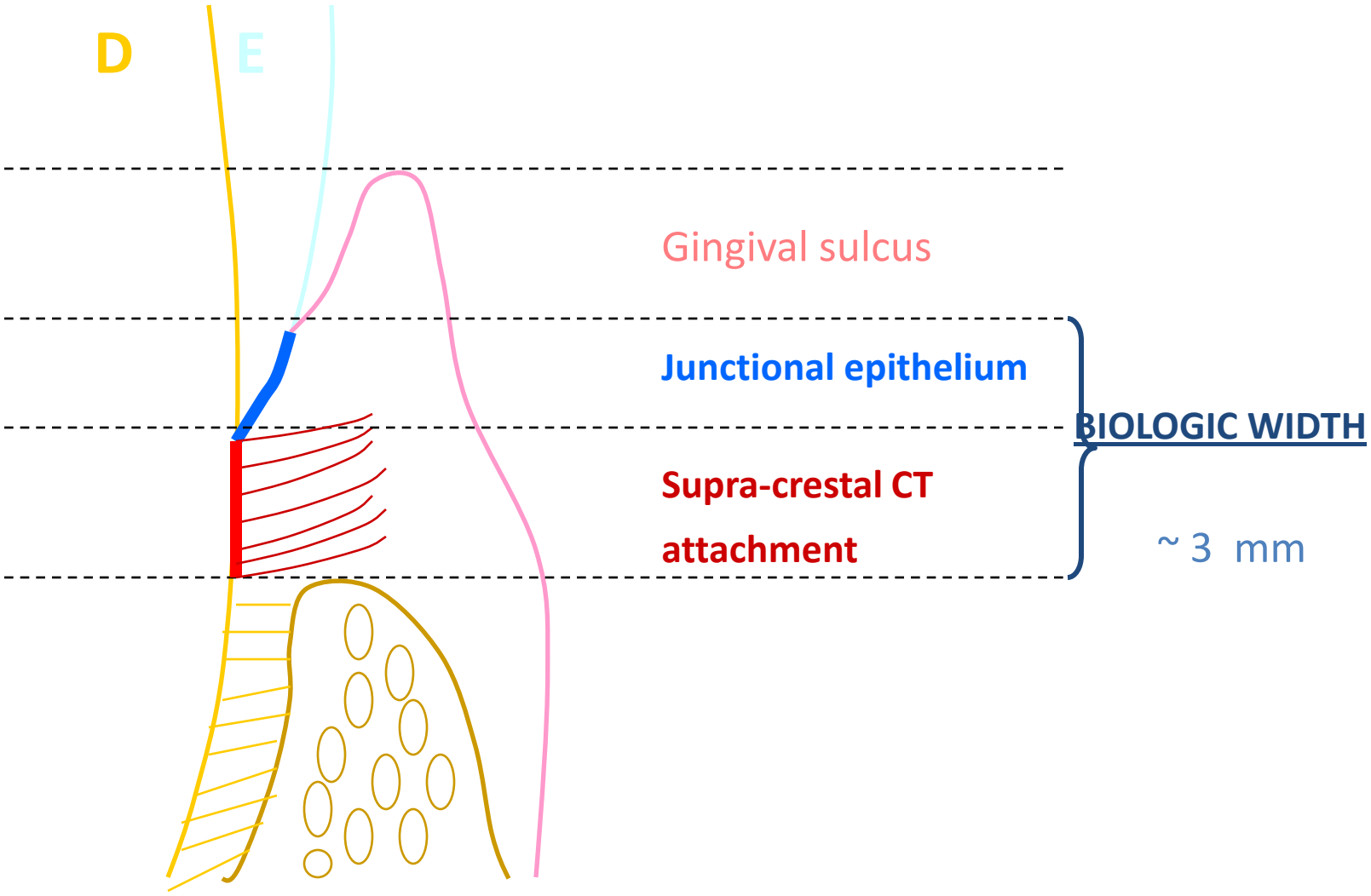
Shoulder with bevel

Margins

- **Types**
  - Knife-edge
  - Chamfer
  - Shoulder
  - Combination
- **Placement**
  - ‘Biologic width’

Avoid testing the biologic width

Biologic Width



Factors influencing position of margins

- Free from ‘biologic width’
- Attainment of retention & resistance forms
- Ability to record impression
- Aesthetic considerations
- Beyond core material (‘ferrule’ effect)

1. Tooth strength determined by amount of residual dentine.
2. Proximity to pulp increases risk of problems.
3. The space required for the correct thickness of crown material is critical to strength and aesthetics of the restoration.

How do we know what shape the preparation should be?

- learn the form of the ideal preparation and superimpose it on the tooth?

OR

- understand the processes that determine the form of the preparation?

How do we know what shape the preparation should be?

"The requirements for tooth preparation are dictated, not by the existing tooth form, nor by the space available for restoration, but by the designed shape of the final restoration."

How do we know what shape the preparation should be?

"In other words, you must ***visualize the final restoration before contemplating any tooth preparation****."*

How do we know what shape the preparation should be?

What can we use as a guide?

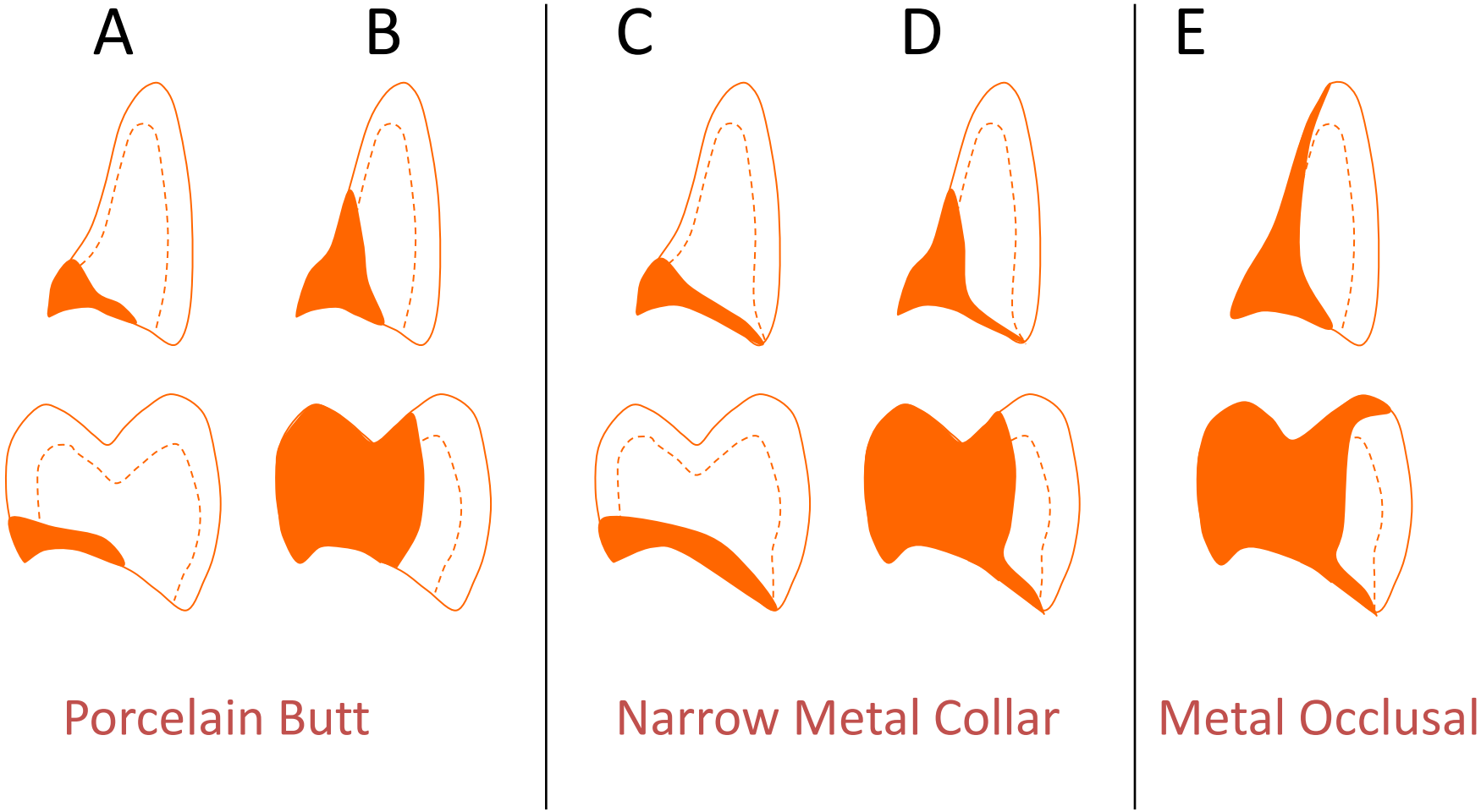
- the ***tooth*** may have the right shape already *(or not!)*
- the ***temporary restoration*** may have the right shape
- a ***diagnostic wax-up*** can be used

PFM crown preparation 11

Suggested sequence :

- Labial reduction – 1.3 - 1.5 mm
- Incisal reduction - 2 mm
- Proximal clearance
- Palatal reduction - no less than 1 mm
- Refine margins
- Remove sharp line angles

Types of PFM margins/design



FIRST DEPTH CUT EXACTLY IN LINE OF DRAW

PFM crown preparation 11

Suggested sequence :

- Incisal reduction - 2 mm
- Labial reduction -1.3 - 1.5 mm