



Outline

- Indications
- Biologic width
- Factors to consider
- Contraindications
- Methods
- Alternative options
- Restorative timing
- Summary

What is it?

- Surgical procedure designed to increase the extent of supragingival tooth structure for restorative or esthetic purposes
- Aims to achieve healthy restorative and periodontal relationship

American Academy of Periodontology

Indications

- Functional
 - Expose subgingival caries, fractures, perforations, resorption
 - Adequate ferrule length
 - Adequate amount of tooth structure for restorations
 - Expose subgingival margins to make them cleansable

Indications

- Aesthetic
 - Excessive gingival display
 - Uneven gingival margins
 - Short teeth

Biological width

- Now called 'supracrestal tissue attachment'

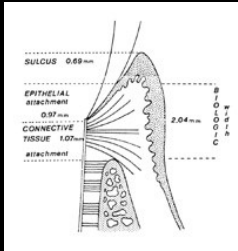
Sulcus 0.69 mm
Epithelial junction 0.97 mm
Connective tissue 1.07 mm
Biological width 2.04 mm

Vertical
Horizontal

Garguilo 1961

Biological width

- Vacek et al. 1994
 - JE= 0.77mm
 - CT= 1.14mm




- Problems as there is great variation and used histologic sections
- Term 'biologic width' relates to the average width of the dentogingival junction = 2mm

Ingber 1977

Violation of biological width


- Placing a restoration in close proximity to the osseous crest has been demonstrated to induce chronic inflammation
- Increased plaque retention and inflammation around subgingival margins
- Restorative margins impinging on the osseous crest may result in bone resorption and recession



Newcomb 1974, Silness 1980, Lanning et al. 2003, Günay et al. 2000, Parma-Benfenali et al. 1985

Violation of biological width

- Recession/inflammation occurs due to a break in the hermetic seal around a tooth, allowing bacteria and products to infiltrate the gingival tissues




So what does it mean?

- Different authors have different recommendations
- Facial- Gingival margin is 3mm from alveolar crest
- Interproximally
 - Anterior- Margin is 4mm from crest
 - Posterior- Margin is 3mm from crest

Ingber 1977, Nevins and Skurow 1984, Kois et al. 2003

So what does it mean?

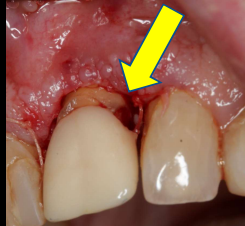
- The pre-surgical biologic width will re-establish
- Use pre-surgical bone-sounding



Lanning et al. 2003, Perez et al. 2007

Supragingival margins

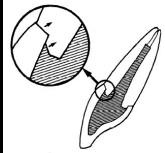
- Impression taking
- Finish restoration margins
- Verification of margin integrity
- Gingival health



Bader et al. 1991

Ferrule effect

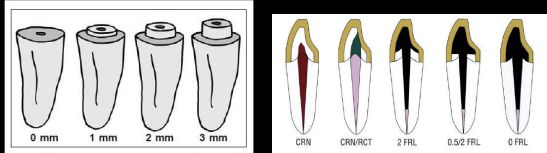
- A ferrule effect is defined as a “360° metal collar of the crown surrounding the parallel walls of the dentine extending coronal to the shoulder of the preparation”
- Elevated resistance form of crown to lateral forces



Sorensen and Engelman 1990

Ferrule effect

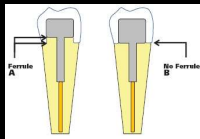
- A ferrule of 1.5-2.0mm has a positive effect on fracture resistance of ETT



Libman and Nichols 1995, Ma et al. 2009, Isidor et al. 1999, Juloski et al. 2012

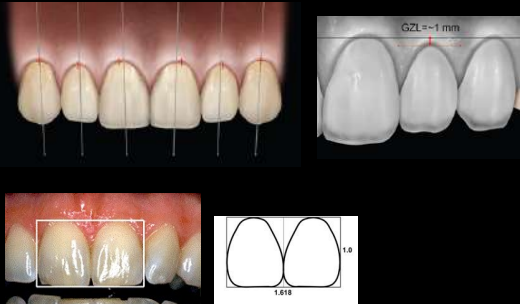
Ferrule effect

- An incomplete ferrule is better than a complete lack of ferrule
- Leads to more ‘favourable’ fracture patterns
- Ferrule factor lessens the impact of the post-core system, luting agents, and the final restoration on tooth performance



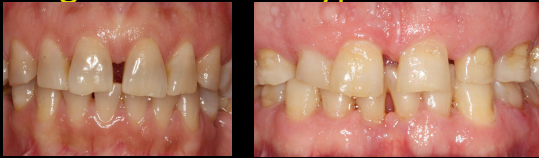
Tan et al. 2005, Dikbas et al. 2007, Naumann et al. 2007

Gingival margins




Kay 1982, Chu et al. 2009

Gingival tissue biotype




- Thick gingival biotype sites tend to rebound after surgery



Müller et al. 2000, Ponteriero and Carnevale 2001 De Rouck et al. 2009

Contraindications

- Sites requiring excessive bone removal
- Unaesthetic outcomes
- Poor crown:root ratio outcome
- Non-restorable teeth
- Generalised periodontal disease
- Risk of furcation involvement
- Anatomic factors
- Medically compromised patients



Lindhe et al. 2008

To lengthen or not to lengthen?

- Need to consider prognosis of the tooth
 - Restorative/Periodontal/Endodontic
- Adverse effects on surrounding teeth
- Cost factor
- Retaining a tooth over time is the most economical option compared with replacing it with an implant prosthesis

Pretzl et al. 2009

Crown lengthening techniques




Factors to consider

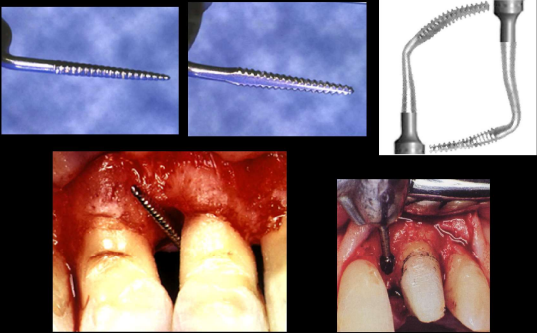
- Apical extension of caries or fracture
- The location of the osseous crest and furcation
- Crown-to-root ratio
- Gingival tissue biotype
- Amount of attached gingiva
- Width of interdental bone
- Smile line and shape of lip

Gingivectomy

- May be useful in younger patients with short clinical crowns and thin biotype
- Precise control of gingival margin position
- Consider amount of keratinised gingiva




Instrumentation



Piezosurgery

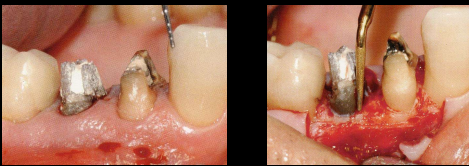
- Soft tissue sparing system for bone cutting, based upon ultrasonic microvibrations
- Developed in 1988 by Dr Vecellotti
- Cavitation phenomenon acting on cortical bone
- 3x more powerful than conventional u/s



Pavlikova et al. 2011

Piezosurgery

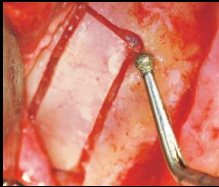
- Tissue response is more favourable than with conventional techniques
- Disinfecting action (due to 'shock waves' in the fluid environment)



Vercellotti et al. 2005

Piezosurgery

- Uses light pressure
- Has irrigation
- Precise
- Soft tissue protection




- Problems with soft tissue tags
- Slow

Vercellotti et al. 2005

Laser

- The Er,Cr:YSGG laser has capability in hard tissue and soft tissue ablation
- Soft tissue= photothermal action
- Hard tissue= hydrophotonic process
- Decreases need for suturing, reduces post-operative discomfort, and shortens healing times




McGuire and Scheyer 2011, Lowe et al. 2006

Laser



Lowe et al. 2006


Laser



- Cuts only at the end of the tip
- Problems with flapless technique- insufficient, ragged bone removal, troughing, bone scorching

McGuire and Scheyer 2011, Lowe et al. 2006, Flax 2004, 2005

Orthodontic eruption



- If moderate eruptive forces are used, the entire attachment apparatus will move in unison with the tooth
- 1-3 weeks of activation and 8-12 weeks of retention
- Requires crown lengthening surgery once tooth is stabilised

Simon et al. 1978, Carvalho et al. 2006

Orthodontic eruption

- Indicated in aesthetic areas where loss of attachment and bone from adjacent teeth must be avoided
- Need adequate anchorage and retention

Photos courtesy of Dr Cherry Zaw

Risks of crown lengthening

- Crown:root ratio
- Damage to tooth roots
- Pulpal problems/ hypersensitivity
- Root resorption
- Tooth hypermobility (transient)

Tarnow 1992, Spear 2007

Risks of crown lengthening

Tarnow 1992, Spear 2007

Brägger et al. 1992

Time Point	0-1mm	2-4mm	5-7mm
6 weeks	33	47	20
6 months	29	38	33

- 12% of teeth showed 2-4mm of apical migration between 6 weeks and 6 months

So how long should I wait?

- Epithelial cells migrate at 0.5mm/day
- Junctional epithelium formed by 7-10 days
- Epithelium mature by 21-28 days
- Connective tissue (incl. vasculature) continues to mature for 5-6 weeks

Bartold and Narayanan 1998, Aukhil 2000

So how long should I wait?

- Restorations can be placed in 4-6 weeks post-surgery
- Final crown restorations should not be completed until a minimum of 6 weeks after surgery to minimise further tissue loss due to trauma of impressions
- In aesthetic areas, a minimum of 20 weeks after surgery is required to be sure no further gingival recession will occur
- Up to 6 months for thin gingival biotype patients

Wise 1985, Bragger et al. 1992, Arora et al. 2013, Deas et al. 2014

Summary

- Case selection is important
- Functional and aesthetic indications/outcomes
- Importance of biological width and gingival biotype
- Outcomes can be predictable



Thank you



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