

Orthodontics: the Good, the Bad, and the Ugly

A review of benefits, risks, and limitations of orthodontic treatment

THE GOOD: *Benefits and positive effects of orthodontic treatment*

1. Enhancement of dento-facial esthetics

- Most common reason patients seek orthodontic treatment is to improve the appearance of their teeth / smile
- Psychosocial benefits to improved dental appearance
 - **Dental Esthetic Factors**
 - Important to remember that patient satisfaction determines success or failure with esthetic procedures
 - Various esthetic factors are categorized via the following hierarchy:
 - Macroesthetics: esthetic factors that include the face as a whole (facial proportions, maxillo-mandibular relations, profile, etc.)
 - Miniesthetics: factors that focus on the frontal smile (teeth, lips, philtrum, etc.)
 - Miniesthetics: factors pertaining to individual anterior teeth and periodontal tissues (tooth shape, height : width ratios, gingival heights, etc.)
 - Wide range of acceptable thresholds for “ideal” values for various esthetic factors
 - Important to use evidence-based threshold values as guidelines for success—not absolute targets
 - Perceptions of esthetic factors vary between dentists of different specialties and lay people

KEY REFERENCES: Witt M, Flores-Mir C. Laypeople’s preferences regarding frontal dentofacial esthetics *Tooth-related factors*. JADA 2011;142(6): 635-45

Witt M, Flores-Mir C. Laypeople’s preferences regarding frontal dentofacial esthetics
Periodontal factors. JADA 2011;142(8): 925-37

2. Periodontal improvements

- Molar uprighting / leveling the alveolar ridge
- Improved access to interproximal areas for better cleansing
- Improved gingival esthetics
 - Leveling of gingival margins

- Open gingival embrasures
 - Many open gingival embrasures can be improved with orthodontics by improving the root angulations of teeth, changing the proximal contours of affected teeth, or combination of both
- Management of impacted teeth
 - Maxillary canines
 - Early identification and extraction of primary canines in appropriate cases can prevent impaction and prevent damage to adjacent teeth
 - Mandibular second molars
 - Orthodontic correction can prevent future periodontal defect(s)

3. Enhancement of restorative outcomes

- Improvements in restorative contours
 - Considerations for orthodontic refinement of spacing associated with small teeth
 - Restorative augmentation of undersized teeth requires careful planning and communication between orthodontist and restorative dentist
 - Timing of restorative treatment is important and should be decided in advance
 - Intra-ortho restorations involve creating excess space mesial and distal to undersized tooth, restoration to ideal width, and then orthodontic closure of residual space
 - Post-ortho restorations involve ideally positioning undersized teeth prior to completion of ortho, and allows for final restorations once braces are off
 - Orthodontic positioning of undersized teeth
 - Maxillary lateral incisors should be positioned in the center of the edentulous space with 50% of excess space on the mesial and 50% on the distal
 - This allows for ideal restorative contours
 - Management of gingival contours with consideration to clinical crown length and width : length ratio is critical
 - Crown lengthening procedures may be necessary to gain adequate length so that natural emergence profiles can be achieved
- Improvements in longevity of bonded restorations due to minimizing tooth preparation
 - Enhanced bond strengths / longevity of bonded porcelain restorations with preparations limited to enamel
- Improved interocclusal restorative clearance
 - Orthodontic intrusion may prevent the need for excessive tooth equilibration or elective endodontic treatment of super-erupted teeth

- Improvements in implant site preparation
 - Orthodontic positioning can achieve ideal inter-coronal and inter-radicular spacing for implant placement in areas of missing lateral incisors or other missing teeth
 - Clinical Considerations for space opening for missing lateral incisors
 - Adequate inter-coronal space to allow for appropriate replacement tooth width
 - Adequate inter-radicular space (root divergence) to allow for placement of implant
 - Excellent communication between orthodontist, restorative dentist, and surgeon to place implant is essential prior to removal of braces to ensure all goals have been met
 - Factors that favor space opening for missing lateral incisors:
 - Class I or III occlusion
 - Lack of dental protrusion
 - Canines that are bulbous in shape
 - Low smile line / minimal gingival display on smile
 - Orthodontic movement can aid in biologic alveolar ridge augmentation

4. Potential to minimize or eliminate need for prosthodontic replacement of missing teeth

- Canine substitution in cases of congenitally missing lateral incisor
 - Factors that favor space closure
 - Class II occlusion with overjet
 - Minimal mandibular crowding
 - Canines that are not overly bulbous
 - High smile line or increased gingival display on smile
 - Financial considerations
 - Clinical Considerations for space closure
 - Successful esthetic outcomes will require recontouring of canines to more closely resemble lateral incisors as well as conservative esthetic restorative procedures (alteration of canine and first bicuspid contours via selective composite augmentation or indirect restoration
 - Proper orthodontic positioning of first bicuspid and canines can enhance appearance of gingival margin heights as well as apparent widths of teeth
 - Evidence does not warrant long term periodontal or occlusion-related concerns

- Molar Protraction
 - Early loss of permanent first molars
 - Congenitally missing second premolars

THE BAD: *Limitations and risks of orthodontic treatment*

LIMITATIONS

1. Ankylosis / Primary Failure of Eruption (PFE)

- Ankylosed teeth or those with PFE are unresponsive to orthodontic force, and cannot be moved
- Early identification and extraction of ankylosed permanent posterior teeth may prevent periodontal defects and allow for orthodontic space closure to prevent need for future restoration

2. Orthodontic stability

- Study by Little et al from University of Washington shows that it is normal for teeth to move over time in both orthodontically treated and untreated individuals. Orthodontic “relapse” is actually a normal process in the absence of retention
- Expected trends over time include:
 - Decrease in intercanine distance
 - Increased mandibular anterior crowding
 - 3rd molars appear to have little or no effect on post-orthodontic change
- Not possible to predict on an individual basis who will experience significant post-orthodontic change
- Approaches to orthodontic attention depend on patient age, initial malocclusion, and oral hygiene level
- Indefinite part time retainer wear is only way to ensure teeth stay put; “nighttime for a lifetime”

KEY REFERENCE: Little RM. Clinical implications of the University of Washington post-retention studies. J Clin Orthod 2009;43: 645-51.

RISKS

1. Periodontal Problems

- Gingival Recession
 - Important to verify adequate attached tissue prior to ortho treatment
 - Tooth movement must stay within boundaries of the periodontium
- Exacerbation of existing active periodontal disease

- Active disease / inflammation must be under control prior to beginning any orthodontic tooth movement
- Open gingival embrasures (as a result of ortho)
 - While ortho may be the best way to improve or eliminate open gingival embrasures that were present prior to treatment, orthodontic alignment may reveal or create new open gingival embrasures, or make existing ones bigger. Adult patients in particular should be informed of this possible negative esthetic outcome

2. External Apical Root Resorption (EARR)

- Etiology is multifactorial, with individual variability in inflammatory response, genetic predisposition, and mechanical factors all playing roles
- Incidence: most orthodontically moved teeth experience some small amount of resorption, but most are able to repair themselves, and are clinically insignificant. Incidence of severe EARR (loss of >4mm of root) is 1-5%. Maxillary anterior teeth are most commonly affected
- Prevention / Identification: unfortunately there are no solid predictors of who will experience severe EARR. Best predictor is actually early radiographic identification. If noticeable resorption has occurred at 6 months into ortho treatment, then chances of continued resorption are high. Orthodontist should try to avoid heavy forces
- Only way to avoid EARR is to avoid ortho treatment all together. Presence of EARR does not necessarily indicate any error in treatment mechanics

KEY REFERENCE: Weltman B., et al. Root Resorption Associated with Orthodontic Tooth Movement. Am J Orthod Dentofacial Orthop. 2010;137: 462-76

THE UGLY: *Problems associated with poor oral hygiene / compliance*

1. White Spot Lesions (WSL)

- Acidogenic bacteria (*S Mutans, lactobacilli*) are the causative agents of WSL, and proliferation of these organisms in plaque adjacent to fixed orthodontic appliances leads to orthodontic associated WSL.
- WSL are in fact incipient carious lesions that occur when the demineralization / remineralization cycle of enamel shifts towards demineralization; This tends to occur when oral pH is below 5.5, and visible WSL can occur in as little as 4 weeks.
- Prevalence is common, with 30-60% of patients developing at least one visible WSL
- Prevention is centered around common caries prevention approaches
 - Oral hygiene techniques and education are essential; electric tooth brushes, and modified brushing technique are helpful in high risk patients
 - Increased fluoride exposure via 5000ppm pastes, and fluoride varnishes are effective in high risk patients
 - Amorphous Calcium Phosphate products show some potential in prevention of WSL

- Attention should be paid to minimizing exposure to low pH foods and drinks
- It may be best to discontinue ortho treatment early in patients who are non compliant to prevent significant damage to tooth structure
- Treatment options include natural resolution (no active treatment), whitening, resin infiltration, micro or macro abrasion, or direct or indirect restorations

Summary of White Spot Lesion Interventions

| Prevention Protocols | Intra-treatment Management (Once WSL are noticed) | Post-Orthodontic Treatment Options for WSL |
|--|---|---|
| <p>NORMAL / LOW RISK:</p> <ul style="list-style-type: none"> • Tooth brushing (modified technique) with 1000 ppm fluoride toothpaste 2-3 times daily • Prophylaxis every 4 months • Fluoride varnish every 4 months • 0.5 % NaFl Rinse daily at bedtime <p>HIGH RISK (initial risk or poor compliance intra-treatment):</p> <ul style="list-style-type: none"> • Tooth brushing (modified technique 2-3 times daily) : 5000 ppm fluoride toothpaste before bedtime, and 1000 ppm all other times using mechanical brush • Prophylaxis every 3 months • Fluoride varnish every 3 months • Xylitol chewing gum 3-5 pieces per day for at least 10 minutes per chew • Chlorhexidine rinse (2 week regimen) 30 second rinse daily after brushing before bedtime | <ul style="list-style-type: none"> • Tooth brushing (modified technique) with 1000 ppm fluoride toothpaste 2-3 times daily • Prophylaxis every 3 months • Fluoride varnish every 3 months • MI Paste Plus™ application nightly after brushing teeth • Xylitol chewing gum 3-5 pieces per day for at least 10 minutes per chew • If above techniques have been utilized and still have progression of WSL and poor compliance then proceed with EARLY APPLIANCE REMOVAL | <ul style="list-style-type: none"> • No treatment / monitoring with natural resolution • Tooth whitening • Resin Infiltration technique • Micro / macro abrasion • Tooth preparation and restoration (direct resin or indirect veneers) |

2. Gingivitis / Gingival Hyperplasia

- Localized or generalized gingivitis is common during ortho treatment
- Gingivitis tends to improve rapidly once appliances are removed
- Hyperplastic tissue may require gingivectomy to completely resolve

KEY REFERENCE: Heymann GC, Grauer D. A Contemporary Review of White Spot Lesions in Orthodontics. J Esthet and Restor Dent. 2013;25(2): 85-95

TAKE HOME MESSAGES:

- Orthodontic treatment can provide numerous positive benefits to your patients beyond just improving their dental appearance
- Orthodontics is not without limitations and potential adverse outcomes

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