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Review Article

Basis of orthodontics-bonding – A review

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ABSTRACT

Bonding has transformed the tedium of appliance construction into an efficient and pleasant operation for both patient and clinician .The bonding procedure requires debonding at the termination of treatment. The objectives of debonding are to remove the attachments and all adhesive resin from tooth and to restore the surface as closely as possible to its pretreatment condition. To achieve these objectives correct bonding and debonding are of fundamental importance. The introduction of the acid etch bonding technique has led to dramatic changes in the practice of orthodontics. The increased adhesion produced by acid pretreatment, using 85% phosphoric acid, was demonstrated in 1955 by Buonocore.[1] In 1965, with the advent of epoxy resin bonding, Newman[2] began to apply these findings to direct bonding orthodontic attachments. The future of bonding is promising, product development in terms of adhesives, brackets, devices and technical details is continually occurring at a rapid rate. The purpose of this review article is to update the current available information on direct bonding to natural and artificial teeth.

1. Introduction

Bonding is a method of fixing attachments directly over the enamel surface of the tooth using adhesive resins. It was in 1977,[3] that the first detailed post treatment evaluation of direct bonding; over a full period of orthodontic treatment in a large sample of patients was published. Today, most Orthodontists directly or indirectly bond attachments to the tooth.

In late 1960s, **Buonocore** had suggested that it was the formation of resin tags that caused the adhesion of the resin to the acid-ethched enamel. The resin penetrates the microporosities of etched enamel and results in micro-mechanical bond. As time went on, variations in duration of the acid-etching procedure and concentration of the phosphoric acid, along with alternative acids were tested for the etching of enamel.

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The present acid etching/smear layer: Several factors characterize the change in bonding systems from the Buonocore era to today; etching enamel/etching-conditioning enamel/smear layer treatment/handling properties.

2. Need for bonding

With the invent of orthodontics, orthodontists used to band teeth to correct malocclusion. But Banding was cumbersome procedure, so people were in continuous search for a procedure which can overcome all the possible difficulties of banding. Finally with the advent of acid etching new concept developed in orthodontics, which led to tremendous changes in orthodontics. Bonding had certain advantages over banding.

1. Esthetically superior
2. Faster & simpler
3. Less discomfort for the patient
4. Arch length is not increased
5. Precise bracket placement
6. Bonds are more hygienic, increased gingival and periodontal health
7. Partially erupted/fractured teeth can be bonded
8. M-D (proximal) enamel reduction is possible
9. Interproximal areas are accessible for composite build-ups
10. Risk of caries under loose bands is eliminated
11. No band spaces are present to close at the end of treatment 12. No large inventory is required

3. Disadvantages of bonding

Even though bonding changed the face of orthodontics but it has certain disadvantages with it.

1. Bonded bracket is a weaker attachment – therefore increased bracket failures
2. Bonding involves etching – therefore may lead to enamel loss and increased risk of demineralization
3. Fracture of enamel during debonding
4. Debonding is more time consuming than debanding
5. Rebonding a loose bracket requires more preparation than re-cementing a loose band

4. Types of bonding

Direct bonding – Direct bonding is the technique in which attachments are placed directly to tooth surface with the use of adhesive. For efficient bonding operator must be able to judge the proper position for the attachments and must carry it to place rapidly and accurately.

Indirect bonding – Indirect bonding is done by placing the brackets on a model in the laboratory, then using a template or tray to transfer the laboratory positioning to the teeth .The advantage is the more precise location of brackets that is possible in the laboratory.

4.1. *Direct bonding procedure*

Bonding procedures involves many steps as follows-

Cleaning
Enamel conditioning
Sealing
Bonding

4.1.1. *Cleaning*

This procedure is essential to remove plaque and organic pellicle that normally covers all the teeth.[4] This requires rotary instruments, either a rubber cup or a polishing brush. A bristle brush cleans, more effectively, but care must be exercised to avoid traumatizing the gingival margin and initiating bleeding. Pumice prophylaxis advisable to remove plaque and debris that might otherwise remain trapped at the enamel–resin interface after bonding. Reisner et al[5] found consistent results when buccal tooth surfaces were lightly abraded with the tungsten carbide bur (#1172) at slow speed (25,000 rpm) than when the surfaces were pumiced for 10 s before acid etching.

4.1.2. *Enamel conditioning*

1. Moisture control – From this step onwards, till the end of procedure an excellent moisture control is a must.

Device to maintain dry field:

- Lip expanders and/or check retractors
- Saliva ejectors
- Tongue guards with bite blocks
- Salivary duct obstructers
- Cotton or gauge rolls
- Antisialagogues

From simultaneous premolar-to-premolar bonding in both arches, a technique using lip expanders, Dri-Angles and a combined saliva ejector-tongue holder to remove moisture from the mouth works well.

2. Enamel pretreatment:

After the operative field has been isolated, the conditioning solution or gel (usually 37% phosphoric acid) is applied over the enamel surface for 15–60 s. When etching solution is used, the surface must be kept moist by repeated applications.

To avoid damaging delicate enamel rods, care should be taken not to rub the liquid onto the teeth. At the end of the etching period, the etchant is rinsed off the teeth with abundant water spray. Salivary contamination of the etched surface is avoided (If it occurs, rinse, re-etch for a few seconds).

Next, the teeth are thoroughly dried with a moisture-and-oil-free air source to obtain the well-known dull, frosty appearance. Teeth that do not appear dull and frosty white should be re-etched. The gel provides better control for restricting the etched area but requires more thorough rinsing afterward.

Recent studies[6] indicate that 15 s is probably adequate for etching young permanent teeth whereas 60 s is recommended