# Beginning Bonding – State of the Art (?)

ROBERT A. WERTZ, D.D.S., M.S.

Over the past five to ten years the process of bonding orthodontic appliances to the enamel surface of the teeth has come to the forefront as a major improvement in the technical aspect of orthodontic therapy. Truly, the evolution from pinching gold-platinum or chrome alloy straight, flat strips to fit tooth form, to pinching preformed strips, to having an inventory of preformed bands containing a full range of fully-shaped sizes has been an amazing series of advances. While reducing appliance placement time, preformed bands reduced fatigue to the patient and orthodontist, and dramatically improved the level of appliance–placement comfortability to the patient. The breakthrough can well be likened to that found in general dentistry when in the mid 1950's the "Borden Airotor" was the introduction to truly high speed air-driven tooth preparation. This moved dentistry from a belt driven speed of about 50,000 rpm to an air driven speed of over 400,000 rpm and offered accompanying patient and doctor advantages.

With the coupling of preformed band appliance placement and the philosophy of light force tooth movement, orthodontics reached a new plateau. Most adept clinicians adopted these two major advances and found them practical and useful. These advances were not just a journey into another "orthodontic panacea" such as seen in the jumping of the unskilled clinician from one technique to another or from one orthodontic cult to another in the hope of finding that which would cure his own inadequacies in diagnostic or technical acumen.

Now, upon the scene is thrust the art of bonding. Bonding of the orthodontic appliance to the teeth offers the immediate recognition of increased comfortability of appliance placement as subgingival placement and separation of teeth is omitted, chairtime is reduced, and patient and doctor fatigue is reduced. With the bonded appliance, increased arch length needed for band placement in nonextraction crowded cases, and closure of band spaces in diastematic cases are obviated. Both are distinct and meaningful advantages.

Bonding of the orthodontic appliance offers a choice of two methods. Some advocates espouse the indirect technique of bonding while others prefer the direct technique. With varying small points, the basis of the indirect technique is the laboratory placement of the appliance on a working model of the dental arch; the appliance is transferred to an impression used as a transfer core to the dentition in the mouth. The chief advantage of the indirect technique seems to be the high degree of accuracy with which the appliance can be positioned on the teeth and the dramatic decrease in required patient chair time.

The direct technique involves the direct placement of the appliance on the enamel surface of the teeth. Although chair time seems to be increased with the direct technique, some feel the coupling of impression chair time with placement chair time in the indirect technique about equals that of the direct technique. Eliminating laboratory time and the training of technicians in appliance placement on the model, and personal control of appliance placement in the mouth are also seen as advantages to the direct technique. Both techniques require tooth preparation, that is,

Read at the January 1980 meeting of the Midwestern Component of the Angle Society.

enamel surface etching, at the time of appliance placement.

My personal experience in bonding began in the late 1950's as a student with black copper cement as attachments were bonded to teeth that, due to impaction, could not be banded. This was limited to one impacted cuspid and was successful with no recall of a loose attachment. Following this many impacted teeth were bonded in private practice. This was with the use of a loose mix of zinc-oxyphosphate cement with usually no tooth preparation except prophylaxis. Occasionally, in later years, the cement liquid was used to prepare the teeth as more knowledge led to the understanding of mechanical bonding to the etched and thereby exposed enamel rods. Seldom was a loose attachment found over an eighteen year experience.

With this background and the orthodontic scene bombarded with those advocating full appliance placement utilizing the acid-etch technique, a limited trial over about a two-year period demonstrated success in the placement of large based, usually perforated, brackets to isolated teeth and many times to the maxillary anteriors. I was ready to go "all the way." Word from several colleagues was that the indirect technique was better, and so I was off to "do it right": take a course in the technique, order the special materials including a full armamentarium of brackets, and gear the office via training of personnel and scheduling for the "big new breakthrough."

The course in indirect technique was sponsored by a university and given by an experienced clinician. This was preceded by a personal visit to the office of a friend where the indirect technique was being applauded for its success and also by personal communication with several well-respected clinicians. The indirect technique was primarily adopted except for several cases where the direct technique seemed desirable.

After about eight months of bonding, the results have been disheartening and discouraging to the patient, orthodontist, and clinical staff. An estimated 25 to 35% of the bonds have failed. This is consistent with a friend's estimated 33% failure rate when beginning bonding. One hopes to reduce this to the 3 to 5% related to be found as time improves one's techniques. The failures in bonds have been seen at both the tooth surface-bond material interface, as well as the bracket—bond material interface with an estimated even distribution. The failure usually occurs at the initial sitting or between that and the next visit. If bonding failure of an individual tooth is not seen by the second visit, it is felt that the percentage of later failure is no greater than that with banded teeth. The initial failures are usually directly rebonded if in the anterior, but usually banded in the premolar area, especially the second premolar teeth. Of the rebonded sites an estimated 80 to 90% are successful. Second failures are usually banded.

Currently the direct technique is primarily used with an apparent slow increase in success. The question remains, "Can continued improvements bring bonding to the state of useful efficiency to justify replacement of a highly successful banding technique?"

An analysis of why bonding results in such a high failure-rate seems to uncover only the obvious possibilities:

1. Poor control of moisture; this seems to be the number one enemy.

2. Possible poor tooth surface preparation; now adult patients and apparent fluoride stained or mottled teeth are given increased acid-etch time totalling about one and one-half to two minutes.

3. Small-based brackets may be a

problem as not as much tooth surface is available for attachment though published reports claim that when using a highly-filled resin the problem of retention has been eliminated.

4. Possibly mesh-backed brackets do not offer as much retention as the formerly used perforated-base brackets.

5. Possibly too much force is applied even though the initial arch is .015 twist wire in .018 slots. The T-loop closing archwire and final wire size has been reduced from .016 × .022, used in banded cases, to .017 × .017 in bonded cases in an effort to reduce force and bonding failures.

Disadvantages to bonding other than bonding failures are mainly limited to the following:

1. Restriction of bracket placement position due to gingival impingement or short clinical crowns. This is seen to be a problem mostly in newly erupted second premolar teeth and severely rotated teeth. The latter are frequently banded.

2. Exposing the interproximal surfaces to increased dental caries in poor hygiene patients as debris and plaque accumulate in the areas that would be protected by circumferential bands. Fluoride and brushing programs must be initiated in high caries-rate patients, if not in all cases.

3. The tendency in the direct technique for ledging of excessive bonding material at the gingival area and creation of gingival irritation. Good technique in removing flash can minimize this problem.

Removal of bonds from teeth has not been a problem when utilizing small bracket bases when the excess flash is minimal. However, several transfer cases have shown much difficulty when the bonding material has covered almost the entire labial tooth surface.

Probably my main concern when reviewing my experience with total immersion in the bonding of orthodontic appliances is not my own inadequacy in perfecting the technique, but it is the answer to the question: "Have we been told the whole truth by the missionaries of bonding?" If those roaming the lecture platforms of orthodontic education are overselling the technique, as has frequently been the case with individuals espousing this or that appliance or clinical routine, then the profession has again suffered from the furthering of personal ego or intellectual dishonesty. These are the days of truth and "tell it like it is." These are the days of "let's discuss the truth of where our inadequacies lie." If a reversion to the days of only showing success is upon us, then orthodontics will have again placed in its own path a stumbling block as old as the profession we have come to love, practice, and preach.

## Open Discussion

Following the presentation, approximately a thirty minute discussion ensued. It was judged that most of the discussion supported the bonding problems revealed in the paper. There was definite unanimity regarding the loss of office time and frustration to the orthodontist and patient due to loose attachments. Emphasis seemed to be directed at the discouragement created when detailed archwire bends created enough force to detach brackets. The fact that the possibility of such reduces the clinician's desire to apply the finishing details to which he is accustomed, in a banded case, clearly seems a disadvantage of the technique.

*401 S. Dearborn Ave.*
*Kankakee, Illinois*
*60901*