Shear bond strengths of buccal tubes

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Aims: To investigate the shear bond strengths of buccal tubes and to determine the sites of failure.
Method: Four orthodontic buccal tubes were selected: A, American Orthodontics; B, 3M Unitek - small base; C, 3M Unitek - large base; D, Hangzhou Dentop. Twenty buccal tubes from each group were bonded to the buccal surfaces of lower right first molars with the same lightcured composite resin. The buccal tubes were debonded with a universal testing machine and the data analysed. The amount of adhesive remaining on the teeth after debonding was classified with the modified adhesive remnant index (ARI).
Results: The groups ranked from the highest to lowest bond strength (MPa) were: B, A, D and C. The bond strengths of the buccal tubes, except Groups A and B, were significantly different (p < 0.05). The majority of the buccal tubes (63 per cent) had modified ARI scores of 1 and 2 and 25 per cent of the tubes had scores of 4 and 5. After debonding, no adhesive remained on 40 per cent of the teeth in Groups B and D.
Conclusions: The shear bond strengths of the buccal tubes fell below the value considered to be clinically acceptable. There were no differences between the shear bond strengths of the buccal tubes with polished and microetched bases. The buccal tubes with the largest base failed prematurely, possibly because the unsupported bonding pad flexed during debonding (Aust Orthod J 2010; 26: 184-188).

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Introduction
The practice of bonding attachments to molars has not been widely accepted because it is believed that bonded buccal tubes have inadequate bond strengths.1,2 The failure rate of bonded buccal tubes has been reported to be as high as 21 per cent.3 The bond strength of buccal tubes can be improved by increasing the etch time to 30 seconds,4 use of foil mesh bonding pads,5,6 and using different resin adhesives.7 According to one authority, bond strength is influenced by the size and design of the bonding pad, but others consider that shear bond strength is independent of the surface areas of bonding pads between 6.82 and 12.32 mm2.8,9,10 The limitations in previous studies are the use of bovine teeth, use of premolars rather than molars, use of attachments with different surface areas and different types of bonding pad.
Our aims were to compare the in-vitro shear bond strengths of different buccal tubes bonded to human molars, and to determine the sites of failure using the modified adhesive remnant index (ARI).

Materials and methods
Eighty lower right first molar teeth were collected, sterilised with 0.5 per cent chloramine for one week and stored in distilled water for 24 hours. The buccal surfaces of all teeth were sound. The teeth were randomly assigned to four groups and mounted in acrylic resin blocks to facilitate debonding in a universal testing machine. Lower right MBT prescription buccal tubes from the following sources were used: A (American Orthodontics, Sheboygan, WI, USA); B (Small base; 3M Unitek, Monrovia, CA, USA); C (Large base; 3M Unitek, Monrovia, CA, USA); D (Hangzhou Dentop, Zhejiang, Hangzhou, China).
The buccal surface of each tooth was polished with fluoride-free pumice powder for 20 seconds, sprayed with water and dried with a blast of air. The buccal surfaces were then etched for 30 seconds with 35 per cent phosphoric acid gel (Transbond XT etchant gel, 3M Unitek, Monrovia, CA, USA), rinsed for 30 seconds with distilled water and dried with air for 20 seconds. A thin layer of Transbond XT primer