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Safe orthodontic bonding for children with disabilities during general anaesthesia

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SUMMARY General anaesthesia (GA) may be employed to overcome management difficulties in the orthodontic treatment of disabled children. This report introduces the application of a rubber dam as a useful aid for a high quality bonding and as an effective safeguard in bonding of brackets in general anaesthesia, in the handicapped in particular. GA was used in 12 patients, of a cohort of 49 disabled patients, to facilitate the placing of the fixed appliance. The first seven were bonded solely with the use of an oropharyngeal pack and a high velocity suction to prevent aspiration, and the last five additionally underwent placement of a rubber dam. The use of a rubber dam to facilitate the safe and reliable bonding of orthodontic brackets in handicapped children under general anaesthesia is highly recommended.

Introduction

Over the past 20 years, there has been an increasing trend towards caring for physically and/or mentally disabled children in their home environment and community. This change in attitude has, in general, significantly increased the demand for more sophisticated dental treatment within this population. In the past, only emergency treatment was offered, while recent developments have encouraged parents to seek elective procedures, including sophisticated orthodontic treatment to improve facial appearance, in the hope that this will help the individual (and his/her parents) to achieve some degree of social acceptability, improving self-esteem, and evoking a more favourable social response (Shaw *et al*., 1980; Becker and Shapira, 1996; Chadwick and Asher-McDade, 1997).

Behaviour modification techniques, conscious sedation, or general anaesthesia (GA), can be applied either solely or combined in order to overcome management difficulties in this population. The criteria for choosing the appropriate mode for management of handicapped children undergoing orthodontics has previously been reported (Chaushu and Becker, 2000).

One of the potential hazards of treatment under GA is airway aspiration of foreign materials, which occurs more commonly than has been supposed (Davis *et al*., 1993). Loss of consciousness is accompanied by a progressive depression of the central nervous system (CNS) and of the protective reflexes of the patient. Because the oral cavity is the field of operation, the potential for debris, water, saliva, or blood entering into the airway and producing an obstruction, laryngospasm, or possible infection of the trachea or bronchi is considerable (Malamed, 1995).

It is therefore crucial, to ensure the integrity of the patient's airway, when treating under GA. The most common prevention techniques include the use of an oropharyngeal pack, high velocity suction, or the ligation of objects to be used intra-orally. The surgical assistant is responsible for the maintenance of a dry and relatively clear field (Malamed, 1995). Careful placement of the oropharyngeal pack may prevent solid material from entering the trachea

and bronchi, but fluids such as water with etchant, primer, or saliva can still contaminate the airway. Additionally, small particles such as orthodontic brackets or even elastomeric modules might pass the oropharyngeal barrier without being noticed.

The purpose of this article is to introduce the application of a rubber dam as a useful aid and as an effective safeguard in bracket bonding during GA in the disabled.

Subjects and methods

Forty-nine disabled patients were treated between 1989 and 1997 at the orthodontic department of the Hebrew University Hadassah School of Dental Medicine. The mean age was 12.9 years, with a range of 7–21 years. The medical diagnoses have been reported previously (Chaushu and Becker, 2000).

For the more difficult treatment procedures, 30 patients were treated by behaviour modification techniques and seven by sedation. The remaining 12 patients were subjected to GA to facilitate the placement of the fixed appliance. For the first seven, bonding was performed with the use of an oropharyngeal pack and a high velocity suction to prevent aspiration, and the last five underwent the additional placement of a rubber dam.

A 6-inch square of medium-gauge latex was prepared on the plaster diagnostic model. Following careful selection of the appropriate size of the hole in the rubber dam punch for each tooth, the sheet was punctured, and the outer edges of the latex sheet stretched over a rubber dam frame. Two clamps, made suitably secure by tying dental floss through their forceps holes, were placed in the holes for the molars (Figure 1a).

The initial arch wire was also prepared on the model, cut to the desired length, and annealed at both ends as needed. This is important in order to facilitate bending the ends distal to the molars and to prevent subsequent slippage of the wire from the tubes, which can easily occur with small diameter initial wires. The use of single attachments, such as narrow edgewise, Begg or Tip-edge brackets, permits a much stiffer initial wire

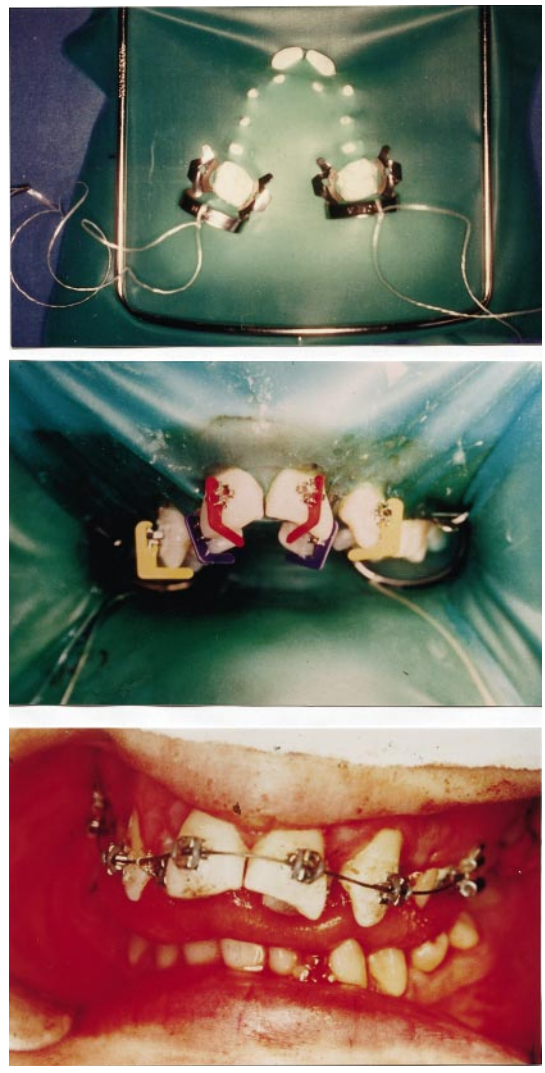

Figure 1 (a) Rubber dam preparation on the plaster diagnostic model. (b) The rubber dam stretched over the teeth, held by clamps, and secured with dental floss, following the placement of the brackets. (c) The intubated patient following rubber dam removal. The premolar extractions have been carried out and the initial archwire placed.

because of the large inter-bracket span and 'one-point contact', thus improving the safety factor by resisting distortion to a much higher degree.

Whenever possible, bands should be fitted and even cemented on molars in the dental chair, before the GA, since a lesser degree of

co-operation is needed for this part of the overall procedure. Nevertheless, this may not always be possible and, in such cases, the bands should be prepared and cemented under GA. For this, rubber separators should be placed 1 week prior to the main appointment. A single clamp is placed over the cemented band to act as distal anchorage on one side and the rubber dam is stretched over the teeth to be bonded. This may then be secured in place if needed by ligating it to the teeth with dental floss or by fixation with wooden sticks pushed inter-dentally. Finally, the second anchor clamp is applied to the contra-lateral molar (Figure 1b).

With pharyngeal isolation thus secured and an effective separation from tongue and cheeks provided, conventional bonding may now proceed and an archwire be inserted. With the appliance completed, the rubber dam was cut inter-proximally, in order to remove it without dislodging the newly bonded brackets (Figure 1c).

Additional procedures, such as extractions or exposure of impacted teeth may be carried out only after removal of the rubber dam, but before archwire placement, wherever possible.

Discussion

The average time required for the application of a rubber dam on a full arch is only 2 minutes (Gergely, 1989). For this modest time investment, there are several important advantages for bonding fixed appliances in disabled patients under GA and these are as follows:

1. It eliminates the danger of aspiration of fluids (such as water, etching gel, or saliva) and solid particles (such as brackets or elastomeric modules).
2. It permits general field isolation from saliva and from the tongue and cheeks, enhancing the chances of long-term success of bonding to enamel. This assumes major importance in the present context, since excessive salivation is a feature in a large percentage of disabled patients (Oreland *et al.*, 1989), particularly those with cerebral palsy (Franklin *et al.*, 1996).
3. Visibility and access in the working field are improved. Many disabled children, such as Down's syndrome patients, have an enlarged or forward-positioned tongue (Vogel *et al.*, 1986), which is otherwise difficult to displace from the field of operation, particularly when a throat pack is present and especially in the mandibular arch.
4. It reduces the risk of contamination to medical staff from aerosols, blood and saliva.
5. When the procedure is complete, removal of the rubber dam results in almost 100 per cent elimination of the post-treatment debris, leaving the post-anaesthetic recovery period relatively free of aspiration danger. This is particularly important with specific disabilities, such as cerebral palsy or muscular dystrophy, in whom the cough reflex is impaired (Malamed, 1995).

The disadvantages include:

(1) possible damage to the gingival tissue due to inappropriate clamp application (Neiburger, 1990);
(2) possible (but rare) allergic reactions to rubber (Blinkhorn and Leggat, 1984);
(3) the remote possibility of aspiration of a detached clamp (Alexander and Delholm, 1971);
(4) the minor extra time required for preparation and placement.

In conclusion, the use of rubber dam to facilitate the safe and reliable bonding of orthodontic brackets in disabled children, under GA, is highly recommended.

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