

# Orthodontic Treatment for Disabled Children —A Survey of Patient and Appliance Management

ADRIAN BECKER<sup>1</sup> B.D.S., L.D.S. R.C.S., D.D.O., R.C.P.S.

JOSEF SHAPIRA<sup>2</sup>, D.M.D.

STELLA CHAUSHU D.M.D., M.SC.

<sup>1</sup>Center for the Treatment of Cranio-facial Disorders in Handicapped Children, Department of Orthodontics, and <sup>2</sup>Department of Pediatric Dentistry, Hebrew University-Hadassah School of Dental Medicine, founded by the Alpha Omega Fraternity, Jerusalem, Israel

**Abstract.** *The objective of this article was to investigate the management problems encountered during the orthodontic treatment of children with disability, and took the form of a retrospective analysis. The investigation took place at the Center for the Treatment of Cranio-facial Disorders, Department of Orthodontics, Hebrew University Hadassah School of Dental Medicine, Jerusalem, Israel, between years 1989 and 1997.*

*The subjects were the 37 children with mental and/or physical disability whose orthodontic treatment was either completed or nearly completed, whose parents were given a questionnaire.*

*Thirty-five patients responded with a mean age of 13 years (range 7–21 years), representing 94.6 per cent of the sample. Most of the patients (94.3 per cent) were able to conclude the orthodontic treatment and 91.4 per cent of the parents reported that the added responsibilities were either negligible or bearable. In 63 per cent of the children, compliance increased during the treatment as anxiety decreased. The problems encountered with fixed appliances were generally more severe than with removable appliances. The two major obstacles were attendance at frequent and regular intervals (37.1 per cent) and maintaining an appropriate level of oral hygiene (37.1 per cent).*

*Children with a disability are able and willing to undergo orthodontic treatment. Recommendations intended to facilitate management are presented.*

**Index words:** Orthodontic Treatment, Management, Mental Disability, Physical Disability.

## Introduction

Orthodontic appliances are a bulky intrusion in the delicate homeostasis maintained in the oral cavity of any patient. They may be uncomfortable and painful, they require day-to-day maintenance, and may be the subject of ridicule from other children. Nevertheless, active co-operation of orthodontic patients is essential over prolonged treatment, and involves keeping appointments, compliance in wearing the appliances, maintenance of an adequate standard of oral hygiene, and refraining from chewing hard and sticky food (Nanda and Kierl, 1992).

The parents are largely minor players in this scenario, but their agreement to offer psychological support may be advantageous. Their willingness and ability to collaborate with the orthodontist is usually helpful for successful completion of treatment.

Patients with disabilities are a unique group with regard to these issues. By definition, they are children or adults

who are prevented by a physical or mental condition from full participation in the normal range of activities of their age groups (Franks, 1974). Regarding orthodontic treatment, they cannot be expected to perform most of the above responsibilities by themselves. For many of them, their level of perception of dentofacial appearance and awareness of the orthodontic problem is doubtful, their manual dexterity is usually very poor, and their submission to the need for an invasion of their oral cavity has received little attention until very recently (Becker and Shapira, 1996; Chadwick and Asher-McDade, 1997). For parents co-operation becomes mandatory, particularly regarding the care of the appliance.

The aim of this study was to investigate the management problems encountered during the orthodontic treatment of children with disability. The use of different orthodontic appliances, and their acceptance is discussed and the effect of the treatment on their family lives is evaluated.

## Patients and Methods

A seven-item questionnaire (Figure 1) was directed to the parents of 37 of 40 patients previously treated between 1989 and 1997 in the Center for the Treatment of Cranio-facial

Correspondence: Professor Adrian Becker, Center for the Treatment of Craniofacial Disorders in Handicapped Children, Department of Orthodontics, Hebrew University-Hadassah School of Dental Medicine, founded by the Alpha Omega Fraternity, P.O. Box 12272, Jerusalem, 91010, Israel. Fax: 972-2-5635415.  
E-mail: adrianb@cc.huji.ac.il

1. After the first day with the orthodontic appliance:
  - (a) we were surprised and relieved by his/her rapid acceptance of the appliance;
  - (b) at first, there were management difficulties which were overcome in a short time;
  - (c) the difficulties were insurmountable.
2. If the child was treated by removable appliances, answer the following:
  - (a) the removable appliance(s) were not tolerated, and he/she tried to remove them;
  - (b) at the beginning, he/she tried to remove it, but accommodated in a short time;
  - (c) he/she got used to the appliance quickly, and never tried to remove it.
3. If the child was treated by a fixed appliance, answer the following:
  - (a) he/she tried to dislodge it in an attempt to remove it from the teeth;
  - (b) he/she complained, and initially asked for removal of the appliance;
  - (c) he/she accommodated to the appliance in a short time.
4. How would you describe his/her compliance during the treatment?
  - (a) the compliance increased during treatment;
  - (b) there was no change from the beginning until the end of the treatment;
  - (c) the compliance declined during treatment.
5. How much did the treatment impede the everyday life of you, the parents?
  - (a) the added responsibilities were excessive;
  - (b) the added responsibilities were bearable;
  - (c) the responsibilities did not disturb our everyday life.
6. Which of the following was particularly burdensome?
  - (a) the day-to-day placement of the appliance and its accessories;
  - (b) difficulties in attending for treatment;
  - (c) maintenance of an adequate standard of oral hygiene;
  - (d) none of them.
7. Which stage of treatment was the most difficult?
  - (a) wearing the removable appliance;
  - (b) wearing the fixed appliance;
  - (c) wearing the integral removable extraoral appliance;
  - (d) none of them.

FIG. 1 The orthodontic questionnaire.

Disorders at the Orthodontic Department at the Hebrew University Hadassah School of Dental Medicine. The remaining three patients could not be located. The questionnaire was aimed at collecting information from the parents describing the difficulties encountered during treatment. Completed questionnaires were received from 35 patients, a response rate of 94.6 per cent. The mean age of the patients was 13 years with a range of 7–21 years. Most of the patients lived at home or with an adoptive family (88.6 per cent). The medical diagnoses are listed in Table 1, and the orthodontic diagnoses in Table 2. The appliances used are shown in Table 3. The results were grouped according to the issues evaluated to determine the frequency of each variable.

## Results

Most of the parents (33, 94.3 per cent), reported that the children accepted the appliance either immediately or within the first few days. Two patients (5.7 per cent) could not adapt to the presence of the appliances at all. One of

TABLE 1 Distribution of patients related to medical diagnoses

Mental retardation	15
Cerebral palsy	5
Down's Syndrome	4
Muscular dystrophy	6
Autism	2
Coffin Lowry syndrome	1
Behr syndrome	1
Congenital kyphoscoliosis	1
Total	35

TABLE 2 Distribution of patients related to orthodontic diagnoses

	Class I n = 5	Class II n = 24	Class III n = 6
Open bite/incomplete overbite	1	13	1
Deep bite	1	4	0
Anterior crossbite	1	1	5
Posterior crossbite	2	3	1
Crowding	4	15	2
Missing teeth	1	2	4
Supernumerary teeth	0	1	0
Impacted canines	1	1	0

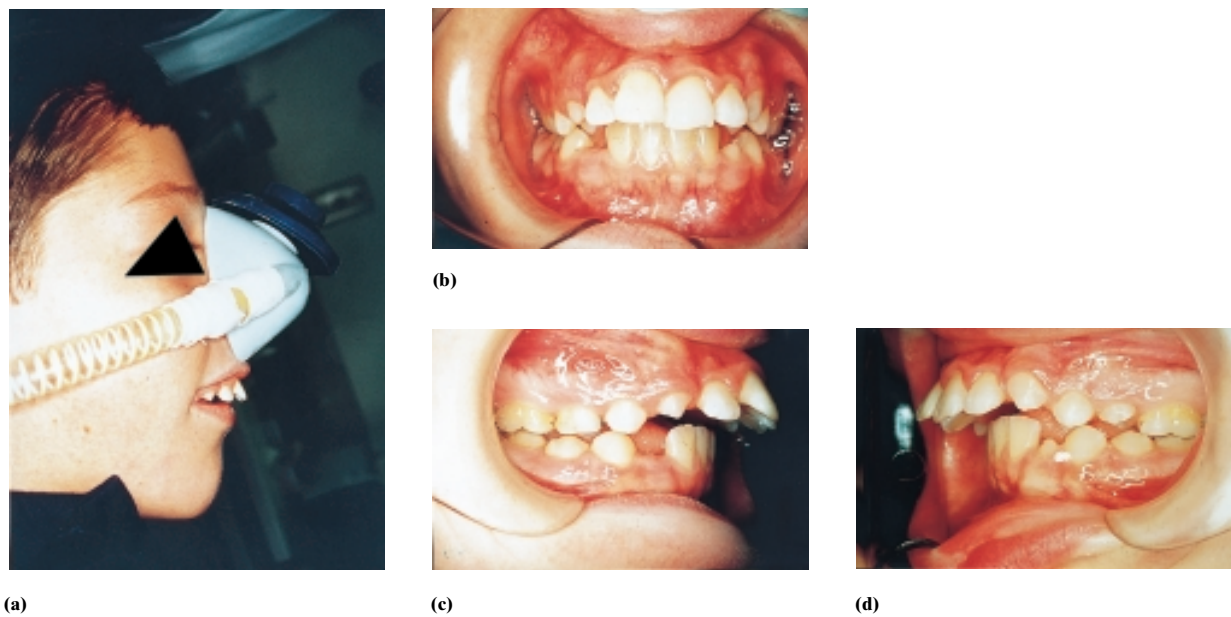


FIG. 2 Pretreatment extra-oral view: (a) profile photograph, taken in supine position, under inhalation sedation. Pretreatment intra-oral views: (b) front; (c) right side; (d) left side.

them was an autistic boy, who actively removed the appliance and the other was severely mentally retarded, who became too seriously distressed to permit continuation.

Thirty-two of the patients were treated with removable appliances: 23 (71.9 per cent) reported rapid accommodation to the appliance, seven (21.9 per cent) tried to remove it at first, but accepted it in a short time, while two (6.2 per cent) did not tolerate the appliance at all.

Twenty patients were treated with fixed appliances, of whom 16 (80 per cent) quickly adapted to them, while four (20 per cent) either tried to dislodge them or continuously complained, and asked to have them removed.

Parental reports on child compliance during treatment are listed in Table 4.

Thirty-two (91.4 per cent) of the parents stated that either the added responsibilities were negligible or bearable, while three (8.6 per cent) felt that the treatment intruded into their lives significantly.

The two main problems encountered, comprising 74.2 per cent of all problems, were difficulty in maintaining an adequate standard of oral hygiene (13 parents) and difficulties in attending for treatment (13 parents). Some of the responders pointed to both of these problems. Only four (11.4 per cent) reported difficulty in placing the appliance

and accessories, while five (14.3 per cent) stated they had no difficulties at all during the therapy (Table 5).

Eight (47 per cent) of the 17 patients who were treated with both active removable appliances and fixed appliances felt that wearing the fixed appliance was the most difficult. Five (29.4 per cent) had no difficulties regardless of the appliance type, two (11.8 per cent) complained about the removable plate and two (11.8 per cent) about the integral removable maxillary extra-oral *en bloc* appliance (Becker and Shapira, 1996; Table 6).

The case presented in Figures 2–4 illustrates the result achieved in an autistic patient, whose treatment involved the use of an integral removable maxillary extra-oral *en bloc* appliance, followed by fixed appliances. Pretreatment photographs and models had to be taken during the first session at which inhalation sedation with nitrous oxide was used, as shown in Figure 1a. The fixed appliances were placed under general anaesthesia. The patient's anxiety gradually decreased, allowing all routine appliance adjustments and final documentation (Figure 3a–c) to be performed, without sedation. After a retention period with removable appliances, upper and lower canine-to-canine fixed retainers were bonded under general anaesthesia.

TABLE 3 Appliances used for the orthodontic treatment

Removable	15
Removable and fixed	17
Fixed	3

TABLE 4 Compliance during the treatment

Increased	22	(62.7%)
No significant change	11	(31.4%)
Decreased	2	(5.7%)

TABLE 5 Major problems encountered during the treatment

Maintaining oral hygiene	13	37.1%
Attending for treatment	13	37.1%
No difficulties	5	14.3%
Placement of appliance and accessories	4	11.4%

TABLE 6 The most difficult stage of treatment (17 patients)

Fixed appliance	8	47.0%
None	5	29.4%
Removable appliance	2	11.8%
Removable extraoral <i>en bloc</i> appliance	2	11.8%



FIG. 3 Treatment: (a) the integral removable maxillary extraoral *en bloc* appliance. (b) The patient wearing the extra-oral appliance.

### Discussion

Most of the patients successfully completed the orthodontic treatment—33 out of 35—(94.3 per cent), insofar as the objectives that were determined in the plan of treatment were achieved. It is important to emphasize that, in a number of cases, ideal results were not aimed for (Becker and Shapira, 1996). This clearly demonstrates that this group of physically and/or mentally disabled children was able to cope with orthodontic treatment. Noteworthy is the observation that 91.4 per cent of the parents found that the added responsibilities were negligible or bearable, illustrating that highly motivated parents are both able and willing to confront the considerable difficulties posed and to make light of them. Only two (5.7 per cent) patients discontinued the treatment—a surprisingly low percentage compared with the reported rate of discontinuation of orthodontic treatment in healthy patients! (Murray, 1989; Patel, 1992). This is undoubtedly due to the highly selective nature of the sample and the significant parental involvement.

The present sample of patients with disability has been previously classified by us, according to the classification of Owen & Graber (1974) and by using the Behaviour Rating Scale of Frankl (Frankl *et al.*, 1962) in a study which found these systems inappropriate and unhelpful in relation to treatment delivery for this section of the population (Chaushu and Becker, 2000). The two patients who failed to complete the treatment, were moderately or severe mentally handicapped, and their behaviour was rated 1 (definitely negative), on the Frankl behaviour rating scale. Both of them were living in an institution, and their parents felt that this was a major impediment to fulfilling the demands of treatment. We have reported (Chaushu *et al.*, 2000), that most of these treated children lived at home or with an adoptive family, and the present report shows that the failures were among the institutionalized patients. These findings confirm that parental motivation and ability



(a)



(b)



(c)



(d)

FIG. 4 Post-treatment extra-oral view: (a) profile photograph. Post-treatment intra-oral views: (b) front; (c) right side; (d) left side.

to assume the responsibility of constant surveillance is a critical factor in delivering treatment to these patients.

Most disabled children approach treatment with higher levels of apprehension than normal orthodontic patients (Becker and Shapira, 1996). The orthodontist has to gain their trust and improve their confidence in order to achieve a workable level of cooperation. The few predictors used to assess future co-operation with orthodontic therapy, generally deal with four issues: patient characteristics, characteristics of the treatment, social support by significant others, and the provider-patient relationship (Woollass *et al.*, 1988). Of these, the doctor-patient relationship may be the most crucial (Nanda and Kierl, 1992). Once they have understood and accepted the appliance, some of these children, especially those classified as mildly disabled, may actually make ideal patients, as confirmed by our finding that in 63 per cent compliance increased during the treatment, as anxiety decreased.

Removable appliances were more easily accepted than fixed appliances, with 47 per cent of the parents reporting that the period with fixed appliances was the most difficult stage of the treatment, compared with only 11.8 per cent who experienced difficulties with removable appliances. Also, four patients could not tolerate the fixed appliances compared with two with removable appliances. These findings compare well with those revealed by a questionnaire addressed to a normal sample of orthodontic patients (Stewart *et al.*, 1997). They discovered that the problems encountered with fixed appliances were generally more severe than with removable appliances, in spite of the fact that swallowing and speech were more difficult with removable appliances, and that these problems persisted to some degree. From the orthodontist's point of view, fixed appliances are more difficult to place, especially in handicapped children, because they require specific conditions, such as the patient to sit still for long periods of time to enable the precise positioning of the brackets and complete dryness of the teeth. As has already been shown, sedation or general anaesthesia are sometimes needed to facilitate their placement (Chaushu and Becker, 2000).

From the parents' point of view, maintaining adequate oral hygiene is more difficult with fixed than with the removable appliances. Accordingly, it is recommended to extend the use of removable appliances in the disabled, with or without extra-oral headgear incorporated, and limit the period of fixed appliance wear. In most cases, treatment was initiated with a relatively simple plate for expansion or levelling and alignment. It served a two-fold purpose: acclimatizing the patient to treatment in stages, but also to test compliance of both child and parents, in maintaining oral hygiene, and performing simple instructions such as opening a screw or activating a spring. Success in this first stage allowed a progress to orthopedic/functional appliances in certain Class II cases or extractions of teeth in others. Simple tipping movements into the extraction space can be performed by removable appliances, thus limiting the duration of the fixed appliances to the minimum necessary for root movement.

The two major obstacles limiting the delivery or success of orthodontic treatment were regular attendance for adjustments and maintaining an adequate level of oral hygiene. Although professional attitudes towards patients with special needs and the willingness to provide treatment

has improved, these parents may still experience difficulty in finding a dentist who is willing to accept them for treatment. For this reason, they often have to travel greater distances than is usually necessary with healthy children. Only a minority of disabled children are routinely seen in general practice.

As medical skill improves, the life expectancy of patients with disability is increasing markedly and the need to recruit more orthodontists who are prepared to learn methods of care for these children is becoming acute.

Concerning the treatment plan, it is wise to establish reasonable goals on a modular basis and to re-assess them after each stage, being prepared to make adaptive changes if needed in the light of the treatment experience for the particular disabled individual. It is emphasized that, in many cases, long-term and sometimes permanent retention is needed, as reported elsewhere (Becker and Shapira, 1996). Non-routine extractions can simplify mechanics and shorten treatment duration, while orthodontic appliances with a longer range of action, requiring less frequent visits, are to be preferred. Becker and Shapira (1996) found excellent acceptance and rapid results with the full-time wearing of removable, *en bloc*, extra-oral appliance (Thurrow, 1975), for treatment of severe Class II malocclusions. This is simple to use, relatively safe, requires few adjustments and permits significantly fewer appointments. With fixed appliances, the use of wires or springs which deliver low, constant forces over a large range of deflection, such as those fabricated from the newer Titanium alloys, may reduce the number of activations of the appliance, and permit longer periods between treatment visits.

Physical and/or mental disabilities are known to directly or indirectly compromise oral function and create food stagnation. Research indicates that children with disability have significantly more decayed and missing teeth than healthy children (Morton, 1977), and suffer from high levels of periodontal disease (Shaw *et al.*, 1989). Therefore, it is not surprising that 37.1 per cent of the parents claimed that one of the major problems was achieving and maintaining a good standard of oral hygiene. As already stated, these children cannot be expected to brush their teeth by themselves, because of a relative absence of understanding of the reasons for doing it and a lack of manual dexterity to perform it (Becker and Shapira, 1996). Furthermore, the natural cleansing by the oral musculature in function may be impaired (Morton, 1977). It therefore becomes obligatory to promote dental awareness with the homecarers of these children, train them to identify plaque, calculus and gingivitis, to understand the significance of oral health, and how they may efficiently perform the suitable or perhaps customized tooth-brushing procedures. Courses for homecarers of adults with learning disability have already been successfully established (Davies and Whittle, 1990), but are not sufficiently widespread. Thus, the first task is to 'dentally educate' the parents, and the patients (Becker and Shapira, 1996). Explanation allows the homecarer to become knowledgeable involved in the treatment. From the child's point of view, this could be the first time he/she has been encouraged to submit to oral procedures and become a partner in the treatment. He/she gradually becomes accustomed to foreign objects, such as toothbrushes, 'invading' the oral cavity.

Additional methods to improve the dental health of

children with disabilities have been explored in the literature. These methods include the use of electric toothbrush in preference to manual toothbrush, or chlorhexidine delivered by mouth rinses, sprays, or gels. While there is no conclusive evidence of the superiority of electric toothbrushes with this group of patients (Bratel and Berggren, 1991), our clinical experience has shown that a good electric toothbrush may be particularly helpful in cases of increased iatrogenic plaque accumulation by an orthodontic appliance.

### Conclusions and recommendations

Clearly, there is still much work required in the understanding of the complexity involved in the management of this group of patients. Based on our earlier published studies, the present work and our clinical experience in the treatment of this compromised minority group within the child community, the following recommendations appear to be in order:

1. Start by educating the homecarers on dental problems, teach them how to identify plaque, calculus and gingival inflammation, and how to clean the child's teeth. An electric, rechargeable, light toothbrush is especially recommended.
2. Verify the child and parents' willingness and ability to take this responsibility, by examining the oral hygiene level several times and the improvement in the gingival condition, before committing to orthodontic treatment.
3. Establish reasonable stage-by-stage goals for treatment, but be ready to modify them, according to the individual patient's progress.
4. Establish a good doctor-patient relationship, to gain the child's and parents' trust and to improve their confidence.
5. Start orthodontic treatment with a removable appliance, to further confirm compliance in carrying out oral hygiene instructions, and performing simple instructions.
6. Extend the use of removable appliances, with or without extra-oral headgear incorporated, and limit the period of fixed appliances.
7. Consider non-routine extractions which may simplify and shorten the treatment plan.
8. Choose appliances with a long range of action, that require less frequent appointments, such as functional appliances or, in the case of fixed appliances, special auxiliaries and springs.
9. Plan for long-term or permanent retention.

The community and the health organizations, in general, and the orthodontic profession, in particular, should aim at improving the social welfare of this group of patients, and instruct more professionals in methods of care for the disabled, in order to facilitate their accessibility to orthodontic treatment.

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