CASE REPORT

Management of dental - orthopedic problems in down syndrome

Sertac Aksakalli, Zehra Ileri

Department of Orthodotics, Selcuk University, Konya, Turkey

Address for correspondence:
Dr. Sertac Aksakalli,
Department of Orthodontics,
Selcuk University Dental Faculty,
Kampüs, Konya, 42075, Turkey.
E-mail: sertacaksakal@gmail.com

ABSTRACT

Down Syndrome (DS) is one the most prevalent genetic disorder. This genetic disorder has physical and mental features including musculoskeletal (e.g. incorrect swallowing pattern), nervous (e.g. anxiety), and dental problems. Maintaining oral health is very important for these kinds of patients. Oral health or dental problems related to DS are localized or generalized periodontitis, mandibular prognatisma, underdeveloped maxilla, caries lesions, delayed eruptions, and oligodontia. Because of dental-oral part is the first part of the digestive system, there is need for orthodontic treatment maintaining better occlusion and mastication. In this case report, orthopedic, orthodontic, periodontal, prosthetic, and conservative dental treatments of a DS patient were presented. These kinds of patients should not be excluded from the dentistry patient population.

Key words
Dental treatment, down syndrome, oral health, oral health, orthopedic orthodontic therapy

INTRODUCTION

Down syndrome (DS) is one of the most prevalent genetic disorders. It affects between 1 in 600 or 1 in 1000 live births.[1] It was described in 1866 by Langdon Down. [2,3] DS is called as trisomy 21 because nearly 95% of all affected individuals have extra chromosome, making the chromosome count 47 instead of 46.[4] The 21 trisomy is the most common genetic abnormality, and other abnormalities included are mosaicism (23%) and translocation (3.6%).[5]

DS, a genetic disorder, is characterized by combination of physical and mental features. Typical features make DS easily recognizable. Studies including radiographic,[6] clinical.[7] dental cast,[6] and photographs[8] have pointed out several features related with DS. Many of the medical and physiological characteristics of DS have direct consequences for the dental and orthodontic health of subjects affected and indirect consequences for the quality of life of persons with DS and their carers.[9]

Skeletal features include underdeveloped facial mid-third, brachycephalic cranium, negative overjet, anterior openbite, posterior cross bite, class III malocclusion.[10] The underdeveloped maxilla combined with an enlarged tonsillar volume results in congestion of the upper airways and induces tendency for mouth breathing and may lead to sleep apnea. The mandible is then lowered, the lips are parted, and the tongue assumes an anterior position over the lower teeth to allow free passage of air.[11] The free way space is about two or three times the normal value of 2 mm.[6,12] Skeletal class III malocclusion exhibits lesser facial convexity as a result of maxillary deficiency, mandibular protrusion and both. Maxillary deficiency or retrognathic maxilla is a common finding.[13] DS patients have also a stair or V-shaped palate and this is caused by deficient development of the midface.[14,15]

Soft tissue features include small ear, eye disorders, narrowed oropharynx, insufficient lip seal, and tongue protrusion or small oral cavity with a relatively large tongue (this situation may cause mouth breathing).[16,17]

Dental features include delayed dental eruption, alterations in the shape, dimension, number and position of the teeth. Clinical crowns are frequently shorter and conical and their roots are small also. Tooth agenesis or defective developments are very common in DS patients. The teeth most affected by agenesis are mandibular incisors, maxillary laterals, and premolars. There is higher frequency of malalignments in both primary and permanent dentition.[14,18,19] Individuals with mouth breathing are more susceptible to periodontal diseases and if disease is not treated in adulthood, there will

Access this article online	
Quick Response Code:	Website: www.ejgd.org
	DOI: 10.4103/2278-9626.101362

be generalized periodontal problems. The prevalence of dental caries is low in DS patients; this is pleasing situation in management of orthodontic patients.[20]

CASE REPORT

The patient was referred to our clinic with the chief complaint of unaesthetic smile and mastication problems at the age of 13. He was not taking any medications at the time, and he was going routine checkups in Faculty of Medicine of Selcuk University.

In extraoral examination, his facial appearance showed typical features of DS such as hypertelorism, short palpebral fissures, wide short low ears, a wide nasal root, a narrow soft nose with a high nasal tip [Figure 1]. His profile was straight with a protrusive upper lip. There was insufficient appearance of the upper incisors and mental muscle strain during smiling. Drooling as a common consequence in DS patients was absent in our patient.

The intraoral examinations showed that he had macroglossia that complicated the orthodontist in bracketing stage. There were generalized periodontitis. Dental caries due to poor oral hygiene and polidiestemas were present. There was posterior crossbite for both arches. There were rotatedmandibular incisors, persisted decidious molars because of congenitally missing premolars and delayed eruptions for all second molars [Figure 1].

His radiographic examinations revealed that there were congenitally missing maxillary laterals, mandibular centrals, and mandibular second premolars [Figure 2] There were unerupted maxillary second premolars and canines. There was no skeletal transverse deficiency. His hand-wrist radiograph revealed that he was at the pubertal maximum growth stage. He had mandibular prognatism (SNB = 83.5°) with midface deficiency (SNA = 79.6°) and horizontal growth pattern (SN-GoGn = 30.5°). He had a dental class II and skeletal class III malocclusion (ANB = -3.9°) with openbite tendency. The possible etiology for malocclusion and skeletal class III are believed to be a combination of DS and heredity. The maxillary and mandibular incisors were slightly protrusive.

His dental cast analysis showed 1.7 mm overjet and -0.2 mm overbite. After model analysis, it was decided to extract or strip deciduous teeth.

Our treatment plan consisted of providing good oral health with no caries and no periodontal problem, correcting mandibular prognatism, retruding maxillary - mandibular incisors, establishing ideal overjet and overbite with class I canine relationship and better intercuspidation.

His periodontitis were treated with oral hygiene instruction and scaling/root planing processes. Then, to correct mandibular prognatism, orthopedically effective chin cup was used approximately two years until an ideal overjet was established. To allow the eruption of maxillary canines, maxillary decidious laterals were extracted. For the lower arch, it was decided to open spaces for missing mandibular centrals and to gain ideal molar relationship, the decidious molars were stripped to prevent premature contacts.

The fixed orthodontic treatment started with 0.018" braces. All the permanent teeth were bonded with braces, and the leveling was initiated with 0.014" round Ni Ti arch wires. At the following stages after leveling and correction of rotations, to widen the maxillary arch, molar bands and transpalatal arch were used. Patient and his parents were instructed to use intermaxillary cross elastics. When class I canine relationships, space openings for mandibular centrals, and maxillary laterals were established, the debonding was performed and the application of bonded lingual retainers has been made [Figures 3 and 4]. All the caries have been treated. Also, for the upper and lower teeth, a removable Hawley retainer was prepared, and patient was instructed a full-time wear of the plate till the fixed prosthesis were prepared.

The changes in cephalometric measurements were shown in Table 1. With the chin cup therapy, the mandibular prognatism were corrected and better profile esthetic was gained [Figure 5]. The overbite was changed positively, and all maxillary – mandibular incisors inclined better in jaws.

Total treatment time was 3 years 2 months. The treatment was finished with patient and his parents' satisfaction. The treatment has been finished with upper and lower anterior fixed prosthesis [Figure 6].

DISCUSSION

In literature, it has been shown that persons with DS are particularly prone to orofacial problems. Systemic

Table 1: Cephalometric values for pre- and post-treatment

Cephalometric values	Pre-treatment	Post-treatment
SNA	79.6°	79.2°
SNB	83.5°	80.8°
ANB	-3,9°	-1.9°
SN-GoGn	30, 5°	31°
SN-PP	7°	7, 5°
U1-NA (mm/degree)	5.9 / 26.6°	4.7 / 24.2°
L1-NB (mm/degree)	5.2 / 27.7°	4.8 / 24.6°
IMPA	93.7°	88.8°
Y Axis	54.7°	55°
Overjet (mm)	1, 7	0.9
Overbite (mm)	0.2	0.4

dysfunction in this population may predispose to oral disease, and oral disease may, in turn, aggravate systemic disease.[9] So, regular reviews, preferably by specialist team, must be undertaken to identify, stop, and prevent both functional problems and oral disease processes. We performed our DS patient treatments by organizing

Figure 1: Pre-treatment photographs

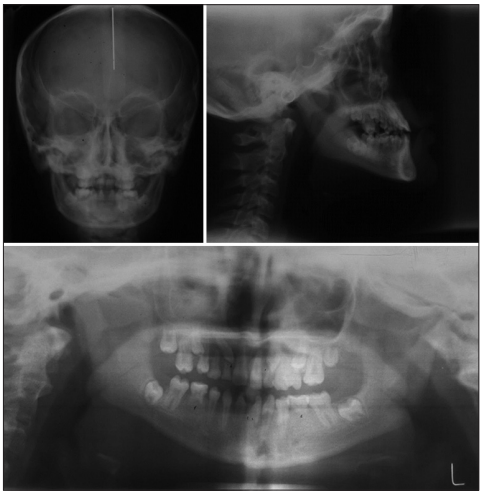

Figure 2: Pre-treatment radiographs

Figure 3: Post-treatment photographs

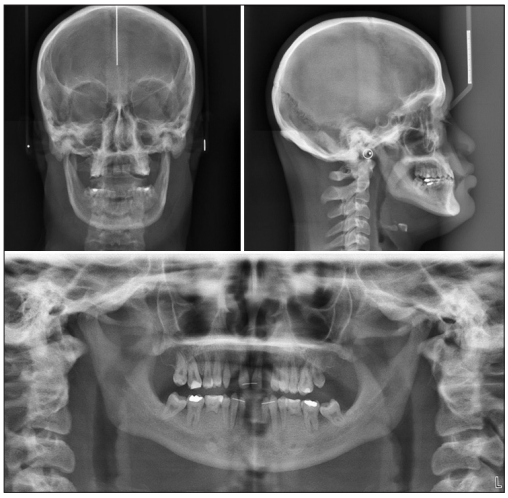

Figure 4: Post-treatment radiographs

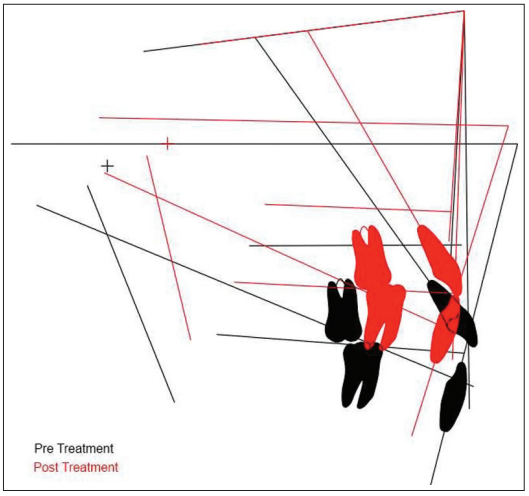

Figure 5: Cephalometric superimposition at Sella-Nasion line

Figure 6: Photographs after prosthetic treatment

specialist team including orthodontic, periodontal, conservative, and prosthodontic departments.

It is demonstrated that DS patient have different eating habits than the patients in control groups. It was certain that some types of oral manipulation, such as biting into a whole apple, were difficult, if not impossible, for the DS patient groups. This resulted in the refusal of some foods, non-functional masticatory cycles, and the swallowing of big, weakly chewed morsels. Such behavior led to belching (corresponding to the swallowing of air), coughing (corresponding to the aspiration of food), sighing, and in copious drinking between mouthfuls.[9] So, establishing ideal maxillomandibular relationship, ideal occlusion, and intercuspidation is very important.

Treatment available depends on the degree of cooperation of the DS patient. If cooperation is very good, then high-quality dentistry including orthodontics is possible in the normal dental setting. If there is no cooperation, then treatment under sedation or general anesthesia is the only solution.[21] In literature, it was stated that it was more difficult to obtain good cooperation for treatment from a mentally compromised patient than from control subjects.[22] Our patient had a good degree of cooperation, and we could make a satisfactory treatment. Chin-cup therapy and fixed orthodontic treatment requires good cooperation.

Despite decreased caries experience overall, early carious lesions are more likely to develop in a DS patient over time than in a control subject because of their cognitive problems in dealing with dental treatments, their problems in recognizing and expressing pain, and their reduced access to dental care.[9] We performed conservative dentistry treatments by taking anamnesis and evaluating clinical / radiographic examinations.

Chronic gingivitis becomes established early in the child because of mouth breathing, inadequate oral stimulation, and loss of oral hygiene. It remains undetected as the primary dentition is shed but evolves throughout adolescence until periodontal disease becomes apparent at around 20 to 25 years of age.[9] So, providing good periodontal health status becomes very important for these kinds of patients. With the effect of severe periodontal disease, tooth mobility may be a problem.

In dental clinics, practitioners can examine teeth agenesis, delayed eruptions, and oligodontia in an individual with DS. The dental reductions seen in relation to size, shape, and number could be the expression of a known decrease in number of some cells in so many body organs due to the slower intermitotic period in trisomic cells. In our case, there are delayed eruptions, agenesis, and oligodontia that made orthodontic treatment coercive.[6,23,24] In DS patient, there are systemic anomalies such as cardiovascular, nervous, and musculoskeletal. Dementia, anxiety, and speech problems can harden the orthodontic treatments and patient cooperation. However, we do not have any important systemic problems related to anomalies in the treatment.[25]

Chin cup therapy is usually an important choice for mandibular prognatism. It has orthopedic effects on mandible and maxilla. Chin cup makes a retardation of vertical ramus growth, retardation of vertical and sagittal development the mandible and retardation of vertical development in the posterior maxilla.[26] So, chin cup is very effective for skeletal class III patients. In our patient, by using chin cup, we had better ANB angle and profile esthetic.

In functional orthopedic therapy, growth and development stages are important. It was stated that any attempt to change growth is best achieved at the peak of the pubertal growth spurt, which is 12 and 14 years of age for girls and boys, respectively[27] Our patient was 13 when we started orthopedic treatment.

For congenitally missing teeth, orthodontic space closing or space opening processes can be performed.[28] We preferred space opening because there are several missing teeth and patients' parents did not want any implant application. We planned having better intercuspidation and occlusion in posterior area following preparation adequate spaces openings for prosthetic application. The maxillary anterior teeth were also small in shape; therefore, space closing could not be beneficial in our case.

This case report shows that a person with DS can be treated in any orthodontic clinic and these kinds of patients should not be excluded from the dentistry patient population. In our case, we have reached all the treatment goals including functional orthopedic therapy and good oral health.

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How to cite this article: Aksakalli S, Ileri Z. Management of dental - orthopedic problems in down syndrome. Eur J Gen Dent 2012;1:58-62.
Source of Support: Nil, **Conflict of Interest:** None declared.