According to the Centers for Disease Control and Prevention (January 6, 2006 report) the prevalence of children born with Down syndrome (DS) in the United States is approximately 1:733. At this rate of occurrence, the genetic trait of trisomy 21 (DS) has a prevalence very similar to that of cleft lip and palate. Whereas dentistry and orthodontics have long been committed to the interdisciplinary team management of patients with cleft lip and palate, the dental/orthodontic commitment to patients with DS is less evident. A quick review of the two major orthodontic journals (American Journal of Orthodontics and Dentofacial Orthopedics and The Angle Orthodontist) illustrates the point—there have only been three articles published related to treatment of patients with DS in the last 25 years. In contrast, for cleft lip and palate treatment and research, during the same time period and for the same key orthodontic journals, approximately 50 articles were published.

Before and particularly since the passage of the Americans With Disabilities Act of 1976, parents of patients with disabilities have sought more inclusion for their children in both the educational setting and the medical setting. One generation ago, a large percentage of children born with DS died early in life because of cardiac problems, and many of those who survived their early medical problems were institutionalized as young children. Most of the current generation of
parents of children with DS make a significant effort to include their DS children in many aspects of traditional family life, school, and sports. In addition, better educational mechanisms exist to assist them and their children medically and socially. Medical support groups and parent support groups have been very active in optimizing the quality of life for children with DS. The combination of these changes over the past few decades has led to a 100% increase in the life expectancy of persons with DS (from a previous average life expectancy of 30–40 years to a current life expectancy of 60–70 years).

There are many dental conditions common to children with DS that are well suited for orthodontic intervention and should be considered for correction at the appropriate times.\(^1\&2\)

1. Maxillary anteroposterior hypoplasia (54% of DS patients have Angle Class III tendencies);
2. Maxillary transverse hypoplasia (65% of DS patients have posterior crossbites);
3. Congenitally missing teeth (20 times more frequent in DS patients than in the general population);
4. Tooth size discrepancy (high degree of frequency of interference with ideal interarch coordination);
5. Open bite (interfering with proper mastication);
6. Impacted teeth (10 times more canine impactions than the non-DS population);
7. Transposed teeth (15% with Mx.C.P1 transpositions, compared to 0.3% in the general population);
8. Tongue thrust and protrusive tongue posture (muscle hypotonicity and joint laxity are frequently present requiring speech and myofunctional therapy);
9. Gingival excess and periodontal infection;
10. Chewing difficulties leading to frequent choking episodes.

The above conditions benefit from timely orthodontic intervention; frequently, a two-phase or multiphase
Treatment program is beneficial to assist in early correction of maxillary transverse deficiency and Class III malocclusion. In addition, if a child has more than one of these frequently occurring conditions, advanced interdisciplinary therapy will be required with a well-coordinated and experienced dental team, including critical treatment planning input from the orthodontist.

Technologic advances in orthodontics have made it possible for orthodontists to create a treatment environment that welcomes children with special needs and treatment requirements. The following technologic improvements help all orthodontic patients, but some are specifically useful for patients with DS:

1. Impressions using quick-set materials with fun flavors—these may reduce the tendency for activation of the more sensitive gag reflex frequently experienced with DS patients;
2. Easy bonding of brackets rather than more complex and uncomfortable banding procedures;
3. Self-etching primer, to reduce the taste of conventional etchants and glass ionomer cements that can be used in the oral environment in which it is difficult to maintain a dry field for several minutes at a time;
4. High-memory wires, allowing a longer activation interval between appointments;
5. Self-ligating brackets, which allow a more patient-friendly activation appointment;
6. Advances in orthognathic surgical techniques that are less invasive and more predictable;
7. Current reliability of implant replacement of congenitally absent teeth, which greatly aids the overall prognosis for patients with DS;
8. Reversible implant anchorage devices to minimize compliance requirements needed for successful tooth movement.

**Summary**

The orthodontic specialist has many treatment management tools and skills to improve the quality of life for the patient born with DS. The use of the new Supplemental History form available through the American Association of Orthodontists (AAO) allows the parents to provide helpful descriptions of details about their child that will allow the dental team to create a health care environment that is more sensitive and comfortable for both the parent and the DS child.
With the technological advances available and the increasing numbers of kids with DS seeking orthodontic care, our orthodontic residency programs need to include training for orthodontic treatment of DS patients similar to the training available for cleft palate team participation. Currently, the AAO’s Council on Education is assessing the role of residency programs training future orthodontists to handle the unique needs of patients with DS and patients with other special needs. Doctor and staff training with clinical updates would be made possible at university centers. Through more frequent journal articles and presentations on this subject, orthodontic specialists might become more comfortable setting aside the extra time needed to manage the requirements of children with DS.

The orthodontic specialty is rapidly becoming aware of the need for its leadership in developing an optimal interdisciplinary setting for providing patients with DS with the advanced dental care available and needed to improve the quality of their lives. With many excellent residency programs in North America, one could easily envision orthodontists taking the lead in the development of interdisciplinary DS treatment teams. In turn, those teams could contribute to existing guidelines that would aid in future treatment approaches, which would be specifically designed for the multifaceted dental problems of the DS patient. Although the optimal treatment of DS patients presents complex challenges for orthodontic specialists and their teams, the fulfillment of applying the best available orthodontic skills to help children with DS is uniquely rewarding. Providing the care and enjoying the fulfillment are experiences in which all orthodontists and staff must be adequately trained.

References
Other documents provided with this article include:

- Seminar Handout for Parents of DS Children, which includes a Supplemental Patient Questionnaire
- Copy of article “Treating Down Syndrome Patients” which appeared in Orthodontics Products Online
Orthodontic possibilities for children with Down Syndrome
Presented to *Ups for Downs* parent group
April 22, 2010
*Drs. Musich and Busch*
“Form and function through art, science and teamwork.”
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Common **dental conditions** and **terminology** associated with Down Syndrome:

- **20x--Missing teeth**
- **10x-Impacted teeth**
  - Short roots frequent

15% Transposition teeth

- **Ectopic teeth** (transposed position with another tooth)
- **Retained baby teeth**

- **Crossbite** (Anterior/underbite and posterior) 65% have post. XB
  - 54% w Ant. Xbite

- **Oversized tongue**

✓ **Jaw growth imbalance**
  - More than 1/2 Class III with under bite of anterior teeth
II. Helping to make the dental/ortho office feel comfortable and safe  
(supplemental questionnaire)

Patient’s Name:_____________________________ Date:___________________________

On your health history you have identified your child with ________________________________
Would you please help us understand more about this condition and how it might affect your child in a dental / orthodontic setting?

1. Could you tell us about the condition your child has and how it affects his/her behavior.
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

2. Please describe any significant fears or anxieties that your child may experience during visits to health care professionals (including dental).
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

3. Has the anxiety or fear prevented any necessary treatment? Please describe.
___________________________________________________________________________________________
___________________________________________________________________________________________

4. Are there any strategies that help your child open up to new experiences such as a visit to a new doctor (Examples: show and tell, humor, going very slowly; modeling with parent or other sibling, other examples)?
___________________________________________________________________________________________
___________________________________________________________________________________________

5. Are there physical disabilities that need to be taken into consideration? (Examples: Difficulty with fine motor skills)
___________________________________________________________________________________________
___________________________________________________________________________________________

6. Are there learning disabilities that need to be taken into consideration? (Examples: Auditory processing difficulties, sensory integration dysfunction, or speech and language difficulties)
___________________________________________________________________________________________
___________________________________________________________________________________________

7. Any additional information that might help us to provide a positive office experience for your child?
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
III. Orthodontic study records:

• Study models

• Panoramic x-ray

• Lateral Cephalometric analysis

• Postero-anterior head x-ray

• Photographs

• Wrist x-rays to assess phys. Maturity and to aid in proper timing of treatment
IV. Orthodontic Appliances useful to treat dental conditions of kids with Down Syndrome

- Expanders to widen palate
- Partial Braces to align incisors
- Removable traction appliance
  To provide elastic traction to
  Accelerate forward growth of upper jaw
- Removable retainers
- Fixed retainers
VI. Frequently asked questions by parents and kids:

➢ Will braces or the expander hurt?

➢ What do you mean by orthodontic records?

➢ How do the orthodontic appliances affect speech?

➢ My child has a lot of anxiety—what can be done?

➢ What will my child be able to eat with braces on?

➢ Will my child have more cavities while in braces?

➢ Most of my child’s teeth are baby teeth—aren’t they too young for braces?

➢ Has any new technology helped to reduce the “hassle factor” related to braces?

Your specific questions:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

Thank you for your interest.
"I do believe that Angie taught everyone on the team a few very important things along the road. A person with a disability is still just a person who deserves to be treated with dignity and respect. Never assume someone doesn’t understand what you’re saying because they don’t speak as well as you. If you have the patience to really listen to what they have to say, you will realize that they have likes and dislikes, friends and interests, hopes and dreams just like the rest of us. If you give them a chance, you will be amazed at some of the gifts they have to share and how they can bring you so much joy.”

Angela’s mom, Mrs. Picchi
Treating Down Syndrome Patients

**OP:** Do you interact with Down syndrome (DS) patients differently than with your other patients?

**Musich:** When parents fill out the child’s health history and indicate that their child has a special need, we ask the parent to fill out the AAO’s Supplemental Health History form for children with special needs (developed by the AAO’s Council on Orthodontic Practice). This provides us with very important insights from the patient’s parents regarding key factors that need to be taken into consideration when treating their child. It should be mentioned that we do not treat our patients with DS with any treatment-planning bias. We start with the thought of achieving an ideal outcome. Like with other children, if we find that we are not getting a reasonable response, then we might reset our objectives after discussing this with the parents and child.

**OP:** Have you had training sessions for your staff in how to treat DS patients?

**Musich:** This is a very important question. Yes, we have the good fortune to have one clinical staff member (Jolette Porter) who has a background in early-child development and who worked with children with autism after college. Jolette and Matthew J. Busch, DDS, (my partner, who is excellent in the management of special-needs children) have had periodic training programs with clinical staff to help them develop skills to manage and customize the treatment situation (private room, longer appointments, etc) so that we are able to achieve the best results possible. Most of the clinical staff follow the lead of the doctors. We are very positive in our approach to treatment and to treatment planning. Orthodontic assistants who have not worked with children with special needs do require several observation appointments to gain their own self-confidence in working in the smaller oral cavity.

**OP:** What’s the biggest challenge in dealing with these patients?

**Musich:** Overcoming “iatrogenic negative conditioning” that parents may have due to faulty information about kids with DS and orthodontics.

Establishing an office setting diminishes the anxieties and fears that kids with DS may feel more than other children of similar age. (Does wearing a dental mask upset them? Does the dental light bother their eyes? Does the sound of the high-speed handpiece or suction bother them? What about their gag reflex?) By learning about their sensitivities, we can take steps to desensitize them and create good experiences.

Two things that we have done to consistently create good experiences are:

1) Establish appointment patterns so that each appointment is a similar experience—same chair, same private room, etc.

2) Incorporate a customized patient-manager system in which two assistants are assigned to the patient and will see him or her at each visit to stay familiar with established patterns.

With the incorporation of some of the above strategies, we frequently see the older DS kids show newfound independence, come to the chair on their own, and seem very proud of their comfort and maturity.

**OP:** What advice do you have for orthodontists who are considering treating DS patients?

**Musich:** Recently (July 2006) I published a guest editorial in the *Angle Orthodontist* that was motivated by the feedback we have received from parents of DS patients. The point of the editorial was to point out how important leadership from members of the orthodontic specialty has become in the area of orthodontic treatment for kids with DS. All children with DS have significant orthodontic needs. Thus far, there is limited training in the graduate programs to help residents understand what their role might be in the management of malocclusions of children with DS. My advice to orthodontists considering treating kids with DS:

1) Use the supplemental health history questionnaire developed by the AAO—it is very helpful.

2) Read the quote from Mrs Picchi—parent of Angie, who was treated about 8 years ago. Read the articles listed as references below.

3) Spend some time discussing the appropriate management of dental anxiety with your staff. This is the main issue that seems to be common in kids with DS. Find out if any staff are interested in taking the lead with the orthodontist in doing specific research to understand additional complexities in the behavioral management of anxiety. Working with local pediatric dentists can be very helpful to learn some of the behavioral techniques they use with their DS patients.

4) Go slowly. Explain everything. Use the “show and tell” technique. Develop the child’s trust through showing respect for his or her comfort level with the procedures.

5) Realize that you are not going to set any speed records in the treatment progress, but in general you can expect very good results, with occasional limited outcomes.

6) When the confidence level improves, offer to give a presentation to the local chapter of the National Association for Down Syndrome about the Orthodontic Possibilities for Kids with Down Syndrome.

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For references, answers to more questions, Mrs. Picchi’s quote, and a sample questionnaire for patients with special needs, see the online version at OrthodonticProductsOnline.com.