Pediatric Bilateral Case Study

Nucleus Recipient:
Sarah Novick, Age 6

Parents: Gregg and Tina Novick

Audiologist:
Marilyn Neault, Ph.D., CCC-A

Center: Boston Children’s Cochlear Implant

Surgeon: Margaret Kenna, M.D.

Certified Auditory Verbal Therapist:
Lea Watson, MS, CCC-SLP

Age at I.D. of hearing loss: 11 months

Background:
Sarah Novick’s world was silent until she was implanted at 18 months of age. In 1997 when Sarah was born, newborn hearing screening was not available in Maine where the Novicks live. Her family had no history of a hearing loss so it wasn’t until Sarah was 7 months old that her parents realized she was a very quiet baby, not babbling or gurgling like other babies her age. At first, doctors attributed this to a series of ear infections she had over the winter. When the Novicks finally convinced their doctor to test her hearing at 11 months old, Sarah was diagnosed with a congenital, profound, relatively flat bilateral sensorineural hearing loss associated with Waardenburg Syndrome (see Figure 1).

By Sarah’s first birthday, she was wearing hearing aids and began Auditory-Verbal therapy but was slow to develop speech or language skills. Even with binaural hearing aids, her pure tone thresholds improved only to around 65-85 dB HL. At this time, when Sarah was 15 months old, her parents decided to take her to Boston Children’s hospital to get a cochlear implant evaluation.

Life with a Nucleus® implant:
On the day of her first activation, Sarah’s mother, Tina, remembers that she immediately reacted to the sounds of a banging drum. Sarah heard the sound but couldn’t figure out how it was happening. First she banged the drum, then she waved the drumstick in the air and finally, she realized that when you put the two together, you could create beautiful music!

Tina also recalls an immediate difference in Sarah’s behavior during therapy sessions. Once her implant was activated, Sarah became much more verbally interactive. In six months and with a lot of hard work, she was responding to a wide array of words, phrases and songs.

At the age of two, Sarah was mainstreamed in a pre-school. The Novicks realized that Sarah was still behind other kids in speech and language development, but she communicated well with her teacher and would respond to questions. It wasn’t long before she caught up to the other kids in her class. Today, Sarah can carry on an endless phone conversation with someone she has never spoken to before, but only after activating the telecoil on her ESPrıt 3G.

Initial Implant – right side:
Type of implant: Nucleus® 24
Age at implantation: 18 months
Date of surgery: April 5, 1999
Date of activation: April 29, 1999

Second Implant – left side:
Type of implant: Nucleus® 24 Contour™
Age of implantation: 5 1/2 years old
Date of surgery: March 28, 2003
Date of activation: April 29, 2003

Etiology: Waardenburg’s syndrome
Speech Processor: 2 ESPrıt™ 3Gs (BTE)
Coding Strategy: ACE™

Figure 1: Audiogram

-10 0 10 20 30 40 50 60 70 80 90 100 110 120 125

Hearing Loss in Decibels

250 500 1000 2000 4000 6000

Frequency in Hertz

ESPıt™ 3G

O - Pre-implant Right, X - Pre-implant Left
CI - Cochlear Implant Right, CI - Cochlear Implant Blue
A - Hearing Aids
Life with bilateral Nucleus® implants:
The Novick’s decision to pursue bilateral implants for Sarah was a simple one. Even though she was doing well with one implant, her parents thought Sarah could do better with two. She understood speech in a quiet environment, but had limited ability to localize and struggled with speech comprehension in a noisy environment. Sarah’s left ear hearing loss was so profound that she did not get any benefit from using a hearing aid. As Tina put it, “We live in a noisy world. Sarah needs to be able to hear in a noisy classroom and localize sounds on a noisy playground.” When asked if they would want to save Sarah’s left ear for future technology, Tina’s response was “Save it for what? Sarah can benefit more by hearing in both ears now, than if she waits for new technology and acquires perfect hearing when she is 30.”

Sarah’s second implant was activated exactly 4 years to the day after her first implant. The team knew that Sarah was starting over and it would take some time to understand words and sentences with her new implant. Even so, they did not realize how true that was. The first few therapy sessions focused on just recognizing the presence of sound. However, after about 1 month, her progress began to soar: Sarah wore both implants most of the day and her parents tried to encourage her to use just her new implant for about 1 hour a day – while reading a story or playing. Tina recalls working with Sarah on the 6 Ling sounds.1,2 “We were hoping for a simple one syllable answer when she used just her new implant, much the same as when she was 18 months old.” But when her therapist, Lea, said “baa,” Sarah said, “The sheep says baa. We saw a sheep on the farm on our field trip.”

Today, Sarah still favors her initial implant, but the consensus among her parents, audiologist and therapist is that Sarah is hearing much better with two implants. Her audiologist, Marilyn, confirmed this recently with a series of speech perception tests. Her improvements in speech perception, with both implants, in noisy environments is considerably improved (see Figure 2). Recently Lea came to Sarah’s kindergarten class and saw Sarah respond very easily to a little boy who bent over to whisper a secret in her ear. When you think about it, it’s really incredible that Sarah could respond so naturally – without lip reading or asking him to repeat his words – just what you would expect from two very typical six year olds!

Criteria for Success:
The keys to successful bilateral implantation include:
- Excellent outcomes with the initial cochlear implant.
- Child gets little or no benefit from wearing a hearing aid in the contralateral ear.
- Parents who are committed to providing their children every possible auditory advantage.
- The child, if old enough, is well prepared for the second surgery and agrees to the procedure.
- The child will have therapy to learn to listen with the second implant and with both implants together.

The earlier the better – clinical studies indicate that children who are implanted before the age of three progress faster than those implanted at a later age.3 In addition, preliminary evidence from Cochlear’s pediatric bilateral study suggests that younger children also acquire speech recognition more rapidly in the second ear than older children.

**Figure 2: Speech Perception Scores for One Implant vs. Two**

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Right Implant</th>
<th>Left Implant</th>
<th>Both Implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBK Monosyllables at 57 dB HL</td>
<td>78</td>
<td>67</td>
<td>73</td>
</tr>
<tr>
<td>Hint-C Sentences in Noise</td>
<td>74</td>
<td>69</td>
<td>71</td>
</tr>
<tr>
<td>Hearing in Quiet</td>
<td>85</td>
<td>80</td>
<td>83</td>
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</tbody>
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**Cochlear’s Pediatric Sequential Bilateral Cochlear Implant Study**
The objective of this study is to evaluate the bilateral benefits in children, aged 3 to 13 years, who receive a second cochlear implant after using a cochlear implant in one ear for a minimum of 6 months. Throughout the U.S., 26 children have been implanted with a second device. Early results are showing that the children are able to acquire improved speech recognition in the second ear, particularly children under the age of 8 years. Results are also indicating improved speech understanding in the presence of background noise. Based on parental reports, the children also experience improved awareness of sound around them and improved listening skills.

**Footnotes:**

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