Childhood Apraxia of Speech

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There are no disclosures related to today’s presentation
Objectives

• Relate key speech and language concepts necessary to understand Childhood Apraxia of Speech (CAS)

• Discuss evidence available to guide treatment of Childhood Apraxia of Speech

• Review considerations of care in the child with Childhood Apraxia of Speech
Case of Henry

Henry is a 2 1/2 year old who presents today for a WCC. His family just moved and is establishing care with you. As recommended by the AAP Practice Guidelines (2006) you administer a developmental surveillance tool and review it before you enter the room.

You notice mom indicates a concern with Henry’s communication. He was receiving ST through EI from 18 months but progress was noted to be slow. Because of this, mom wonders if she should try and get EI started here or just wait and see?
Conceptual Framework: What is speech and what is language?

- Speech
- Social Interactions
- Play
- Language
  - Receptive language
  - Expressive language
  - Semantics
  - Pragmatics
  - Syntax
  - Grammar
  - Vocabulary
Conceptual Framework: What is speech and what is language?

Dysfluency

Articulation Disorder / Phonological Disorder

Childhood Apraxia of Speech
Dysfluency

Stuttering: Interruptions in the normal flow of speech

**Typical**
- Whole word or phrase repetitions
- Interjections
- Revisions
- Hesitations

**Less Typical**
- Repetition of sounds
- Repetitions of syllables
- Prolongation

Etiology unknown
Ages affected: 2-5 yrs
Often resolves on its own
Exacerbating factors include Stress, Fatigue & Language complexity
Articulation/Phonological Disorder
Articulation Disorder

• A person cannot produce the **sounds** necessary for correct speech.

• Predictable:
  - Unable to make: p, b, m by 3 years
  - Unable to make: d, n, k by 4 years
  - Unable to make sh and th by 6 years
  - Unable to make s by age 7
Phonological Disorder

Poor use of certain speech sounds expected for age

- Predictable errors, consonants more common
- M > F
- 3% of preschool children and 2% of children 6 - 7yr
- Prognosis is generally good for normal or near-normal speech
Childhood Apraxia of Speech
Childhood Apraxia of Speech

Neurological speech sound disorder

That affects a child’s ability to coordinate the muscles of the tongue, lips, mouth and jaw to make accurate and reproducible speech sounds
Genetics

7q31, at the SPCH1 locus

Forkhead Box Promoter Gene (FOXP2)

Gene Mutation or deletion leads to decreased protein production

FOXP2 Protein
Genetics

FOXP2 is required for proper brain and lung development.

-mice studies

FOXP2 may regulate genes involved in neuroplasticity:

- songbird studies
- bat studies


Apraxia in humans has been linked to mutations in the FOXP2 gene.

fMRI analysis of these individuals performing silent verb generation and spoken word repetition tasks showed under-activation of Broca's area and in the putamen.
Suggestive History

• Feeding problems
• Prolonged drooling
• Hard time blowing bubbles
• Trouble drinking through a straw
• Weak kisses
### Distinguishing characteristics

<table>
<thead>
<tr>
<th>Phonological Disorders</th>
<th>CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consonant omissions and substitution errors common</td>
<td>Consonant omissions and substitution errors uncommon</td>
</tr>
<tr>
<td>Deletions not specific to position</td>
<td>Terminal deletions common</td>
</tr>
<tr>
<td>Accuracy unrelated to # syllables in words</td>
<td>Accuracy reduced with longer utterances</td>
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</tbody>
</table>
Features

- Limited babbling as an infant
- Delayed onset of speech
- Restricted sound inventory
  - lots of words.....all with the same sound
  - ‘word approximations’
Features

- Error (un)predictability
- Vowel errors prominent
- Effect of increased complexity
- Dysdiadokokinesisis effect
  - /pa/, /pa/, /pa/ versus /pa/ /ta/ /ka/
- Disturbances of prosody
- Groping (age effect)
Back to Our Case:

You ask some more questions and you find that she has few words, many of which are word approximations ex da for daddy, ma for mommy, ba for bottle

She is frustrated and gets angry easily when she is not understood.

She is wearing a bib around her neck that you remove when you do your physical exam

History suggests a possible speech disorder, or maybe apraxia...
An approach: My child isn’t talking…

• Identify all domains of developmental delay first
  Refer to Early Intervention
  Does the profile you see fit a speech disorder?

• Refer for confirmatory testing
  Tx needs to be geared to the dx in terms of frequency, intensity and approach

• Consider the co-morbidities possible
  Ex. Apraxia in children with autism

• Consider alternative and augmentative communication devices (AAC) for voice and for keeping up with learning while speech develops
Once upon a time..

EVALUATE AND TREAT DX SPEECH DELAY
Developmental Domains

Motor
- fine motor
- gross motor
- **speech**

Cognitive
- visual motor
- play
- adaptive skills

Communication
- nonverbal skills
- receptive language
- expressive language
- **speech**
- social interactions
Speech and Language Evaluation

- Possible speech disorder r/o apraxia of speech
The Evaluation

Expressive & Receptive Language

Speech

Phonemic awareness and early literacy (for ages 4-5 and older)
How Many Treatment Sessions Are Required to Improve My Child's Speech?

Phonological disorder
21-42 sessions (x 29)

Apraxia
144-168 sessions (x 151)

Children with apraxia of speech required 81% more individual treatment sessions than the children with severe phonological disorders in order to achieve a similar functional outcome.

Treatment Evidence Summary

• Although there are differences in definitions of intensive remediation for children with apraxia, there appears to be emerging consensus within the literature that therapy should be conducted at least three to five times weekly, in sessions lasting between 30 and 60 minutes each, and that the intervention should be conducted on an individual basis (1:1).

What evidence exists to guide treatment?

• CAS over-rely on their own imprecise auditory feedback.
  - Slowing down the rate of articulation can help correct this over-reliance and may be a new angle for intervention [1].

• There is a lack of dissociation and decreased coordination among tongue tip, lower lip and jaw movements compared with normal age-matched peers [2]

• Therapeutic emphasis on training more difficult speech targets yields generalization to simpler sound productions[3].

Treatment programs available

- Multisensory programs work best.
  - PROMPT
  - Moving Across Syllables
  - Word Flips
  - Kaufman Praxis
Apraxia's link to Literacy

**Phonological Awareness** is knowing that sentences are made up of words, words are made up of syllables and syllables are made up of sounds.

**Phonemic awareness** is required for
- Rhyming
- Manipulating sounds
  - "take the c in cat and put a b --- What do you get?"

**Phonetics** is how we learn to read
Vocabulary size is strongly related to phonological awareness

Lexicon can lead to phonological awareness through decreased production of words and fewer vocalizations, decreased skill and motivation, higher order literacy, and decreased vocabulary learning. Reduced practice and feedback can also contribute to decreased skill and motivation and decreased vocabulary learning.
What are the long term outcomes for children with CAS?

Children with apraxia, even if they are completely remediated by school entry, are at increased risk of language based learning problems (dyslexia).

Re-evaluation is suggested until age appropriate and reading
  - every 6 months under age 3 years
  - yearly from 3 onward
  - through early literacy years
So........

Identifying children with a speech / language delay in practice is important but only part of the story.

Speech and language development are different and understanding the differences helps to formulate an informed differential diagnosis.

Diagnosis (working or confirmed) is very helpful in guiding treatment and advocating for such will only improve ultimate developmental potential for the children we serve.
Back to our case....

We suspected a speech disorder. We requested an evaluation. Henry’s speech pathologist completed the PLS5 and the Kaufman to confirm normal receptive language, moderately delayed expressive language and findings consistent with childhood apraxia of speech.
Back to our case....

He was treated 3 times per week with an evidence based treatment approach utilizing PROMPT methods by a certified and experienced therapist. He had a combination of school based and private therapy so that the family could learn how to be involved and carry over the goals of therapy at home.

Henry loved using an Ipad with apraxia applications to practice at home.
Back to our case...

3 ½ years later Henry returns for his kindergarten physical exam and mother delights in telling you that he is doing fabulously. In fact, he is already reading simple books and loves rhyming games on his mother’s Ipad.
Conclusions

Childhood apraxia of speech is a significant and not uncommon speech sound disorder in children.

Diagnosis can be suspected by the pediatrician and confirmation with testing is needed by an SLP experienced in apraxia to confirm an ultimate diagnosis.

Once diagnosed, specialized intervention, education and monitoring will be needed to help children with CAS reach their ultimate communication potential.
Thank you!!