Infantile Esotropia: Do the Right Thing.
What is the Right Thing?
Is There a Right Thing?
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Infantile or Congenital Esotropia

Agreements:
- Present by 6 months
- Not present at birth
- Larger than 30 PD
- Normal refraction
- Often cross fixate
Etiology

• Not the muscles - generally OK
• Eyeballs – also seem fine.
• “The cause of strabismus should be sought elsewhere than in the muscles of the eyes, elsewhere than in the retina: that is to say in the brain and nerves, organs which preside over the association of the acts of the muscles of the eyes.” –W. Mackenzie – 1855.
The cause remains Unknown

• Worth (1905) – sensory theory. The child has a defective fusion center in the brain. Therefore binocularity cannot be restored, and it doesn’t matter when you operate because they just can’t fuse.

• Worth was wrong.
• Editing Worth’s textbook disagreed with Worth –
• The primary problem is mechanical, fusion ability might be normal.
• If the eyes were straightened early enough in infancy, perhaps fusion could be salvaged.
• Yet until the 1960’s late surgery was the standard of care!
Surgical Treatment
Marshall Parks and Malcolm Ing
Frank Costenbader
Studies of early surgery

• Costenbader in 1958 – better binocularity when surgery straightens eyes before age 18 months

• Ing et al 1966: Straight by 18 months 22/50 patients were binocular.

• Ing 1981 OAS thesis: straight by age 2 years – 80% get at least peripheral fusion
If early is good, is earlier better?

- Ken Wright 1994 – if surgery done before 6 months, average 3 to 4 months provided better stereopsis.
- However, Ing 1995 –
  - Age 0 -6 months 80% stereopsis
  - Age 7- 12 months 80% stereopsis
  - Age 13 – 24 months 58 % stereopsis.
What if Wright is Right:

- Is there any concern about very early surgery?
Anesthetic Neurotoxicity in Children

- Mary Ellen McCann, M.D
- Anesthesia professor at Harvard
- Presentation at Academy Pediatric Subspecialty day In Pediatric Ophthalmology
- November 10, 2012
- Copies of her synopsis and references available here, today.
Mary Ellen McCann, M.D.
Animal studies
Mice
Guinea Pigs
Rhesus Monkeys
All show neurotoxicity

- Immature animals
- When exposed to general anesthetics
- Show increased neuronal cell death
- Abnormal behavior when adults
Neurodegeneration found

- In N-methyl D-aspartate antagonists –
- Ketamine and nitrous oxide
- But also GABA agonists –
- Inhalational anesthetics,
- Midazolam
- Even Propofol
Difficult to extrapolate

• Between rats and humans
• Rats live 2 years, humans 80 years
• Anesthetic exposure of several hours in a rat might be the equivalent of several days in terms of synoptogenesis!
However...

- Retrospective humans studies:

- Children having more than 2 surgeries before age 4 linked to learning deficits (Wilder 2009)

- 383 children with hernia repairs before age 3 – twice as likely to have developmental or behavioral disorders. (DiMaggio 2009)
Human Studies

• Australian study revealed that even a single anesthetic exposure before the age of three was associated with lower score in language and cognition (Raine)

• European studies however found no link in twin studies, and in adolescents who underwent hernia repairs as infants. (Hansen) (Franks)
So, should we delay Surgery?

• Not necessarily
• As we saw previously, delay causes decreased binocular vision.
• But studies have also shown that maternal withdrawal alters neural pathways in rats.
• And alters long-term behavior in humans.
Psychosocial Aspects

• Akay et al (2005):
• Mothers of children with strabismus have
• Higher depression scores
• Less support and friendliness towards child
• More rejection of maternal roles
• Are more nervous and distressed
• Overall adverse effect on mother and child
So waiting...

• Could potentially alter neural development and behavior to an equal or greater degree than anesthetic neurotoxicity!
Greater benefits:

• Drover, Stager et al (2008) found
• Prior to surgery, infantile esotropes are delayed in developmental milestones.
• After early surgery (between 6 months and one year of age),
• former esotropes showed rapid development and gained motor skill equal to those of normal children.
Anecdotal reports:

• All Pediatric Ophthalmologists have heard
• From parents
• Reports of accelerated development after strabismus repair in infants.
So, What is to be done?

• Dr. McCann suggested that animal studies in neurodevelopment correlate to delaying surgeries until after 3 months of age if possible.

• Ing’s studies show equal benefits in binocularity in surgery done 0-6 months and 6-12 months, slightly worse as child is older. Much worse after age 2 years.
What is to be Done?

• Developmental and psychosocial benefits to mother and child, - the sooner the better.

• So...

• Studies appear to confirm our present practice pattern for infantile esotropia correction.

• First surgery at 6 months to one year, with the aim of straight eyes by age 2 years
However..

• Be aware of ongoing research in the neurotoxicity of anesthetics in children
• Limit anesthesia exposures in developing children as much as possible.
• As in all surgery, continue to balance the risks and benefits of all our treatments.
Outside the Kings County Eye Clinic
Orthophoric Children