NON-ACCIDENTAL BRAIN INJURY IN CHILDREN: A MEDICAL PERSPECTIVE

Arne H Graff MD
Child Protection Program
Hasbro Children’s Hospital
Providence RI
Statistics 2003

- 3.3 million cases sent to CPS
- 896,000 cases substantiated
- 50,000 cases reported weekly
- 4 children die daily from abuse
Figure 3–1 Map of Victimization Rates, 2004

Based on data from table 3–2.
Age Group, 2004

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>RATE PER 1,000 CHILDREN</th>
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</thead>
<tbody>
<tr>
<td>Age &lt;1-3</td>
<td>16.1</td>
</tr>
<tr>
<td>Age 4-7</td>
<td>13.4</td>
</tr>
<tr>
<td>Age 8-11</td>
<td>10.9</td>
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<tr>
<td>Age 12-15</td>
<td>9.3</td>
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<tr>
<td>Age 16-17</td>
<td>6.1</td>
</tr>
</tbody>
</table>
Figure 4-1 Age of Fatalities, 2004

- 81.0% <1-3 years
- 45.0% <1 year
- 14.6% 1 year
- 13.2% 2 years
- 8.2% 3 years

Based on data from table 4-3. N=993
The Boys Jeered Her

When she was a little girl, Virginia Jaspers always drew a special measure of love and kindness. Her father William Jaspers, a New Haven railroad executive was most anxious that, in the home at least, his ungainly older daughter not suffer from “ugly duckling” comparisons with her lovely younger sister, Betty.

At school it was different. Virginia was slow and dull. Her boy classmates called her “horse,” and “elephant,” and mocked her strong ham hands. Such gibes she took with slow good nature, seemingly unhurt. Only rarely did she show flashes of a violent, sudden anger.

Virginia left high school at 19 to study pediatric nursing. “I’ve always loved children,” she said later. “I’ve always wanted children of my own.” She fussed over her charges extravagantly, and parents liked her.

Five years later, in 1948, one of “her” babies, Cynthia Hubbard, died suddenly at eleven weeks of a cerebral hemorrhage. Doctors in the case found suspicious signs of violence, as if the infant had been dropped or thrown. But the Hubbards trusted their nurse and asked her back to tend their second child.

“She handled the baby well,” Mrs. Hubbard was to remember. “True, she was heavy-handed. When she burped the baby, she seemed a little strong. We kidded her about it a few times, but...
NOMENCLATURE:

- SBS  Shaken Baby Syndrome
- NAHT  Non-accidental Head Trauma
- ITBI  Inflicted Traumatic Brain Injury
AGE OF VICTIM?
STATISTICS:

1300 CHILDREN WITH ABUSIVE HEAD TRAUMA EACH YEAR (ESTIMATE)

LEADING CAUSE OF ALL TRAUMA-RELATED DEATHS FOR INFANTS UNDER 6 MONTHS OF AGE

2ND MOST COMMON CAUSE OF DEATH, DUE TO TRAUMA, IN CHILDREN

MOST COMMON CAUSE OF DEATH FROM CHILD ABUSE
STATISTICS CONT:

RESPONSIBLE FOR (IN SERIOUS HEAD INJURIES):
80% OF CHILDREN LESS THAN 2 YEARS OLD
95% OF CHILDREN LESS THAN 1 YEAR OLD
WHY DO PEOPLE SHAKE?

THEY STOP CRYING!!

IS THIS ONLY THE TIP OF THE ICEBERG?
BIOMECHANICS:

TRANSLATIONAL

ROTATIONAL ANGULAR
CONTACT INJURIES:

SKULL FRACTURE
SUBDURAL HEMATOMA
COUP INJURY
CONTRECOUP INJURY
INTRACEREBRAL HEMATOMA
ACCELERATION INJURIES:

- Subdural hematoma
- Contrecoup injury
- Intracerebral injury
- Diffuse axonal injury
- Concussion syndrome
PREDISPOSING FACTORS:

- LARGE HEAD
- BRAIN IS 95% WATER
- WEAK NECK
- SHAPE OF SKULL
- NO DEFENSE ABILITY
- SIZE DIFFERENCE (VICTIM/OFFENDER)
INJURY FACTORS:

AMOUNT OF FORCE
ANGLE OF CONTACT
SIZE OF WEAPON
AGE/DEVELOPMENT OF VICTIM
THICKNESS OF SKULL AT IMPACT
WHO IS AT RISK?
CAUSES OF PARENTAL STRESS

- COLIC
- NIGHTTIME AWAKENING
- SEPERATION ANXIETY
- CRYING
- “NO” ATTITUDE
- EATING CHALLENGES
- TOILET TRAINING
- VULNERABLE CHILD
NOT ALL OFFENDERS ARE BAD PEOPLE!
CAREGIVER RISKS

- ACUTE LIFE CHANGES
- ECONOMIC STRESS
- MENTAL HEALTH PROBLEMS
- POOR PARENTING SKILLS
- INAPPROPRIATE EXPECTATIONS
- DOMESTIC VIOLENCE?
CHILD’S RISKS:

- CHRONIC ILLNESS
- WRONG GENDER
- MENTAL HEALTH ISSUES (ADD)
- DRUG HOME
- SIBLING WITH HISTORY OF ABUSE
TEAM APPROACH FOR EACH CHILD!!!

ULTIMATE GOAL IS “SAFETY OF CHILD”
MEDICAL EVALUATION
PRESENTATION

- Nonspecific (irritable, vomiting, poor eating, poor suck, stop smiling, etc)
- Coma
- Vital sign changes (bradycardia, hypertension)
- Enlarging head circumference
- Seizures
- Other Injuries
- DEATH
RED FLAGS!!

- INCONSISTANT WITH DEVELOPMENTAL ABILITY
- NO WITNESS
- SIBLING ACCUSED
- CHANGING HISTORY
- FAMILY STRESSORS
- DELAY IN SEEKING CARE
PATIENT’S HISTORY

- PAST MEDICAL HISTORY
- FAMILY MEDICAL HISTORY
- DEVELOPMENTAL HISTORY
- PREVIOUS INJURY/ABUSE
- DCF HISTORY
- WELL CHILD/GROWTH
- PRIMARY CARE RECORDS
PHYSICAL EXAM

HEAD TO TOES
INCLUDES GENITAL EXAM
EXAMINE DAILY FOR CHANGES (BRUISES)
OPTHOMOLOGY EXAM EARLY!!!
CLASSIC TRIAD

- Intra-cranial Hemorrhages (SDH, SAH)
- Retinal Hemorrhages
- Fractures
XRAYS:

PLAIN FILMS
CT SCANS (HEAD, OTHER AREAS)
MRI
SKELETAL SURVEY
LAB TESTS:

CLOTTING STUDIES
LIVER FUNCTIONS
AMYLASE, LIPASE, URINE
CBC
FOLLOW-UP:

SKELETAL SURVEYS
EARLY INTERVENTION
NEUROLOGY
COUNSELING STARTED?
SAFETY ISSUES
LONG TERM MEDICAL:

SEIZURES
BLINDNESS/LOSS OF VISION
LEARNING DISABILITY
MOTOR DISABILITY
SWALLOWING DYSFUNCTION
PERSONALITY CHANGES
PROFOUND MENTAL RETARDATION
30% FATAL

30-50% NEUROLOGIC DEFICITS

30% RECOVER

SKULL DEFORMITIES DUE TO BRAIN INJURIES

PERMANENT NEUROLOGIC AND VISUAL SEQUELAE IN 50% OF SURVIVORS.
ACUTE CHANGES VS OVER TIME CHANGES
BAD OR NO WIRING
ALTERNATIVE THEORIES

VACCINES
FALLS FROM SMALL HEIGHTS
HYPOXIA FROM OTHER CAUSES
SPONTANEOUS
RESEARCH:

BIOMARKERS
STIR STUDIES
MRS (MAGNETIC RESONANCE SPECTROSCOPY)
PURPLE CRY/PREVENTION
Types of models used to study head injuries

- Gelatin models
- Animal models
- Human cadaver models
- Crash test dummy models
- Computer models.
Are animal models and human infants the same?

- Geometry
  - Infant skull/brain has different shape
SIMON
Time = 0

Contours of Effective Plastic Strain
min=0, at elem# 1
max=0, at elem# 1

Fringe Levels
1.500e-01
1.350e-01
1.200e-01
1.050e-01
9.000e-02
7.500e-02
6.000e-02
4.500e-02
3.000e-02
1.500e-02
0.000e+00
PREVENTION:

PUBLIC EDUCATION
NURSERY/NEWBORN EDUCATION
PROVIDER EDUCATION
IDENTIFY “AT RISK” FAMILIES--INTERVENE
RESOURCES:

NATIONAL CENTER FOR SBS  www.dontshake.com
CAC
CHILD PROTECTION PROGRAMS
WHEELER CLINIC
KIDSAFE