



NON-ACCIDENTAL BRAIN INJURY IN CHILDREN: A MEDICAL PERSPECTIVE



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Statistics 2003

- 3.3 million cases sent to CPS
- 896,000 cases substantiated
- 50,000 cases reported weekly
- 4 children die daily from abuse

Age Group, 2004

AGE GROUP

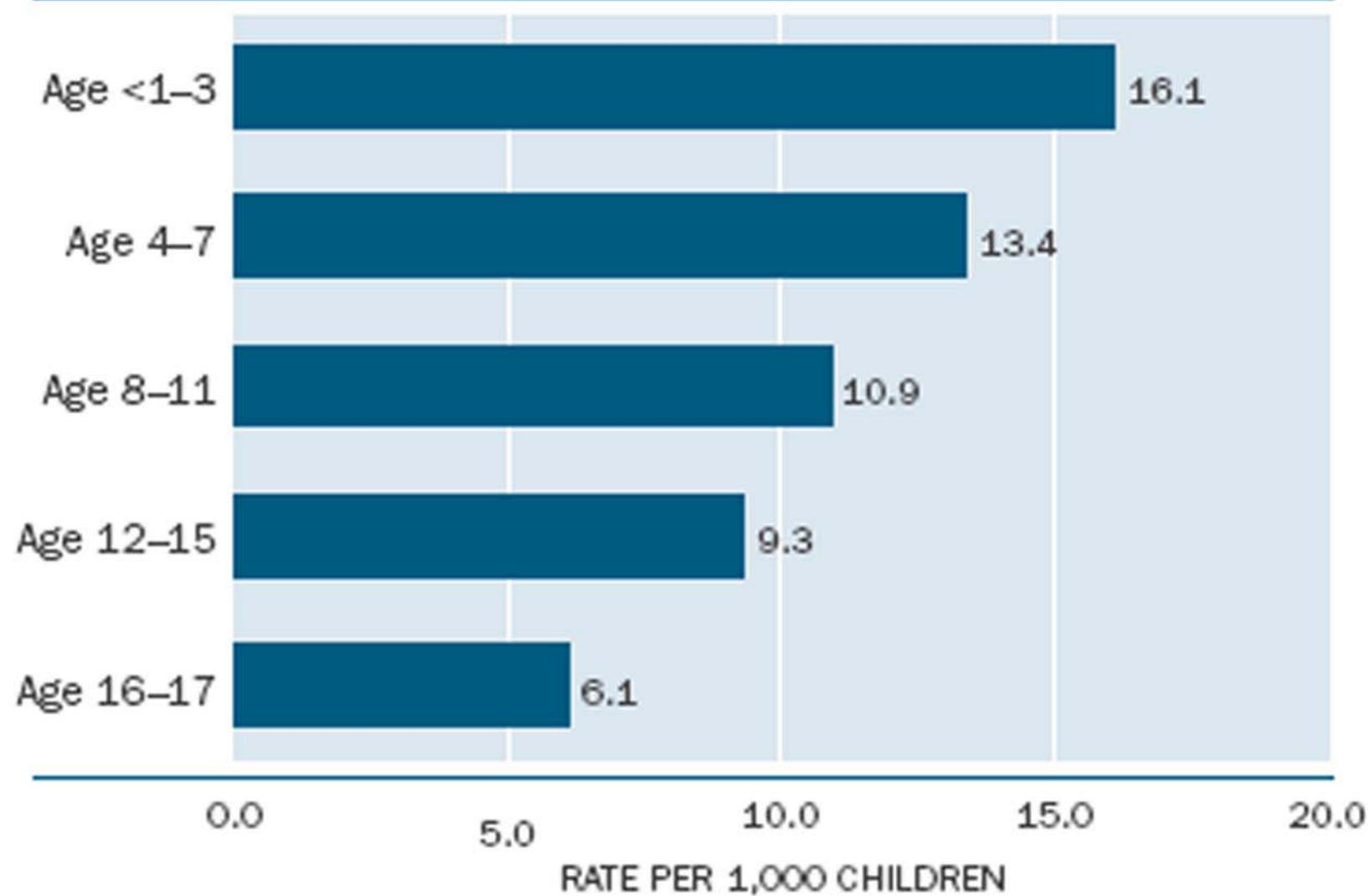
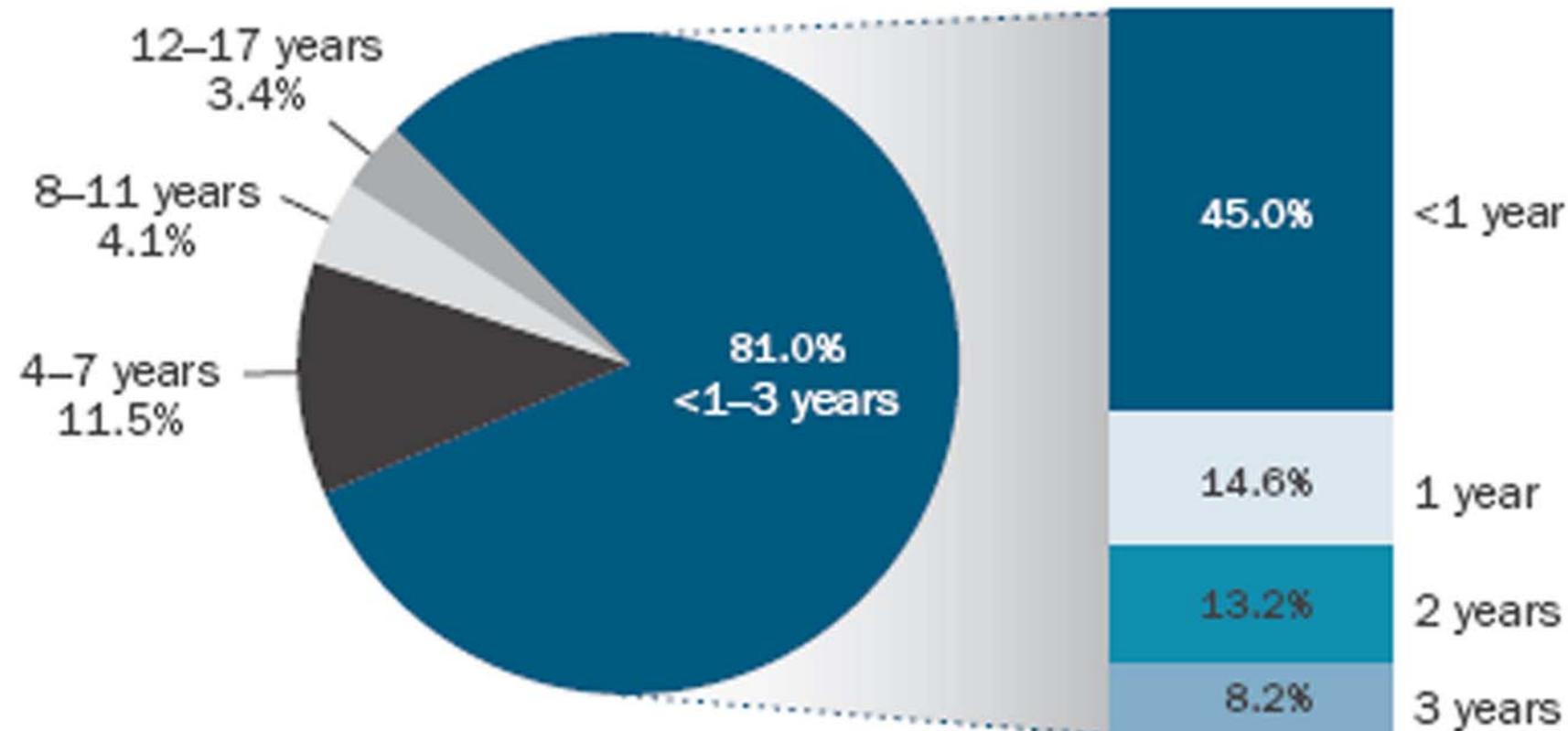
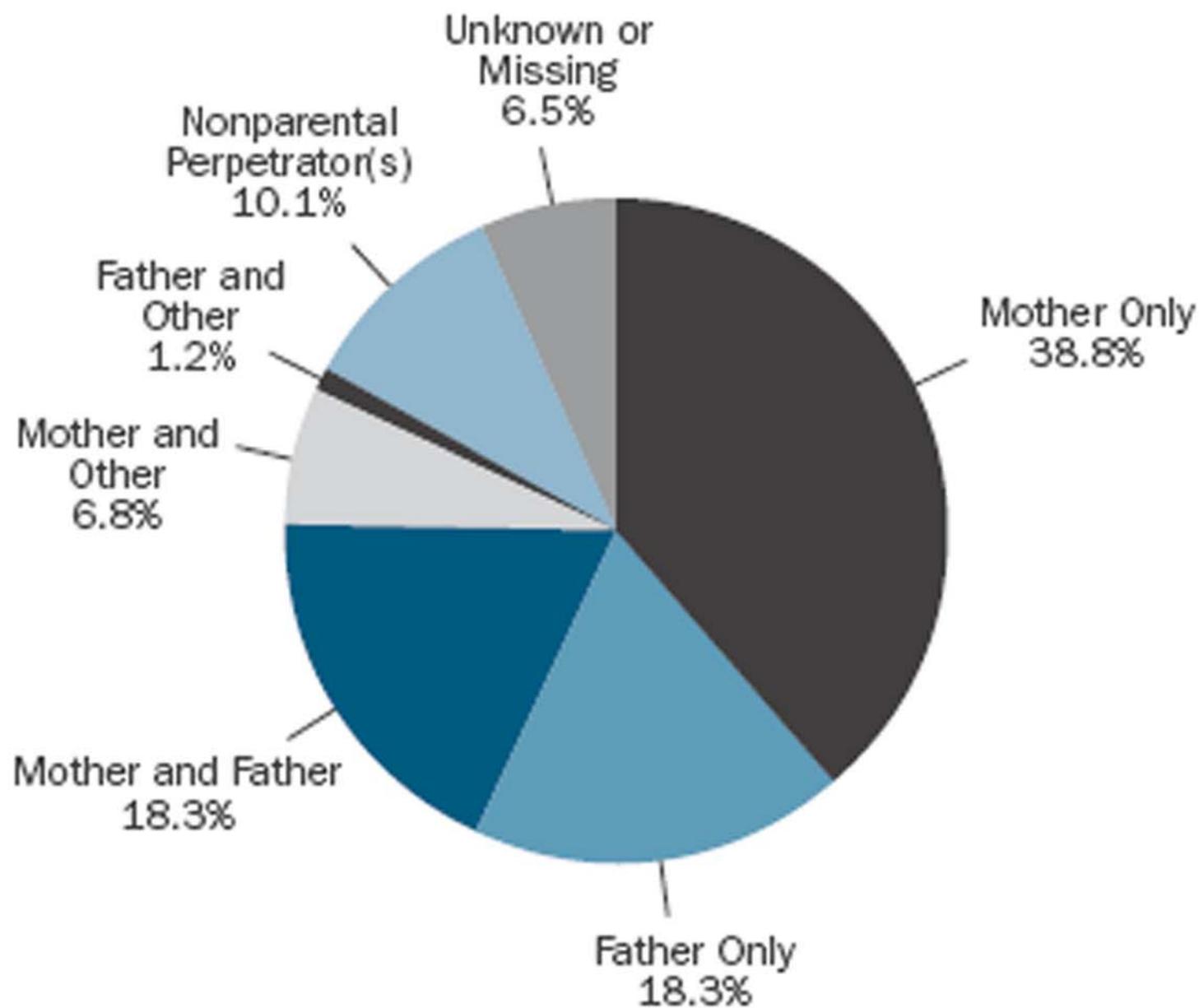


Figure 4-1 Age of Fatalities, 2004



Based on data from table 4-3. N=993

Relationship, 2004



The Boys Jeered Her

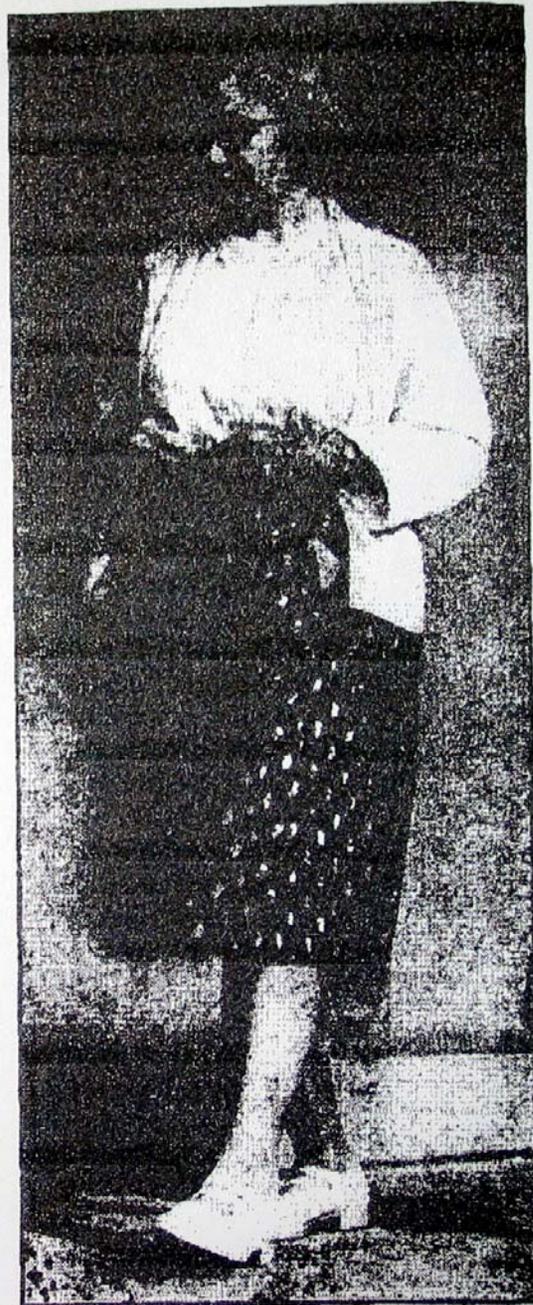
When she was a little girl, Virginia Jaspers always drew a special measure of love and kindness. Her father William Jaspers, a New Haven railroad executive was most anxious that, in the home at least, his ungainly older daughter not suffer from "ugly duckling" comparisons with her lovely younger sister,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

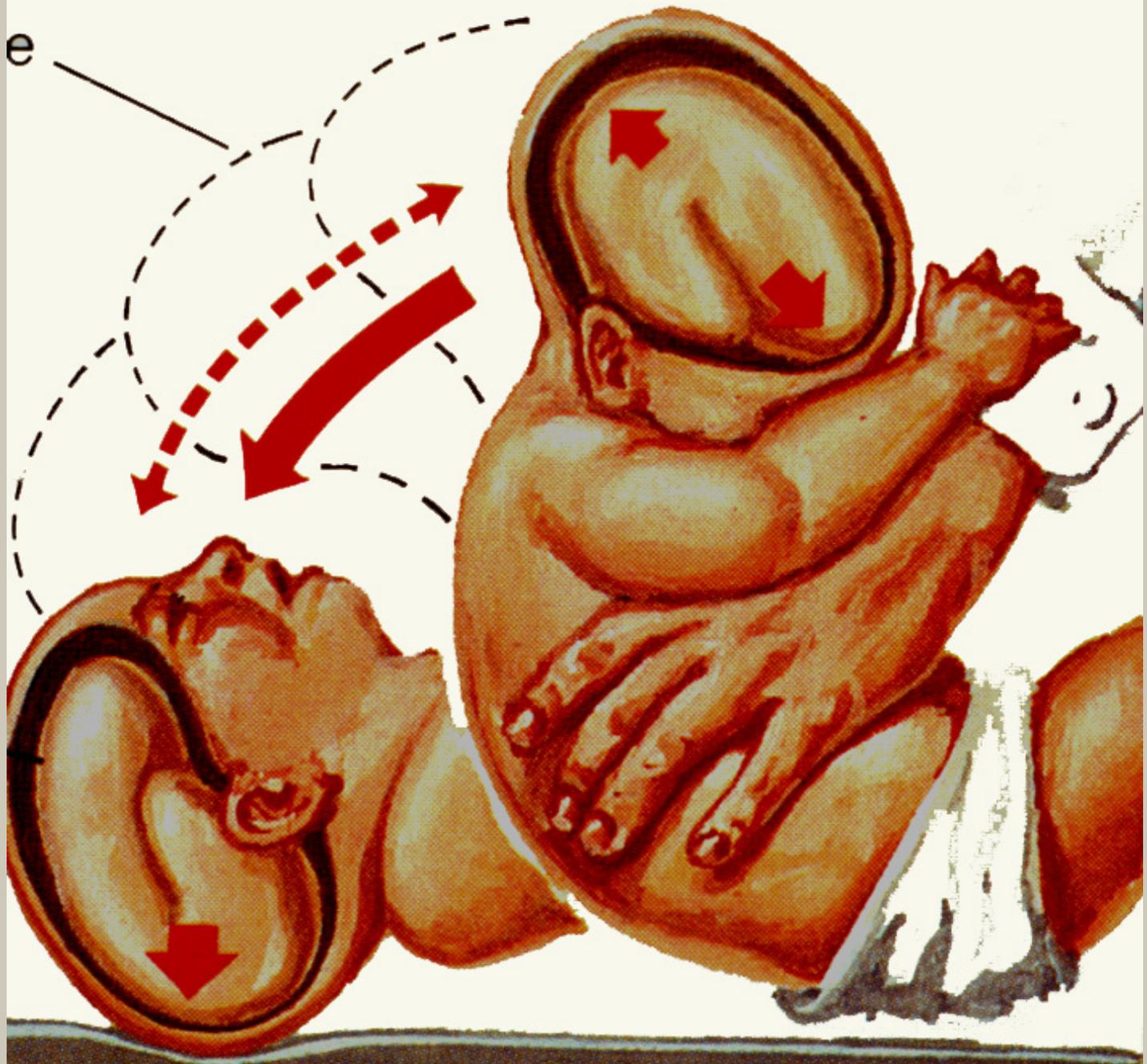
AMOUNT OF FORCE

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



ALTE



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)

OPHTHOMOLOGY EXAM EARLY!!!



CLASSIC TRIAD

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

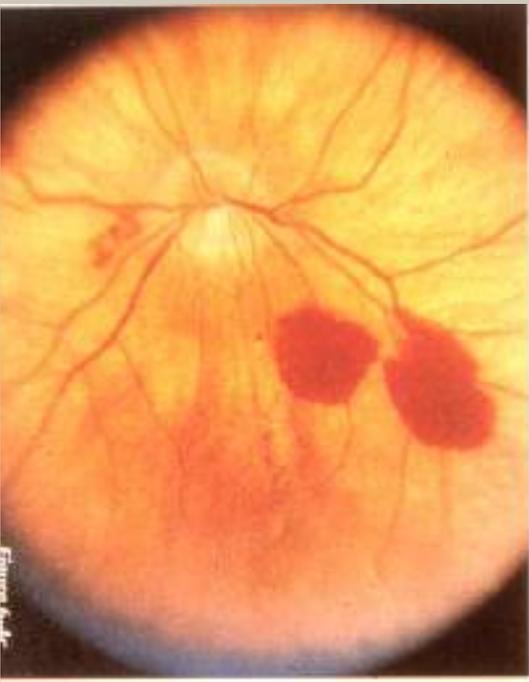


Figure 6-4a

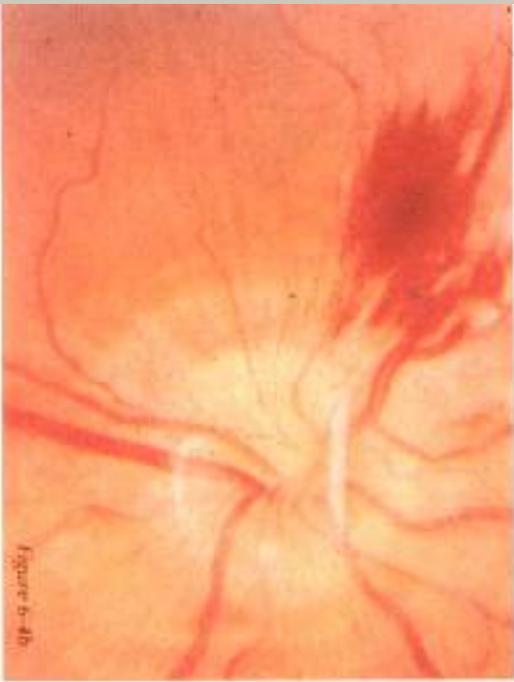


Figure 6-4b



Figure 6-4c



Figure 6-4d









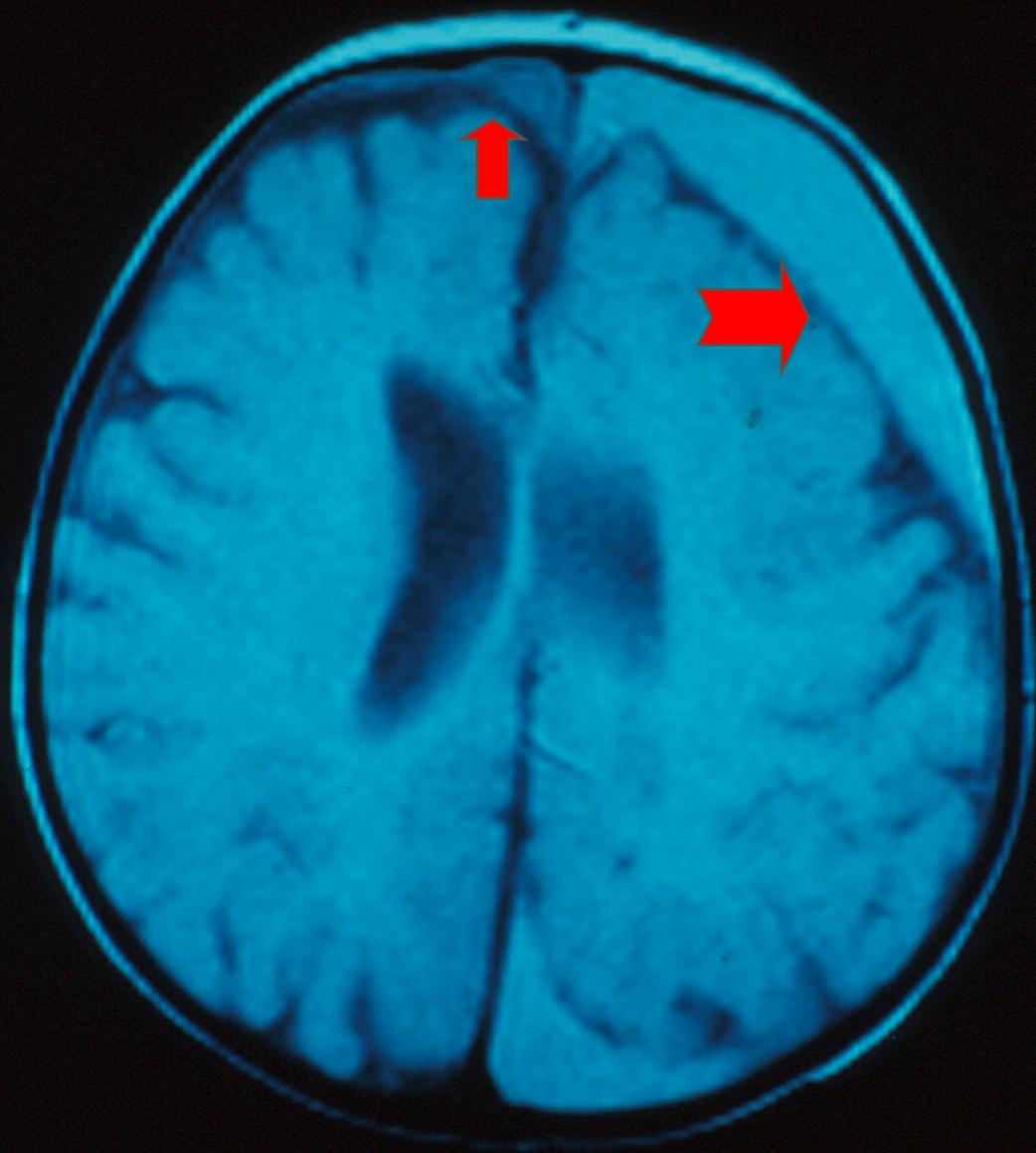
XRAYS:

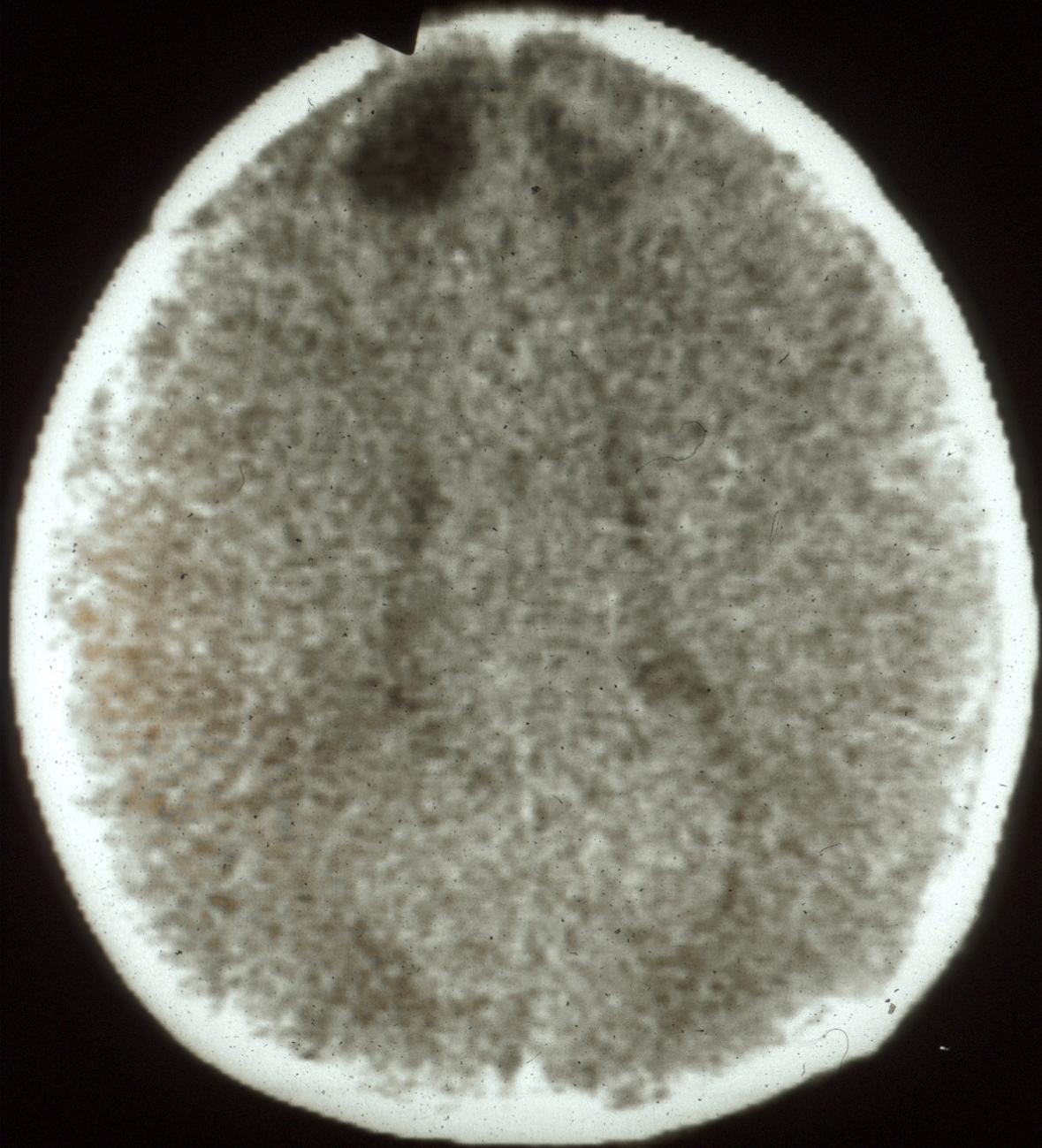
PLAIN FILMS

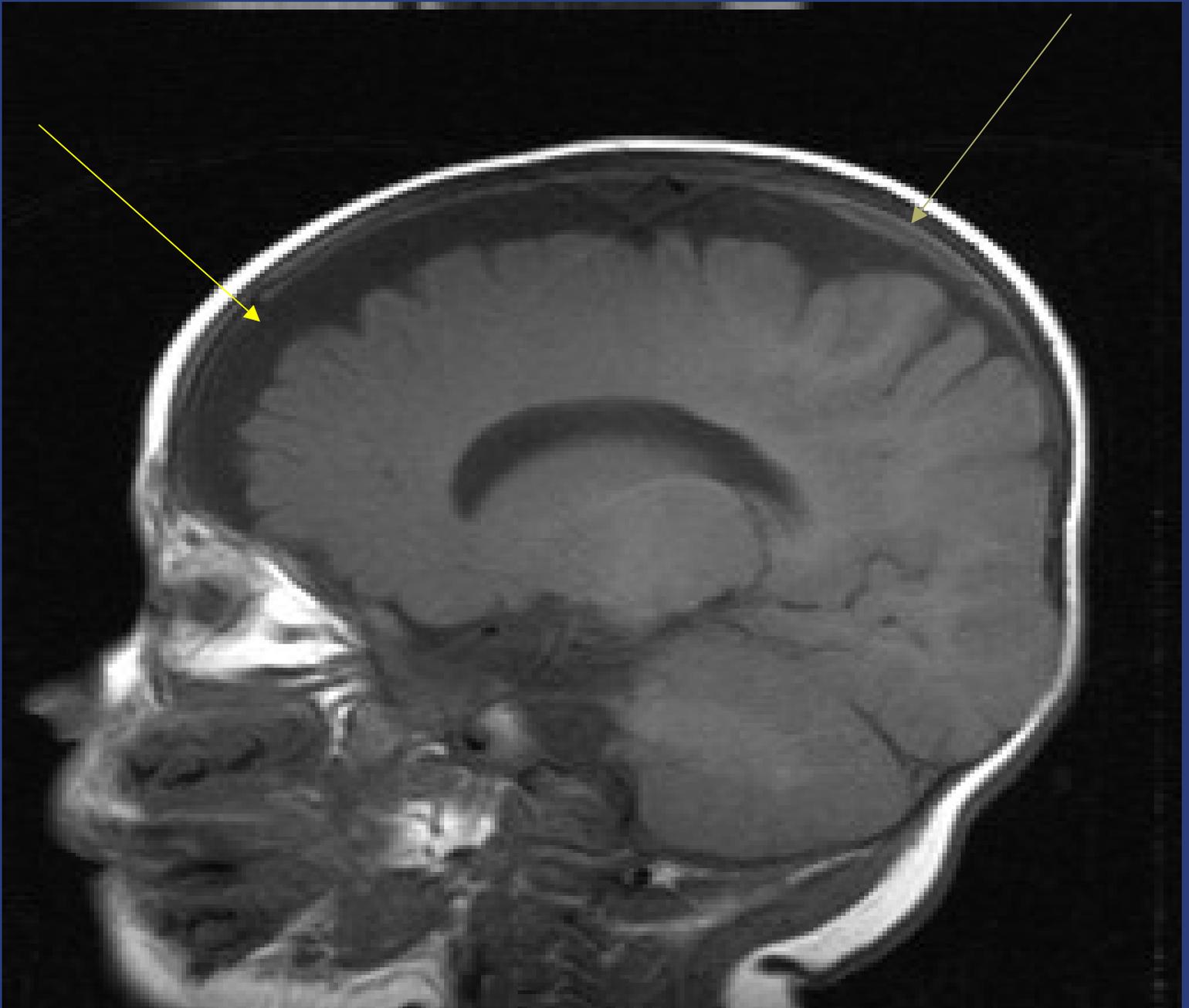
CT SCANS (HEAD, OTHER AREAS)

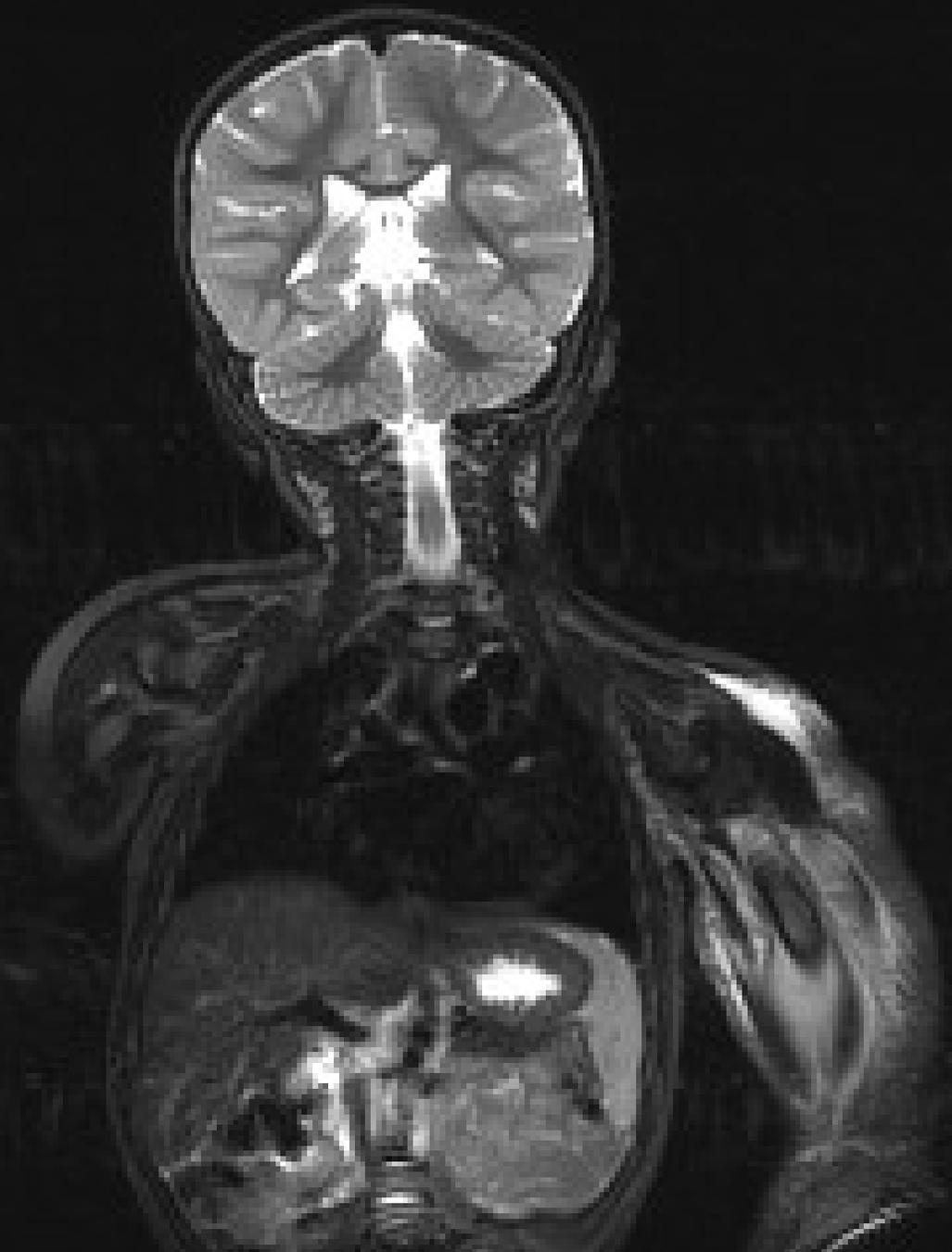
MRI

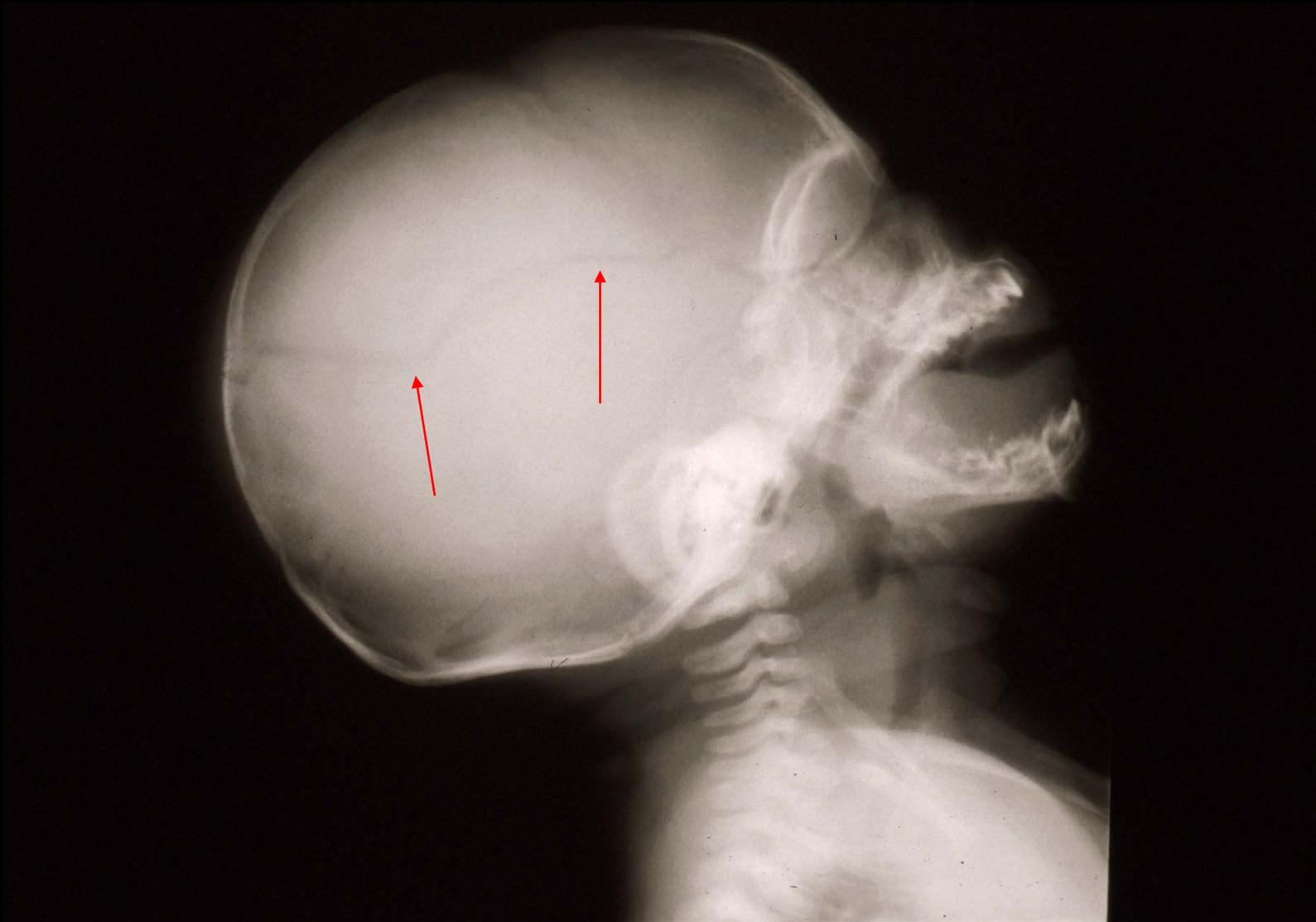
SKELETAL SURVEY

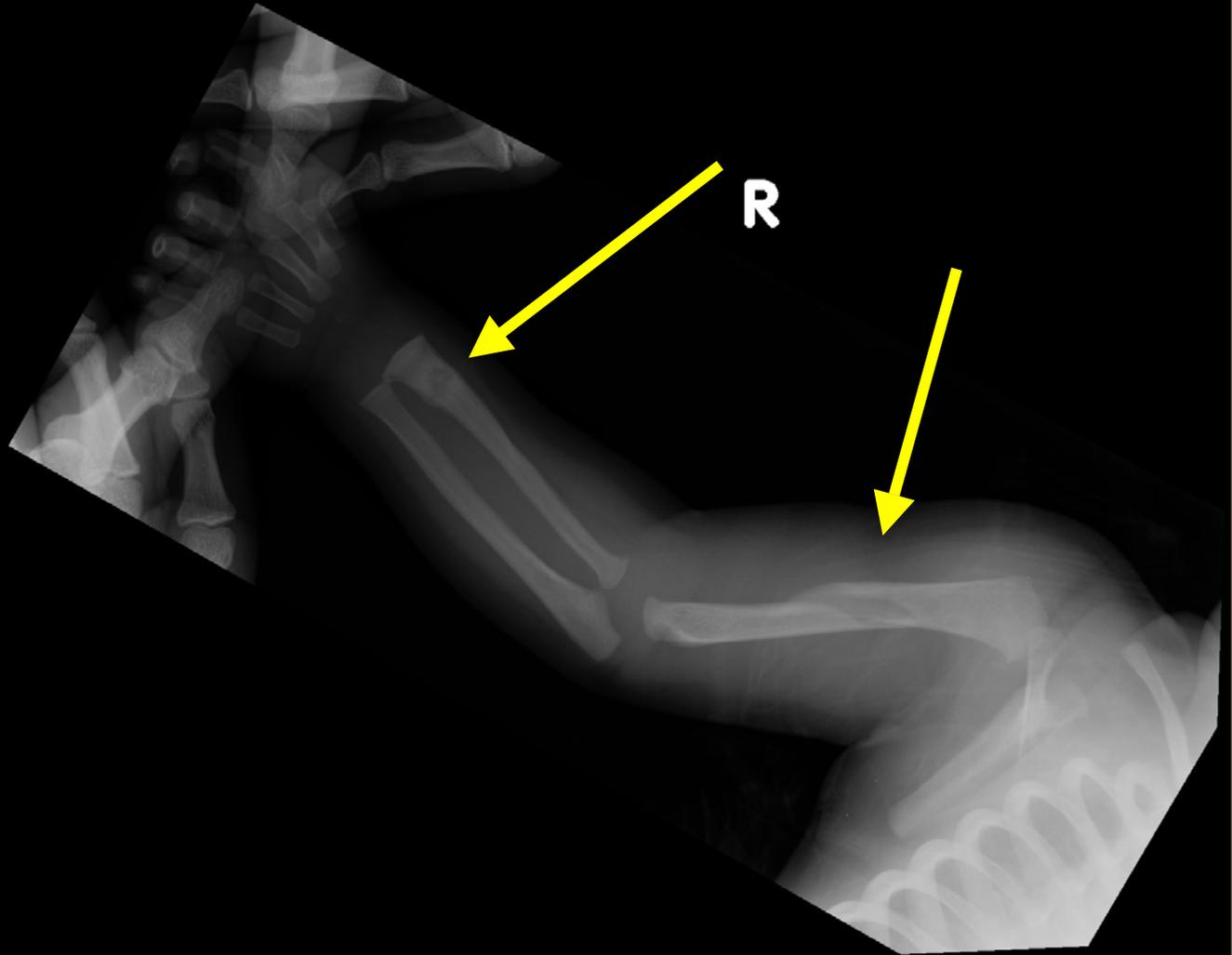














LAB TESTS:

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.

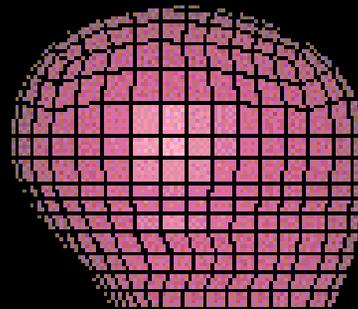


Are animal models and human infants the same?

- Geometry
 - Infant skull/brain has different shape

SIMON

Time = 0



\hat{z}
Ex

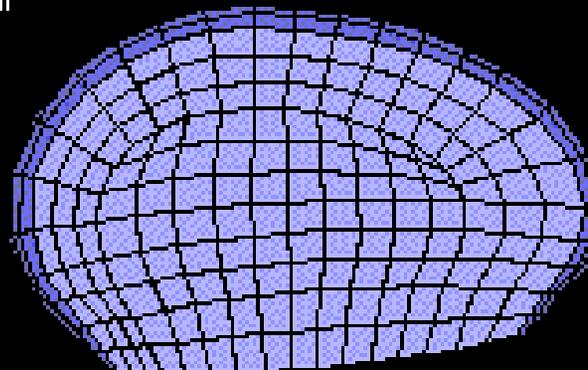
SIMON

Time = 0

Contours of Effective Plastic Strain

min=0, at elem# 1

max=0, at elem# 1



\hat{z}
Ex

Fringe Levels

1.500e-01

1.350e-01

1.200e-01

1.050e-01

9.000e-02

7.500e-02

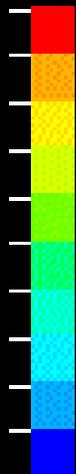
6.000e-02

4.500e-02

3.000e-02

1.500e-02

0.000e+00



Scene Trigger IDENTIFIER Frame
1 82/85/21 10:25/21 +888745



8 PLAY 38.8 588 10.588
ID Status Play Rec Shutter



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

