Chapter 8
Medicolegal Issues of Battered Baby Syndrome

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Abstract Battered baby (child) syndrome has been recognized for nearly half a century and is defined as repeated non-accidental trauma of various ages. In medicolegal death investigations, it is often avoided, due to its alleged controversy, or more accurately, due to the challenges it presents in court. In this chapter, we discuss some of the medicolegal issues of a battered baby syndrome diagnosis for the cause of death and the legal issues surrounding the prosecution and defense in these types of cases. A case example involving a 5-month-old infant is presented. Additionally, the importance and challenges in timing fractures and using skeletal trauma as evidence of abuse are discussed. Finally, this case is contextualized among infant and child homicides and recommendations for best practices are outlined.

Children begin by loving their parents. After a time they judge them. Rarely, if ever, do they forgive them.
Oscar Wilde

8.1 The Speaker for the Dead

Pediatric forensic pathology is one of the most challenging fields within the specialty; it can charge the investigators, pathologists, and anthropologists to their limits. The issues we face in these cases are not confined to "just" determination of the cause and manner of death and scientific evidence shedding light on the circumstances of death, but also include ethical and emotional aspects. We do not want to over-call or under-call the diagnosis, since the consequences of each may be quite severe. One can also easily find himself/herself framed as a "speaker for the defense" or a "speaker for the prosecution." This must be avoided with great care: we have to bear in mind that we are neither. If we do speak for somebody, we can be considered *The Speakers for the Dead.* At times it is difficult to avoid being emotional in these cases; after all, we are human, and often parents ourselves. However, despite the subtle (or not so subtle) push from the attorneys to elicit emotional responses from jurors, we should stay within the limits of science and clearly indicate the gray areas of scientific uncertainty.

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The first challenge of death investigation of a child is to gather the background information. To begin with, the available information usually originates from the caretakers. Even in a benign controversy of natural vs. accidental manners of death, difficulties may arise, since the source of information are emotionally challenged people who just suffered a loss and often fear the investigation. This may result in the omission or commission of information that eventually may affect the cause and manner of death opinion, for example, a "probable SIDS" case in a child that was reportedly found supine in his crib, but has fixed anterior lividity. A prone position would not exclude SIDS. On the other hand, one starts to wonder *what else was I not told*, and that may result in an opinion of "undetermined" due to inconsistency in the investigation.

In cases of child abuse, it is typical for the responsible parent or caregiver to tell authorities that the child fell or had an accident, even while seeking medical treatment for inflicted trauma. Therefore, it is incumbent upon detectives, medical examiners, and forensic anthropologists working in cases of child deaths to present clear evidence that will either support or refute such claims. In some cases, distinction between accidental versus non-accidental injuries may be difficult or outright impossible [1]. In such cases, clues may be buried in the investigation data, provided by autopsy findings or anthropological analysis, or found in the ancillary studies. Another issue may be dating of the injuries, e.g., various ages of fractures to bone or bruises; at times such determinations are pertinent to the diagnosis, and in other cases, they may be of paramount importance for the prosecution or defense, even when they bear no significant influence on the cause and manner of death opinion. Establishing a timeline for injuries may provide the attorneys with physical evidence that is necessary for demonstrating custody and control in cases of child abuse.

The correct interpretation of the findings may allow for reconstruction based on the injuries of the events surrounding the death and determination of whether or not a crime was committed. When accidental versus inflicted trauma can be clearly differentiated, and patterns of repeated abuse or neglect established, issuing an opinion seems to be a straightforward task. Having said that, even in some cases where significant amounts of inflicted trauma are present, the actual mechanism of death may not be clear, thereby challenging death investigators and courts.

In this chapter, we present a case of a 5-month-old infant, whose death was opined as resulting from battered baby syndrome with a laceration of the small bowel and rib fractures, and the manner of death as homicide. The case details, including ante- and perimortem trauma, are discussed, with attention to radiography for fracture diagnosis and histological timing. Further, key issues arising at the trial in the attempted prosecution of this case are discussed, including the prosecution and defense tactics, and the debate over the specific mechanism of death, diagnosis, and the dating of the rib fractures. Finally, we present some of the general trends among cases involving battered baby syndrome and child homicides to illustrate the difficulty in employing this syndrome as the diagnosis; we hope to dispel common misperceptions, offer some recommendations for best practice, and highlight the areas where further research may be beneficial.

8.1.1 Case in Point

The decedent was a 5-month-old infant boy, who was visiting family with his father, from another state. They were staying in their family's apartment for 3 weeks, occupying one bedroom. Reportedly, the vacation from their home state and from the child's mother was not quite voluntary, due to financial problems associated with job loss back home. There was neither history of domestic violence in this family, nor history of any medical problems. During the stay, the child was healthy. Their hosts described the father as a person loving and caring for the child; they never noticed any evidence of him abusing the boy. In the bedroom, the boy was co-sleeping with his father in a queen-size bed. One night the father emerged from the bedroom, extremely upset, screaming and kicking furniture; he stated that he found the child unresponsive.

The father claimed that the baby rolled off the bed and was found "wedged" face down in between the bed and the dresser, with his feet on the bed. When he picked the baby up from the floor, the infant gasped and then became unresponsive. Reportedly, the decedent's father attempted resuscitation; he said that he was compressing the boy's abdomen while the child was on the bed. Then, the aunt (who is a nurse) started resuscitation, and the paramedics were summoned. The initial recorded heart rhythm was asystole, and the Glasgow coma scale score was 3. The child was transported to a hospital. The baby did not regain consciousness or heartbeat, and since the therapeutic efforts were ineffective, he was pronounced dead in the emergency room. The elapsed time of resuscitation, including by-stander efforts, was nearly 2 h. The death was reported to medical examiner's office as suspicious, due to external evidence of blunt impact trauma, i.e., multiple bruises.

The scene was in a ground-floor apartment, neat and clean, in a new, gated apartment complex. The bedroom that was occupied by the decedent and his father was equipped with a queen-size bed. There was a dresser against the wall parallel to the side of the bed, with an 18-inch-wide gap between the dresser and the bed. In that space, there was a carpeted floor (about an inch thick carpet with sponge padding) with a large pillow filling the space between the bed and the dresser. The pillow had dried clear stains of mucus, on the entire surface, i.e., close to the bed and close to the dresser.

The autopsy revealed multiple contusions in the skin, subcutaneous tissue, and muscles on the abdomen in the inguinal and umbilical regions and at the rib arches. Small contusions were in the back muscles, in the thoracolumbar region, and in the scalp on each side. There were also contusions on the buttocks. The distribution of the inguinal and buttocks contusions had pattern consistent with fingers of adult hands; the grip that could have caused such a pattern would be with a child's body flexed forward, with thumbs of the holding hands on the buttocks, and fingers in the inguinal regions of abdomen; such hold would account for some, but not all, bruises on the abdomen and thighs. The perianal skin had two shallow lacerations oriented radially from the anus, but not extending to the anus, each less than 1 cm long.

Internally, the child had almost completely lacerated small bowel within the ileal portion, which was associated with 75 mL hemoperitoneum, but with no peritonitis.

There were hemorrhages in the Treitz ligament and in the periadrenal adipose tissue. Skeletal trauma included several healing posterior rib fractures on the right and left sides; at least one of the calluses had a recent re-fracture. The radiological imaging of the entire skeleton was completed prior to the internal examination; however, due to the child's age-related weak mineralization of the bones, the rib plates were dissected and examined with a mammography machine (Figs. 8.1 and 8.2). This allowed for better visualization of the calluses. All areas with fractures or potential fractures were identified and sampled for histological assessment.

The histological examination revealed healing fractures, with periosteal fibrosis, residual thrombus, and no bony union. There was young scarring with neovascularization and beginning of cartilage formation. All the fractures had similar appearance, indicative of approximately the same age, which was estimated at 5–10 days antemortem. Histology also confirmed the recent re-fracture with fresh hemorrhage (Figs. 8.3, 8.4, and 8.5). The toxicological tests and other additional studies, i.e., bacterial and viral cultures, and genetic metabolic studies were negative.

Fig. 8.1 Radiographic images from mammography machine of right rib fractures

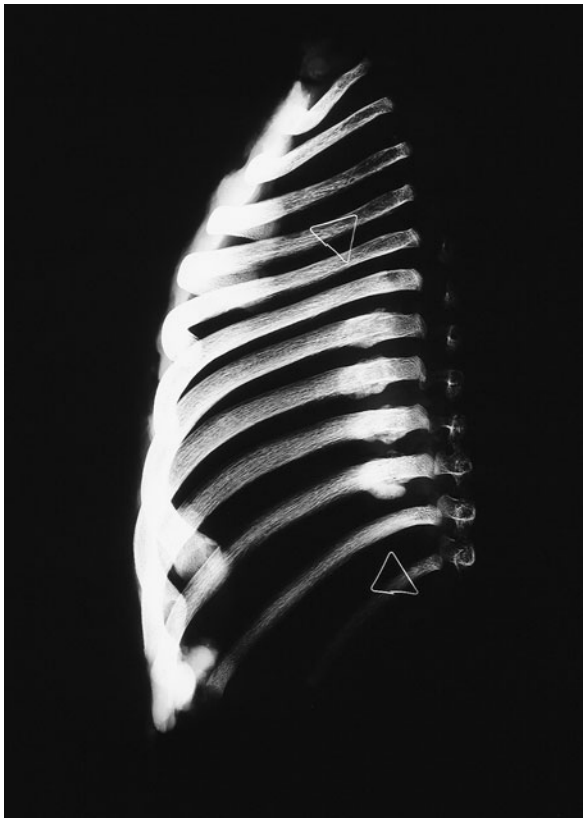

Fig. 8.2 Radiographic images from mammography machine of left rib fractures

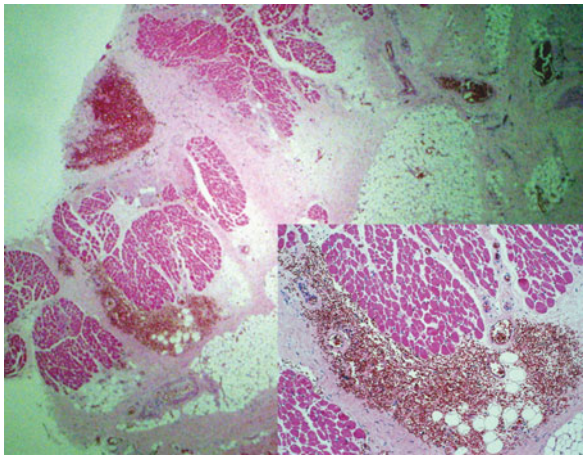

Fig. 8.3 Recent hemorrhage in muscle adjacent to callus

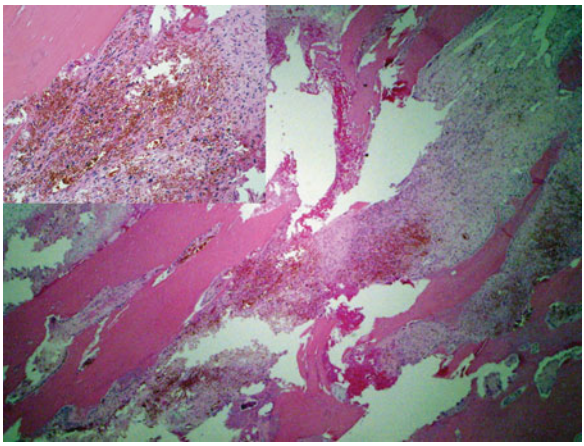

Fig. 8.4 Recent hemorrhage in a callus (re-fracture)

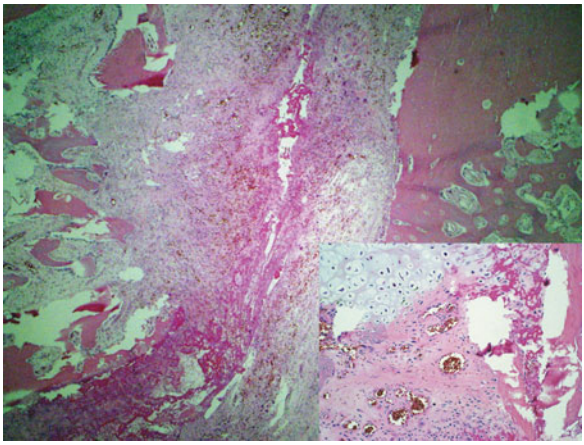

Fig. 8.5 Callus without bony union

After thorough review of the gathered data, the following opinion was rendered: Cause of death *Battered Baby Syndrome with Rib Fractures and Laceration of the Small Bowel* and the manner of death a *homicide*. The reasoning behind this opinion is as follows: there was no clearly identifiable mechanism of death in this case, with several reasonable possibilities.

- The child could have been smothered with a pillow.
- The child could have had positional asphyxia.
- The child could have had hemorrhagic shock. The volume of hemoperitoneum plus hemorrhages in the contusions could have resulted in hypovolemia.
- The child could have had neurogenic shock associated with ruptured bowel and peritoneal irritation.

Given his stage of development, the infant could roll over in bed, but would not crawl. If the boy fell from the bed, why would he stay in the face-down position without movement, while suffocating? There was enough space to not restrict his movement. Also, according to witnesses in the house and the father, the baby did not cry. Why did the child have so many bruises on his body? What explains the prior skeletal rib fractures?

Cardiopulmonary resuscitation that is correctly administered results in approximately 50 mmHg blood pressure, which is barely enough to perfuse the brain, and certainly too little to perfuse the skin or muscles of the torso and extremities. Bruising, i.e., hemorrhage into the tissue, needs blood pressure to occur. Almost all the children seen at the medical examiner's office have undergone resuscitation attempts before death, some for prolonged periods of time. However, they do not have bruises. If the child was dead when found on the floor, the subsequent manipulation would not result in bruising. In the literature, there have been reports of ruptured bowel and retroperitoneal hemorrhages resulting from resuscitation attempts [2–4]. However, in this case the only time when the alleged resuscitation was incorrect enough to cause any injuries was reportedly performed by the boy's father, on a soft bed. In addition, the child had healing rib fractures, in portions pathognomonic for inflicted trauma, just distally to the costo-transverse joints.

The cause of death is an injury or disease that initiates the chain of events ending in a person's death. Its definition does not include the mechanism of death. The battered child syndrome is a diagnosis defined by multiple inflicted injuries of various ages. In our opinion, the presented case meets the criteria for a battered child syndrome diagnosis, regardless of the actual mechanism of death. As such, it was also opined as homicide.

8.2 Battered Baby (Child) Syndrome

"Battered Baby Syndrome" was first diagnosed and described in 1962 by Dr. C. Henry Kempe and is described as follows [5; p. 28]:

> . . . the extreme form of a whole spectrum of non-accidental injury and deprivation of children. At one end of the spectrum is the child who is frankly battered and may have repeated serious injuries. These injuries often occur in a crescendo of increasing severity from mild bruising to subperiosteal bleeding seen on x-ray, to fractures of the long bones and ribs, to subdural hematoma with or without skull fracture.

The majority of children who are abused and neglected survive, and so it is typically incumbent on pediatricians and emergency room doctors to recognize abuse or the failure to thrive as non-accidental or nonpathological. Repeatedly among cases of inflicted trauma, caregivers or parents tell authorities that the injuries result from an accident. This trend is observed in families regardless of the socioeconomic or demographic patterns of those involved. The literature on battered baby (child) syndrome reports similar findings in that child abuse and neglect occur across all social and economic boundaries [6–8]. Therefore, debate surrounding the frequency

and diagnosis of this syndrome has not been without controversy. Similar questions arise for forensic pathologists and anthropologists, who are presented with the challenge of differentiating between accidental and inflicted trauma and the timing of those injuries.

The evaluation of battered baby (child) syndrome as a cause of death includes evidence of repeated abuse. However, the presence of prior injuries does not necessarily prove prior abuse, as those injuries may have been caused by accidental trauma. Likewise, the presence of skeletal or dental anomalies associated with starvation or malnutrition may be present in the form of delayed growth, insufficient bone density, or skeletal lesions, such as *Harris Lines*, *dental hypoplasias*, *vitamin deficiencies*, or *skeletal osteopenia*. Adelson [9] presents five cases of homicide by starvation among infants. Skeletal evidence of starvation or neglect may also be detected in bone tissue, without the presence of soft tissue. For example, *vitamin D deficiency* may result in *rickets, osteomalacia*, or marked bowing of the tibia, whereas *vitamin C deficiency* may be evident in the form of scurvy, including skeletal lesions, cribra orbitalia, ectocranial porosis, and lytic lesions of the sphenoid, zygomatic, maxillary, and temporal bones.

8.3 Methods of Analysis, Radiography, and Histology

It is well accepted that fractures in various stages of healing at the time of death are an important tool for demonstrating a history of abuse in cases of child deaths. A similar approach has been taken to document patterns of torture in human rights cases and among elder abuse. The protocol used for osteological analysis of trauma (Table 8.1) should be based on standard practices for forensic medicine and anthropology, including gross observation of bony tissues, examination of the clothing, and the radiological analysis of skeletal remains (i.e., Buikstra and Ubelaker [10] and Kimmerle and Baraybar [11]). There are several radiographic references that provide specific and useful guidelines for radiographic use and methodology for the

Table 8.1 Protocol for the documentation, analysis, and timing of skeletal trauma

Inventory of all affected bones.
Description, measurement, and documentation of each location of the specific affected areas on bone, including the side/region/aspect of each fracture or defect.
Description of the number, type(s), and size of fractures or defects.
The presence of any abnormal bone shape, growth, or loss.
The severity, state, and distribution of abnormal bone changes.
Histological sectioning or decalcification of bone tissue for internal and/or microscopic analysis.
Documentation of any radiographic evidence (fractures, bone healing, callus formation, or weaponry). Depending on the availability, multiple radiographic methods may be of use for differentiating mechanisms of trauma and neglect.
Analysis of affected clothing (defects, tears, burning, or weaponry).
Estimation of the mechanism of injury, class of weapon, and victim's position relevant to the direction of the force.

interpretation of postmortem examinations [12–16]. The identification of fractures or skeletal defects at autopsy through direct observation or radiography can depend on what tools are available. It has been demonstrated how the elucidation of fractures through CT scanning or 3D modeling can detect fractures missed in traditional radiographs. In large part, modern radiographic tools such as CT scanning, mammography, and virtual autopsies have demonstrated the detection of minute fractures not visible in standard radiographs. Employment of these sophisticated techniques highlights the importance of using multiple tools when possible. Still, the need for direct observation of skeletal tissue remains, e.g., through maceration of soft tissues, in addition to the use of any radiographic tool to confirm or refute patterns of injury.

The detection of antemortem injuries is evident from signs of healing such as new bone growth, callus formation, abnormal bone shape or displacement, necrotic tissue, periostitis, osteomyelitis, or myostitis ossificans. The timing of bone remodeling can be assessed macroscopically and histologically, with varied rates depending on age. Among adults, the edges of a fracture begin to become rounded after about 1 week following the injury [17] and eventually form into a "V" shape as the two elements reunite. Within approximately 4–6 weeks, a bony callus begins to form [17]. New bone growth is structurally different in form and may be best summarized as *disorganized*. New bone growth is evident both visually and radiographically, though this process may be altered or significantly delayed or disrupted due to a lack of blood supply to the region from surrounding soft tissue damage or necrotic bone tissue.

Several methods specific to the timing of antemortem injuries based on direct and radiographic observation include O'Conner and Cohen [18] and Islam et al. [19]. Additionally, histological analysis of bone remodeling may produce a narrow and reliable timeframe for injuries. Very limited experimental data is available regarding the sequence of changes in a healing fractured bone. Most of the current knowledge we have on rates of healing and bone remodeling is based on accumulated observations, which is severely limited. The cumulative body of knowledge on this topic was summarized in an article "Dating of Healing Rib Fractures in Fatal Child Abuse" [20], published in *Advances in Pathology and Laboratory Medicine* in 1990, which still remains the standard text for forensic evaluation of the time for fracture healing.

Rates of bone remodeling and healing among children is expected to be faster than it is in adults, assuming growth, development, and healing occur at normal rates. A lack of medical treatment or continued stress or injury to the area may also impede or delay the healing process. According to O'Conner and Cohen [18], soft tissue restoration typically begins 2–10 days following injury in children. Periosteal thickening occurs within 2–3 days, and the earliest reported was within 24 h. Early periosteal bone growth such as rounding along fractured edges typically occurs 4–21 days and soft callus formation on bone typically occurs 7–21 days following injury. Soft tissue restoration in this case was present, with periosteal and callus formation. Islam et al. [19] observed that sclerosis along the fractured margins is evident in radiographs by 5 weeks following injury among children in 85% of cases. No

sclerotic changes were observed on the radiographs. No bony union was observed microscopically in any of the fractures. Such union should be present within 3–6 weeks, with the earliest observed reportedly after 18 days [20]. The scarring within the fractures had the appearance typical for about a week, with extensive neovascularization and fibroblastic activity. Given these findings, the antemortem rib fractures in this case most likely occurred 1–2 weeks prior to death.

8.4 The Legal Issues: What Happened at Trial?

After the pre-trial hearings, the Grand Jury decided to prosecute the father of the decedent in our case example. Initially, the prosecution offered him a plea agreement, in which case he would plead guilty of manslaughter and serve 8 years of imprisonment. The public defender presented the offer to the accused, informing him that the charge in court could result either in him walking free or alternatively in a possible life sentence. The defendant decided to accept the trial.

The prosecution charged the father with *First Degree Murder with Aggravated Child Abuse*, following their algorithm for this type of cases, and subsequently the case went to trial.

The jurors decided that the defendant was not guilty of these charges, and the defendant was acquitted.

It is always difficult for the prosecutors to file charges or win convictions in cases of battered baby syndrome or homicidal violence without a specific mechanism of death. The task of the defense is a bit less demanding, due to the presumption of innocence.

In this particular case, the defense initiated the proceedings by filling a *Motion in Limine* (at threshold), requesting that the judge forbids the pathologist to use the diagnosis of "Battered Baby Syndrome" and orders exclusion of the rib fractures from the trial. Their argument was that since the fractures were old, they were irrelevant to the child's death. The defense argued that "Battered Baby Syndrome" was not an established diagnosis because it was not present in the International Classification of Diseases (ICD) or in the library of the National Institute of Health. However, their claims were disproved during the hearing, based in part on the overwhelming amount of literature and research establishing "Battered Baby Syndrome," as well as the fact the rib fractures were in fact part of the diagnosis. Indeed, the term "Battered Baby Syndrome" is nearly half a century old, yet today's forensic pathologists rarely use it. The diagnosis is listed in the ICD code 995.5, but more often, other wording is favored, e.g., "Homicidal Violence," which interestingly does not have an ICD code. Consequently, the motion was denied and a full discussion of the rib fractures was allowed.

Overall, the defense team was very well prepared, and after calling into question the very diagnosis for the cause of death, they also questioned the timing of fractures, the investigation procedures, and the credibility of the medical examiner. The forensic expert hired by the defense (who, parenthetically, was recommended to the defense attorney by the pathologist that performed the autopsy) was a retired,

very accomplished forensic pathologist. During his deposition he signaled his disbelief in some microscopic findings, specifically hemorrhages, and disagreed with the histological dating of the rib fractures. Anticipating his denial of the findings, the prosecution introduced microphotographs of the fractured ribs and bruises at trial. As a result, the presence of recent hemorrhages, e.g., in the re-fractured rib, was not in question, and his assessment of timing of rib fractures shrank from "over 4–5 weeks" during the deposition to "3–4 weeks" during the trial.

Second, the defense team questioned the investigation procedures. They were concerned with handling of the pillow from the floor, specifically, why it had not been tested for the presence of transfer DNA? The answer was that such a test would have no evidentiary value, since the child lived in the room for 3 weeks prior to his death and his DNA would be expected on any of the objects found there. The defense then asked whether the police investigators followed up with the defendant so as to explain how the child could have been held to leave a specific pattern of bruises in the inguinal regions. However, this was a moot point since police investigators do not release information about the inconsistencies between the findings and their interviews to suspects.

Third, the autopsy report came under scrutiny and this lead to questioning about the medical examiner's credibility. One mistake was found in the autopsy report. In the report it was erroneously noted that the infant was "slightly underdeveloped" although not out of range for his age (5 months, 26 days). The weight (6,760 g) and height (67 cm), given his age, placed him "below the 5th percentile for weight and the weight to height ratio." The error was due to a slightly misplaced line marking the age of the child on a CDC Growth Chart, which resulted in a false reading. The child was in fact in 50th percentile for age. However, since there was no documented history of prior medical problems, abuse, or illness, and it was a single reading of these numbers, it was dismissed as diagnostic tool and not considered in the final determination for the cause of death. During the cross-examination of the pathologist, the defense attorney questioned the meaning of the child being below the 5th percentile; he suggested that it may mean "failure to thrive," a child abuse feature. The medical examiner pointed out that since such a conclusion would be based on a single reading, with no additional clinical information, it was of no value and could not influence the process of arriving at the diagnosis. Regardless, during the examination of the defense expert on the next day, the attorney reintroduced the issue, revealing the mistake on large posters and spending about 15 min discussing it.

At the end of any direct or cross-examination of the pathologist, the defense attorney would ask a litany of questions following list of injuries from the autopsy report:

Defense attorney:	Was the contusion in muscle at the right rib arch the injury that killed the child?
Pathologist:	No, sir, it was not.
Defense attorney:	Was the healing fracture of the right eight rib the injury that killed the child?
Pathologist:	No, sir, it was not.

And so forth. The defense expert, when asked what in his opinion actually killed the child, stated that he did not know, "maybe SIDS, maybe suffocation," but argued that prolonged resuscitation could have introduced artifacts to the body, which in the end were misinterpreted as injuries.

The defense tactics proved effective, since it introduced a reasonable doubt to the jurors.

8.5 Discussion

In Hillsborough County, Florida, where this case study originated, there have been just over 580 criminal homicides from 1997 to 2010 among local law enforcement agencies in the county solved by the following police agencies and included in our database: the Hillsborough County Sheriff's Office, the Tampa Police Department, and the Temple Terrace Police Department. Among this sample, approximately 45 involved juveniles under the age of 7 years. In addition to the solved juvenile cases, there are five homicide investigations involving infants and children that remain open since 2007. The open cases are unsolved for a variety of reasons, but several key issues challenge investigators and prosecutors as discussed in this chapter, such as the difficulty of timing injuries, particularly when they occur over a several-day period and the fact that multiple people may have had access to the child during the time frame prior to the death. In some cases, the manner of death is opined as homicide, but the specific mechanism of death may be more elusive or attributed to homicidal violence or battered baby (child) syndrome.

Given the high number of variables that contribute to understanding the epidemiology of battered baby (child) syndrome, these findings are presented only as general trends, without specific incidence reporting. The primary goal is to share our findings in an effort to help dispel some common misperceptions about diagnosing battered baby (child) syndrome, such as the relationship between soft and skeletal tissue injuries. These findings further highlight areas where future research could benefit this discussion for investigators.

In the majority of solved juvenile cases from this sample, parents reported that the infant "fell" accidentally upon seeking medical treatment, though inflicted trauma was determined as present at autopsy. Overall, victims tended to have multiple blunt impact injuries throughout the body. The most common areas affected included the head, followed by the extremities and then thorax. Through comparison of injury patterns among known cases of accidents and inflicted trauma, common threads emerge. For example, in addition to specific patterns, i.e., affecting the specific body parts, accidents tend to create far fewer injuries than cases of abuse, accidental trauma tends to be more focused, and rarely are there multiple incidents of repeated accidental trauma.

- Overall, more than half of the victims under the age of 10 years are male, yet there is a higher ratio of female victims involving infants and children under the age of 3 years.

- In approximately half of the cases, the body was moved following the death. In four cases, the scene was actually altered, and in one case, the scene was staged to look like something other than a murder.
- In the majority of cases, the offenders are a parent (17/32), the boyfriend or girlfriend of the parent (2/32), or another family member (1/32). In six cases, children were killed by a nonrelated babysitter. The majority of offenders who inflicted trauma and committed murder were male.
- In just over 56% (18/32) of cases, the primary mechanism of injury was blunt impact trauma followed by gunfire, strangulation, smothering, drowning, and nonspecific violence including beating, stomping, and the throwing of infants against walls, across the room, or from moving vehicles.
- It is rare to find no evidence of injury upon external examination of the body. However, typically when soft tissue injuries to the face or head are evident, only a fraction have cranial fractures (typically around 20%). More commonly, fractures to the ribs or extremities are present.
- Only about half of cases reveal physical evidence of prior neglect or abuse at autopsy.

In only a very small number of fatal cases are kidnapping or child rape a factor. A higher frequency is classified as *victim precipitated*. *Victim-precipitated* homicide refers to instances in which the victims' actions contribute to their own demise; i.e., the deceased may have made a menacing gesture or was first to pull a weapon. In cases of child abuse, these typically reflect events where the offender is responding to the child who is crying or *acting up* when administering physical punishment. It is precisely these types of cases that can be challenging to prosecute as jurors tend to view the parent as having lost control but not intending to fatally harm the child. The key legal issue for investigators in those types of situations is to show a pattern of repeated abuse, rather than the intent to kill for that single incident.

8.6 Recommendations for Best Practice and Future Research

Mapping out the case factors that take into account intrinsic, extrinsic, and circumstantial variables helps clarify the events surrounding the death and ultimately speaks to whether a crime was committed. The general patterns of injury and presence of repeated trauma illustrate trends consistent with inflicted injuries that vary from accidental trauma. The ability for forensic pathologists and anthropologists to create a differential diagnosis of trauma patterns at autopsy increases when these practitioners work together and apply a range of radiographic technologies. Likewise, soft tissue injuries do not always occur in the same pattern or distribution as skeletal fractures. Direct observation of skeletal tissue by forensic anthropologists provides medical examiners and prosecutors a second opinion on the type of injuries, mechanisms of trauma, and timing of fractures. As documented in this example, the ability to accurately time antemortem or healed injuries

(physical evidence of past abuse) is fundamental to investigators. Therefore, increased research into the histological changes of bone remodeling for different age groups, particularly among populations under stress or enduring repeated abuse, would be highly beneficial.

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