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The Significance of Postmortem Radiographs in Infants

REFERENCE: Williamson, S. L. and Perrot, L. L., "The Significance of Postmortem Radiographs in Infants," *Journal of Forensic Sciences*, JFSCA, Vol. 35, No. 2, March 1990, pp. 365-367.

ABSTRACT: The radiographs of 108 infants were analyzed prospectively before autopsy to correlate radiographic findings with those found at the postmortem examination. There was poor correlation between radiographs and autopsy findings when pulmonary pathology was present, and there was no gut pathology when radiographs revealed portal venous air. The radiographs were most helpful when either bony abnormalities (that is, fractures or congenital abnormalities) or free air were found before autopsy.

KEYWORDS: pathology and biology, X-ray analysis, postmortem examinations, infants

Several studies have been published demonstrating the usefulness of radiographs involving perinatal death [1-4]. These studies have shown how the radiographs aided in diagnoses that might otherwise have been missed by the clinical examination alone. Other authors have advocated the use of radiographs in the investigation of crimes [5], especially in forensic medicine [6]. The infants used in our radiographic study were suspected clinically of having died of sudden infant death syndrome (SIDS). Because autopsies do not routinely involve examinations of the extremities, radiographs were obtained to exclude occult bony pathology. A second goal was to evaluate the soft tissues of the infants in an attempt to correlate radiographic changes with autopsy findings. This report summarizes the radiographs and subsequent autopsy reports for 108 infants.

Material and Methods

Radiographs were obtained of only those infants for whom consent for autopsy had been granted. The radiographs consisted of frontal and lateral radiographs of the skull and trunk as well as frontal radiographs of the extremities on each of the infants immediately before autopsy. The radiographs were reviewed prior to the autopsy by a pediatric radiologist (SLW) and then re-reviewed after the autopsy results were obtained to correlate findings. All autopsies occurred within an hour of the radiographs.

Autopsies were all performed within 24 h of death except on two occasions where the postmortem examinations were done 48 h after demise of the infants. The delay in these latter two cases was due to inadequate permission/consent by the coroner's office and delay in transport. All autopsies were performed at Arkansas Children's Hospital (ACH)

Received for publication 8 Aug. 1988; revised manuscript received 19 April 1989; accepted for publication 25 April 1989.

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except one done by the state medical examiner's office in which radiographs revealed numerous fractures.

Results

Complete radiographic studies were performed at Arkansas Children's Hospital on 108 infants whose ages ranged from 7 days to 11 months. There were 73 infants (45 males and 28 females) in whom no cause of death could be found and, thus, met the criteria for SIDS [7]. Other causes of death were found in the remaining 35 infants (21 males and 14 females).

In the 73 infants dying of SIDS, there were 76 radiographic findings as follows: normal 30, opaque lungs 12, portal venous gas 4, extra-alveolar air 3, patchy air space/interstitial pulmonary process 26, and absent thumb and radio-ulnar synostosis 1. The normal radiographs of the 30 dead infants could not be distinguished from those of living infants. In these 30 cases, there was poor autopsy correlation. The lungs showed congestion or infection or both in 23. Likewise, of the 38 cases with radiographic lung abnormality (12 opaque lungs and 26 other pulmonary processes), no pathologic findings were present at autopsy in 21. Those with portal venous gas had no gut pathology. The air was considered to be a postmortem finding [8]. In the 3 cases of extra-alveolar air seen radiographically, pneumothorax or pneumomediastinum or both was present at autopsy and was considered to be secondary to cardiopulmonary resuscitation. The autopsy findings in all 73 of these infants showed visceral congestion, petechiae, and systemic lymphadenopathy.

A specific cause of death was found for the 35 remaining infants. Etiology of death at autopsy was as follows: congestive heart failure 4, child abuse 3, sepsis 5, aspiration 7, central nervous system (CNS) disorders 7, pneumonia 8, and disseminated intravascular coagulation 1. Radiographs in these infants showed similar findings to the SIDS infants: normal 10, opaque lungs 5, portal venous gas 1, extra-alveolar air 1, patchy air space pulmonary process 15, and multiple fractures 3.

Of those infants in whom lung pathology was suspected radiographically (20), abnormality was found at autopsy in all but 2. When the lungs appeared to be normal (10), all of these infants had some pathology ranging from severe pulmonary edema to massive aspiration.

In summary, in both sets of infants, radiographic/pathologic correlation was poor when the lungs appeared to be clear. Of 40, 33 (83%) demonstrated abnormal pathology. There was somewhat better correlation when pulmonary pathology was present radiographically. Of 50, 39 (78%) appeared abnormal at autopsy. In all cases with portal venous gas, no gut pathology was found, making this finding most likely a postmortem one. The radiographs were most helpful when extra-alveolar air or fractures were present.

Discussion

The value of radiographs in stillborn and perinatal deaths has been well established [1-4]. The diagnosis of skeletal dysplasias, for example, can be greatly aided by radiographs. Radiographic findings are particularly helpful in family counseling. Other documented uses of radiographs have demonstrated their usefulness in crime for the location and better definition of fractures suspected to have occurred after assaults, the location of foreign bodies, the detection of contraband in customs cases, or for the identification of dead bodies [5,6].

This radiographic study was undertaken to aid the autopsy, because the autopsy excluded the extremities. Not surprisingly, as can be seen from this series, several causes of death were found at autopsy that clinically were thought to represent SIDS. Child

abuse with fractures or free air or both was really the only diagnosis that could be suggested from the radiographs before autopsy. There was little use in trying to diagnose soft tissue pathology from the radiographs, that is, lung parenchymal disease or gut pathology, because of the poor radiographic/autopsy correlation. As other authors have found, the main value of these preautopsy radiographs is to detect occult bony pathology or dysplasia. Routine autopsy exams would have missed the fractures seen in these cases. In addition, without the knowledge preautopsy of the extra-alveolar air present on radiographs, this finding would not have been appreciated once the body was opened.

Not surprisingly, case selection in this series was limited to those infants younger than one year, as SIDS is not found in older children. This is the age group that is also frequently subjected to child abuse. Therefore, the authors advocate the use of radiography before autopsy, especially in infants, to detect occult bony pathology and free air, while keeping in mind that diagnosis of other processes from the films is not accurate.

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