

A87 Rib Fracture Analysis of Infant Cardiopulmonary Resuscitation (CPR) Methods Using Porcine Surrogates

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Learning Overview: The goal of this presentation is to create a more comprehensive understanding of how CPR-induced rib fractures are presented in infants and how CPR-related infant rib fractures compare to those sustained in conjunction with abusive trauma.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a comprehensive understanding of how CPR-induced rib fractures are presented in infants using two different techniques. This research benefits those in the fields of forensic anthropology, medicolegal practice, pathology, pediatric medicine, and anyone who attempts to differentiate the causation of infant rib fractures as therapeutic or abusive.

The purpose of this research is to recognize if infant rib fractures are distinguishable between those caused by CPR or violence. In 2005, the American Heart Association suggested that when performing CPR on an infant, instead of using one hand to perform compressions, two hands should be used to create a front-to-back compression.^{1,2} Prior to this switch, infant rib fractures were uncommonly associated with CPR, and therefore, associating rib fractures exclusively with abuse was clearer. Since using the two-hand approach, reports of CPR-related fractures have increased in autopsy documentation.^{3,4} Because of the similarity in hand position between two-handed CPR administration and abusive scenarios, the cause of rib fractures cannot always be confidently discerned between CPR and violence.

One-handed and two-handed CPR methods were performed on deceased piglets to act as proxy for human infants. Afterward, autopsies of the piglets were performed to determine the location and type of fracture that occurred, or did not occur, on each rib. Furthermore, these results were compared to an infant trauma database from Harris County Institute of Forensic Science. The similarities and differences were noted between rib fractures sustained from CPR and those sustained in conjunction with abusive trauma.

This research demonstrated that both methods of infant CPR can produce rib fractures. Results from the piglet sample indicate that two-handed CPR causes statistically more rib fractures than one-handed CPR. Results from this study contradict current literature that uses descriptive terms like “highly unlikely” or “rare” to describe infant CPR-induced rib fractures.⁵⁻⁸ The location of fractures identified on the piglet sample were observed exclusively on the anterior portion of the ribs, while fractures associated with abuse were observed most commonly on the posterior portion of the ribs. The pattern of rib fractures following CPR is distinct and will aid in differentiating from patterns more typically associated with child abuse.

This animal model research has direct application to a significant set of social and legal issues with conclusions that can be relied on by biological forensic anthropologists conducting medical-legal death investigations. Further benefit is to fields of law enforcement, pathology, pediatric medicine and anyone who attempts to differentiate the causation of infant rib fractures as therapeutic or abusive. Interpreting whether an injury is a result of child abuse or therapeutic intervention is a stressful and precarious situation. Cases may not present with obvious causes of injury, and therefore diagnostic evidence is crucial. The expectation of this research was to create a comprehensive understanding of how CPR-induced rib fractures are presented in infants.

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