Chest Compressions in an Infant With Osteogenesis Imperfecta Type II: No New Rib Fractures

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ABSTRACT. The case report of a newborn female with osteogenesis imperfecta type II who underwent cardiopulmonary resuscitation (CPR) with manual chest compressions for several minutes is presented. Chest radiographs taken before and after the chest compressions were administered were reviewed by several radiologists from 3 different hospitals and demonstrated no new radiographically visible rib fractures. Collagen analysis, the patient's clinical appearance, and clinical course, as well as a consultant's opinion aided in confirmation of the diagnosis of osteogenesis imperfecta type II. A review of 4 previous studies concerning rib fractures and CPR is included. This unique case supports previous articles that have concluded that rib fractures rarely, if ever, result from CPR in pediatrics, even in children with a lethal underlying bone disease, such as osteogenesis imperfecta type II. *Pediatrics* 2000;106(5). URL: http://www.pediatrics.org/cgi/content/full/106/5/e71; *cardiopulmonary resuscitation, chest compressions, osteogenesis imperfecta, rib fractures, bone disease.*

ABBREVIATION. CPR, cardiopulmonary resuscitation.

In 1984, Feldman and Brewer[1] reviewed 50 pediatric patients who had undergone cardiopulmonary resuscitation (CPR), finding none that had sustained rib fractures based on CPR alone. They concluded that "in the absence of roentgenographic evidence for other bone disease, unexplained rib fractures were specific for abuse."

Sheridan and Sheridan[2] reviewed 147 pediatric (birth to 3 years of age) cases of CPR in their study. They found no rib fractures attributable to CPR alone, except 1 case in which the child had undergone open heart surgery the day before and had cardiac arrest during that procedure and again the following day. At the time of both arrests, prolonged CPR was administered, including manual chest compression. The authors concluded that "rib fractures rarely, if ever, occur in small children from CPR except in the most unusual cases, as with the child with open heart surgery."

Other articles published on this topic in 1994 include those by Spevak et al[3] and Betz and Liebhardt.[4] The retrospective review by Spevak et al concluded that "cardiopulmonary resuscitation is unlikely to cause rib fractures in infants." The article by Betz and Liebhardt stated that their findings refuted "any possible claims that rib fractures were caused by inexpert resuscitation in a panic-like reaction."

In the following case, we document a patient with osteogenesis imperfecta type II who had no new radiographically visible rib fractures despite several minutes of manual chest compressions during CPR.

CASE REPORT

A 38-week gestation, 2355-g female infant was delivered in a rural community hospital. Apgar scores were 4 and 7 at 1 and 5

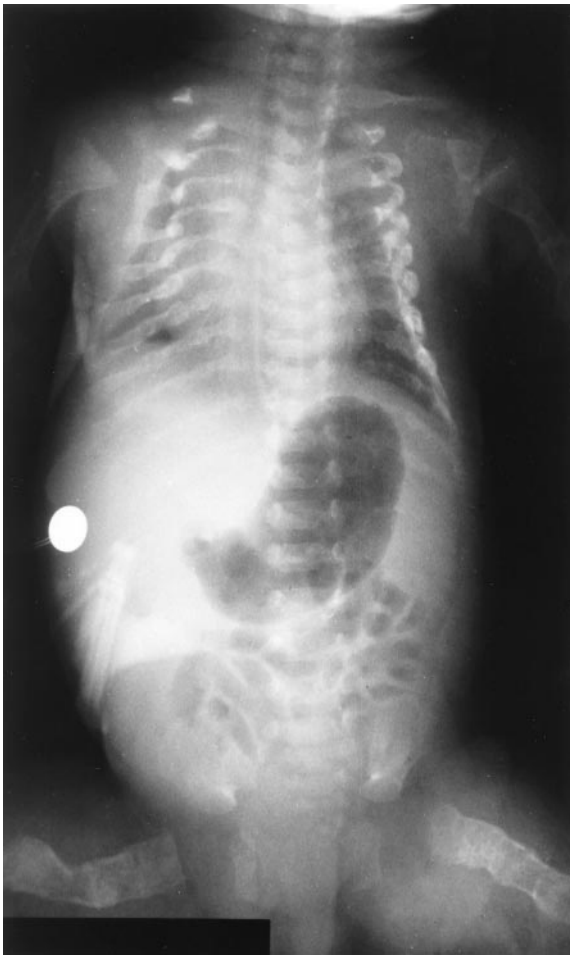

Fig 1. Chest and abdominal radiographs taken before commencement of manual chest compressions. The radiographs clearly demonstrate multiple fractures of ribs and extremities and pulmonary hypoplasia.

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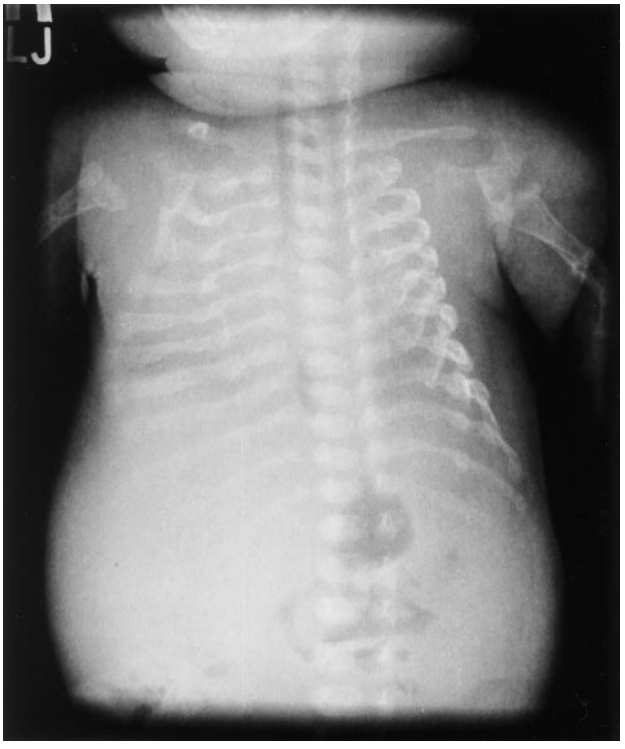

Fig 2. Postmortem chest radiograph demonstrating no new radiographically visible rib fractures after manual chest compressions.

minutes, respectively. The pregnancy was remarkable for limited prenatal care.

At birth minimal respiratory effort was noted, which prompted bag–mask ventilation for several minutes and then intubation. Subsequently, the endotracheal tube was dislodged and removed, and the infant remained stable in 45% oxygen via an oxygen hood. It was noted that the infant kept her arms and legs flexed and that the limbs appeared somewhat shortened. Radiographs of the chest and extremities demonstrated multiple fractures of varying ages of the ribs and all extremities.

A neonatal transport team from a tertiary care hospital arrived ~3½ hours after delivery. They inserted an umbilical artery catheter, started parenteral fluids, checked a blood gas, and gave the infant morphine sulfate (.5 mg/kg). The infant became apneic and profoundly bradycardic, requiring CPR, including 5 minutes of manual chest compressions using the 2-finger technique. There were no residual visible markings on the sternum after the chest compressions. A chest radiograph was taken to document endotracheal tube placement. The infant was then transported to the tertiary care hospital, where the diagnosis of osteogenesis imperfecta type II was confirmed by the usual clinical course (eventual respiratory failure secondary to pulmonary hypoplasia), physical appearance, collagen analysis, and consultation with appropriate susbspecialists with expertise in the diagnosis of osteogenesis imperfecta. Two days after admission to the tertiary care hospital, assisted ventilation was discontinued, and the infant expired. At the parents' request, no postmortem examination was performed.

Several radiologists from 3 different hospitals reviewed chest radiographs performed before (Fig 1) and after (Fig 2) CPR was administered. All of the radiologists concluded that there were no new radiographically visible fractures of the ribs as a result of the CPR.

DISCUSSION

In some cases of severe child abuse in which rib fractures have been identified, CPR has been suggested as the cause of the fractures. In this case, an infant with the lethal form of osteogenesis imperfecta received CPR but had no new radiographically visible rib fractures. Because no autopsy was performed, the presence of acute nonradiographically visible fractures cannot be ruled out. This unique case supports the previously cited conclusions that rib fractures rarely, if ever, result from CPR.

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