Childbirth protocol and respiratory distress

Halliday (2008) retells the story of Patrick Bouvier Kennedy's death from hyaline membrane disease two days after his birth, 5 to 6 weeks prematurely, in August of 1963 [1]. This was the son of then President John F. Kennedy:

“An obituary in the New York Times noted that at that time all that could be done ‘for a victim of hyaline membrane disease is to monitor the infant’s blood chemistry and to try to keep it near normal levels. Thus, the battle for the Kennedy baby was lost only because medical science has not yet advanced far enough to accomplish as quickly as necessary what the body could do by itself in its own time.’ Patrick Kennedy’s death from HMD increased public awareness of the disease and stimulated further research into its treatment. Within a few years two trials reporting the use of synthetic surfactants to treat RDS had been published.” [1, pS49]

Patrick Kennedy was born by emergency cesarean section, and was thus subjected to immediate clamping of the umbilical cord. His lungs may have been too immature to secrete natural surfactant, but he may also have suffered insufficient perfusion of the alveolar capillaries [2].

Windle (1940) had warned of the dangers of umbilical cord clamping:

“The rather common practice of promptly clamping the cord at birth should be condemned. Of course, this will make it impossible to salvage placental blood for 'blood banks.' However, the collection of usable quantities of placental blood robs the newborn infant of blood which belongs to him and which he retrieves under natural conditions... ... Immediate clamping of the cord is comparable to submitting the infant to a rather severe hemorrhage.” [3, p546]

Windle reiterated this viewpoint in his 1969 Scientific American article on asphyxia:

“in any delivery it is important to keep the umbilical cord intact until the placenta has been delivered. To clamp the cord immediately is equivalent to subjecting the infant to a massive hemorrhage, because almost a fourth of the fetal blood is in the placental- circuit at birth.” [4, p78]

Earlier and earlier clamping of the cord appears to have begun in the 1930s, when banking of umbilical cord blood became popular [5-10]. Following is the procedure used by Page et al. (1939):

“When the baby is born it is laid on the mother’s abdomen or some other convenient place. The cord is clamped immediately with two artery-forceps,
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...without waiting for pulsation to cease, and the infant is separated and handed to an assistant.” [8, p200]

Frischkorn and Rucker (1939) described the natural course of postnatal blood flow in the umbilical cord, which by the end of the decade may already have been unfamiliar to many obstetricians, even if they delayed clamping until after the baby’s first breath:

"If a cord be watched immediately after delivery the umbilical vessels can be seen to pulsate strongly throughout their entire length. In a varying length of time the pulsations cease in the more distal part and as this occurs the umbilical vessels collapse. This process of cessation of pulsation and collapse of the vessels proceeds toward the umbilicus until finally there is no pulsation even at the navel. The vessels are then entirely collapsed. If now the cord be tied and cut very little blood will escape from the placental end." [11, p 593]

Twenty years later Desmond et al. (1959) described prolonged pulsation of the clamped-off umbilical cord stump in the newborn nursery [12]. Following are some of their comments:

“More recent experience with distressed infants revealed that certain of these infants show disturbances in the closure of umbilical vessels after birth. . .
. . . The umbilical arteries normally cease to pulsate within a short period after the infant has been delivered. . .
. . . While ligation of the umbilical cord immediately after birth is a tradition in modern obstetrics, the danger of hemorrhage from cords left unligated is not great.” [12, p131]

“Forty-one infants manifested prolonged pulsation of the cord after delivery. The mean duration of cord pulsation was 5 hours, with a range of from 40 minutes to 13 hours after birth.” [12, p132]

. . . “Seventy-three per cent of the infants had either fetal distress prior to delivery or difficulty with the onset of respiration on delivery.” [12, p145]

Pulsation of the umbilical cord stump indicates that transition from fetal to neonatal circulation has not completed. Ongoing pulsation from 40 minutes to 13 hours (mean duration 5 hours) represents a futile attempt by the newborn infant to obtain blood and oxygen from the mother. If not clamped, the umbilical cord will pulsate for 3 to 30 minutes after birth [13, 14].

Montgomery (1960) described his procedure for cesarean delivery, following which he held the baby face down below the level of the uterus, then:

“Generally within 5 minutes with the baby held in this position, the respiratory passages of the fetus are cleared, adjustments in fetal circulation occur, blood has come over from the placenta, pulsation of the umbilical cord stops, and the cord then can be safely severed.” [15, p908]
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Figure 11 from Montgomery’s paper illustrates the appearance of the cord once pulsations in it have ceased, then its appearance following ligation showing very little bleeding.

References
5. Goodall JR et al. (1938) An inexhaustible source of blood for transfusion and its preservation.
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Figure 11: From Montgomery (1960) showing
Top – Collapsed cord ready for division, and
Bottom – Appearance of cord after late severance with only a small amount of blood evident.