



OFFICE OF THE STATE CORONER

NON-INQUEST FINDINGS OF THE INVESTIGATION INTO THE DEATH OF A BABY

CITATION: **Investigation into the death of a baby**

TITLE OF COURT: Coroner's Court

JURISDICTION: Brisbane

FINDINGS OF: Ms Christine Clements, Deputy State Coroner

CATCHWORDS: CORONERS: Inquest, death of a baby, vitamin k injections, subdural and subarachnoid haemorrhages, due to late onset vitamin K deficiency bleeding.

At the time of her death, the baby was 33 days old. She was born in a regional Queensland hospital in 2011. She was living with her parents in regional Queensland.

Circumstances of the death

The mother was 30 years of age at the time of the pregnancy. This was her first pregnancy and she did not have any previous medical conditions. The pregnancy was uneventful and she attended regular antenatal appointments at the hospital. A foetal morphology ultrasound was conducted at 20 weeks. The ultrasound indicated no abnormalities and showed normal growth. The birthing plan was for an entirely natural birth, with no medications or injections to be administered to either the mother or the baby.

The baby was born 10 days early in hospital by vaginal delivery. The first stage of labour lasted for around five hours, 40 minutes. The mother did not receive any pain relief. The second stage of labour lasted one hour and 40 minutes. At this stage, the midwife pushed a cystocele back behind the baby's head. This occurs in situations where the mother's bladder is bulging into the vaginal canal. The baby was delivered a short time later. Throughout the labour, the baby's heart rate varied between 140-162 bpm.

The baby's measurements at birth were normal. Her initial neonatal examination was also normal. In accordance with her parents' wishes and the birthing plan, she did not receive Vitamin K, nor was she vaccinated for Hepatitis B. Information relating to the vitamin K injection was provided to the parents during their first antenatal visit. The information stated the reasons why vitamin K is recommended, namely that it assists the blood to clot and that newborn babies require it to prevent bleeding problems especially in the first few months after birth. The parents submitted a birth plan, which stated their decision not to have vitamin K administered. The birth plan was discussed with the parents, and the decisions made within it were confirmed before it was placed in the patient record.

The day following the birth, mother and baby were both discharged home. The baby was successfully breast fed and was gaining sufficient weight. There were no concerns.

One month after the birth, the mother noticed that the baby had been sleeping a lot and was not feeding as much as usual. She was noted to cry out at times and then settle. She went to sleep that night, but an hour later, she vomited. In the early hours of the next morning, the mother went to change her nappy and she was seen to be limp. The Queensland Ambulance Service (QAS) was contacted.

QAS found the baby to be lethargic with some inspiratory stridor. Her heart

rate was slowed and her respiratory rate was increased. She was given adrenaline, and transferred to the nearest hospital. Upon admission, the baby appeared ill, was floppy and unresponsive and had a low temperature. Her heart rate remained low and she had grunting respiratory effort. At this stage, it was thought she had sepsis. She was given fluid and antibiotics, and airlifted to the Mater Hospital in Brisbane. The retrieval team noted that the baby had a firm fontanelle (the soft spots on a baby's head), which together with her other symptoms were suspicious of raised intracranial pressure. She was ventilated in an effort to reduce this pressure.

Arrival at the Mater Hospital was after lunch that same day. A CT scan was performed immediately, which showed widespread subarachnoid haemorrhage and left sided subdural haemorrhage (bleeding on the surface and beneath the dura/lining of the brain). This was causing some effacement of the left ventricle (compression of the cavity within the brain as a result of increased pressure and mass effect). There was also loss of grey/white differentiation of the brain matter, which indicated damage to the brain and widening of the spaces between the skull bones. No fractures were seen. There was haemorrhaging within both eyes, and her pupils were non-reactive.

A blood test called an INR (International Normalised Ratio) was conducted. This test measures the time it takes for blood to clot and compares it to an average, with one being normal and 10 being extremely thin and prone to bleeding. The baby's measurement was 10. She received fresh frozen plasma to help coagulate the blood and her INR came down to 1.6. She was also given a dose of Vitamin K.

The baby's condition did not improve overnight or into the next morning. There remained markedly elevated intracranial pressure and her prognosis was considered to be extremely poor. She remained on ventilation over night. Following discussion with her parents, the baby's life support measures were withdrawn the next morning and she subsequently died.

Autopsy

The baby's parents were initially opposed to an invasive autopsy, but counseling assisted them in accepting the necessity of the autopsy to determine the cause of death.

The autopsy was conducted two days after the death.

A CT scan showed extensive intracranial haemorrhage composed predominantly of subarachnoid haemorrhage involving the brain and the spinal canal and cerebral oedema (swelling of the brain).

Internal examination showed widening of the skull sutures and underlying brain swelling. Examination of the brain confirmed the CT findings. The lungs showed some minor collapse and haemorrhage.

Given that the baby had presented with an INR of 10, and responded well to treatment with plasma and vitamin K, the pathologist considered vitamin K

deficiency as a cause for the bleeding. A neuropathologist was consulted in this regard and confirmed that the features were consistent with vitamin K deficiency bleeding. It was concluded that there were no signs of trauma or non-accidental injury. The birth was not considered to be a contributor to the death.

The pathologist concluded that the cause of death was subdural and subarachnoid haemorrhages, due to late onset vitamin K deficiency bleeding.

Vitamin K deficient bleeding

A neonatologist at the Mater Hospital assisted in the investigation of the death by providing information generally on vitamin K deficient bleeding (VKDB).

Vitamin K is essential for the synthesis of blood clotting factors. Vitamin K deficiency can lead to VKDB. Administration of vitamin K after birth all but eliminates VKDB. This is usually done by an intramuscular injection.

The Australian National Health & Medical Research Council (NH&MRC) recommends that all newborn babies receive vitamin K after birth. This is because babies generally have a low level of vitamin K in their bodies. It is poorly transferred across the placenta; babies have low levels in cord blood and have limited liver reserves.

Human breast milk contains relatively low concentrations of vitamin K (1 – 2mg/L), whereas infant formula milks are supplemented with additional vitamin K to a minimum concentration of 30mg/L. Therefore, infants who are exclusively breast-fed are at risk of developing VKDB, unless supplementary vitamin K is administered.

In newborns, VKDB is categorised as early, classical and late. Of relevance to this death, late VKDB occurs from eight days, to six months after birth, with most presenting at one – three months. It is almost completely confined to fully breast-fed infants. Serious intracranial haemorrhage occurs in about 30 – 50% and the mortality rate is about 30%.

Conclusion

The baby was 33 days old when she tragically died after suffering extreme bleeding in the brain. This bleeding developed over the month of her life, due to a lack of vitamin K in her system. As part of the birthing plan and, in accordance with her parents' spiritual beliefs, the baby was not administered vitamin K after her birth, or any other medications.

The death has been investigated by the Queensland Police Service and found to be non-suspicious. I accept the findings of that investigation. I also support the recommendation made by the pathologist in her autopsy findings, that future siblings of the baby receive vitamin K.

Holding an inquest is unlikely to provide any new information, or result in any recommendations being made. I am unable to make any further preventative recommendations on anything connected with the death, with respect to

matters of public health and safety, the administration of justice, or ways to prevent deaths from happening in similar circumstances in the future.

The administration of vitamin K is a well established and safe prophylaxis known to reduce the risk of VKDB in newborn babies. The administration of this treatment remains within the parental consent. The baby's mother had a detailed labour plan and a considered position declining various medications and interventions in the birth process. This included a specific direction not to administer vitamin K to their baby.

Christine Clements
Deputy State Coroner