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Opinion Article

Analysis of Umbilical Artery Blood Gas and Acid-Base at Child Birth

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DESCRIPTION

Due to its great diameter, the umbilical vein is simpler to sample. Umbilical artery blood gas measurement, however, provides more precise details regarding the foetal metabolic state and has a greater correlation with newborn outcomes. Blood rich in carbon dioxide expelled by the foetus returns to the placental circulation through the umbilical arteries, whereas oxygenated blood is sent from the placenta to the foetus by the umbilical vein. As a result, arterial sampling more correctly reflects foetal metabolism while venous cord blood gas measurement primarily reflects placental metabolism.

Compared to arteries, veins are more compressible. Thus, venous flow from the placenta to the foetus is reduced more during umbilical cord compression than arterial flow. Fetal tissues will respond by boosting their oxygen uptake in order to meet their metabolic demands. Because more carbon dioxide is expelled through the umbilical arteries, the arterial cord blood becomes more acidotic, while the umbilical venous acid-base state is maintained by a healthy placenta. The arteriovenous pH differential is significantly influenced by the degree of cord compression. Therefore, it is always necessary to collect blood samples from the arterial and venous systems for analysis.

All antepartum and intrapartum surveillance measures are intended to evaluate foetal acid-base status, either directly or indirectly. In 80% of depressed neonates, the umbilical arterial blood pH is normal, demonstrating the lack of birth asphyxia both in the delivery room and in court. Considered are the method, normal ranges, dangers, advantages, and cost analysis of routine versus chosen umbilical blood sampling. In certain deliveries, the American College of Obstetricians and Gynaecologist advises collecting umbilical blood for acid-base analyses. However, they think it makes sense to routinely sample umbilical blood at every delivery.

The health of the mother during pregnancy, particularly the placenta, has a direct impact on the development and regular growth of the foetus. Many maternal disorders, including preeclampsia and Gestational Diabetes Mellitus (GDM), which can impair foetal growth, lead to placental insufficiency. Preeclampsia is a dangerous disease of the mother's placenta that can result in severe complications. Preeclampsia is characterized by proteinuria and hypertension (SBP>140 or DBP>80) found on two occasions at least six hours apart after 20 weeks of gestation. The condition may be accompanied by pathologic edema. Increased SBP >=30 mmHg or DBP >=15 mmHg are the criteria for pre-existing essential hypertensive individuals. In the United States, this disease affects 2-6% of healthy nulliparous women, whereas in poorer nations, it affects 4- 18% of moms. Preeclampsia is linked to complications for the mother and the foetus. Prematurity and Intrauterine Growth Retardation (IUGR) are the two most significant foetal problems.

The majority of prenatal exams are made to look for foetal hypoxia. The gold standard test for foetal hypoxia in newborns is umbilical cord blood gas analysis, particularly when base excess is more than 12-16 mmol/lit4. Analyzing the blood from the umbilical cord is thought to provide information on the infant's acid-base balance at the time of birth, when the umbilical circulation was stopped by clamping the chord. However, as a result of continued placental metabolism and gas exchange, the umbilical cord blood will gradually change its acid-base balance going forward if it stays in continuity with the placenta. Within 60 seconds of delivery, the umbilical pH changes somewhat, and over the course of 60 minutes, the cord's arterial or venous pH can drop by more than 0.2 pH units. Blood taken from placental surface vessels also undergoes similar alterations, but they are more pronounced and unpredictable.

If the chord is twice clamped after delivery, isolating a portion of the cord blood from the placenta and the surroundings, these alterations are not noticed. The blood's pH then stays essentially unchanged at room temperature for an hour. Due to continuing blood gas exchange inside and across the placenta after cord clamping, placental cord blood provides a close approximation of the foetal base excess and haemoglobin status at birth, but with more inaccuracy for Po_2 and consequently O_2 saturation and Pco_2 and thereby pH.

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