# FETAL LUNG MATURITY AND THE L/S RATIO

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Amniotic fluid is formed in the sac that surrounds the fetus. The volume of fluid can vary somewhere between 500 to 2500 milliliters. It is often useful, and in fact, necessary, to collect this fluid and test it to identify genetic and neural tube defects, hemolytic disease of the newborn, fetal infection, fetal renal malfunction, or fetal lung maturity. It is this last condition that is of special interest to the respiratory therapist who is responding to a crisis delivery in the obstetrics ward.

Amniocentesis is generally done between 14 and 16 weeks gestation, but it can also be done between 26 and 35 weeks gestation if fetal distress is suspected. The method of choice for obtaining amniotic fluid is ultrasound-guided needle aspiration from the amniotic sac. Approximately 10 milliliters is collected in a sterile, brown glass or plastic tube or bottle protected from light. The fluid is then subjected to one- or two-dimensional thin-layer chromatography to separate the lecithin and sphingomyelin into fractions which is quantified.

***The L/S ratio assists in the evaluation of fetal lung maturity.***

The agents of interest in fetal lung maturity are actually phospholipids which would normally be produced by the mature babies lungs in alveolar type II cells and stored in granular lamellar bodies in the lung. We know it commonly as surfactant. There are actually three chemicals of interest in this process. A researcher by the name of Gluck is given credit for their discovery. The phospholipids of importance are phosphatidylglycerol (PG), phosphatidylcholine (PC, lecithin), and sphingomyelin (SP). Relative amounts of PG and PC increase dramatically with pulmonary maturity, whereas SP concentration is relatively constant. It is the increases in PG and PC that result in large amounts of surfactant being produced by the alveolar type II cells as the fetal lung matures. As we know, surfactant normally coats the surface of the alveoli, and reduces the surface tension of the alveolar wall during breathing. It is when the infant is born premature, where the PG and PC do not have a chance to increase in quantity, that sufficient surfactant is not produced and the alveoli are unable to expand normally and gas exchange is inhibited. Respiratory distress syndrome (RDS) is the end result.

The classic breakpoint for judgment of maturity of the surfactant system in the infant's lungs has been an L/S ratio of 2 or higher. As the L/S ratio increases beyond 2, the incidence of RDS approaches zero. As the ratio drops below 2 the incidence ranges from 40% to 80%, with lower ratios indicating higher risk. The incidence of false negative L/S ratios is high, 20% to 25%, and occurs when an immature L/S ratio is associated with no signs of respiratory distress. False positive values are much less frequent and for the most part are related to perinatal complications and maternal diabetes. An infant with a mature L/S ratio seldom develops RDS.

The frequency of borderline L/S ratios (1.5-2.0) and problems with false positive test results has led to the usefulness of a more accurate phospholipid marker of lung maturity. This lipid is none other then phosphatidylglycerol (PG). This lipid appears at about 36 weeks gestation and continues in rise in concentration until term. It is perhaps the most reliable indicator of pulmonary maturity; even when the mother is diabetic or when blood or meconium contaminate the amniotic fluid sample. Its presence is always associated with lung maturity.

A simple alternative bedside method for assessing lung maturity is the "shake test" developed by Clements and coworkers. The test is bases on the fact that pulmonary surfactant generates a stable foam in the presence of ethanol. Few false positive test results occur, but false negative results are frequent. Specimens for testing may be obtained by amniocentesis or by aspiration of the infant's posterior pharynx or gastric contents at the time of delivery. The specimen is mixed with dilutions of 95% ethanol at 1:1, 1:2, 1:3, and 1:4, and each tube is shaken vigorously for 15 seconds. After 15 minutes the formation of bubbles on the surface of the mixture is observed. A complete ring of bubbles is considered a positive test result. Virtually no infants with a positive result at the 1:2 dilution or greater develop RDS.

The indications for the L/S ratio are as an assist in the evaluation of fetal lung maturity as well as for determining the optimal time for obstetric intervention in cases of threatened fetal survival caused by stresses related to maternal diabetes, toxemia, hemolytic diseases of the newborn. As always, the risk of a procedure such as amniocentesis (0.5% complication rate) needs to be weighed against the importance of obtaining information that will help the patient in a crisis situation.

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