VALUE OF LECITHIN - SPHINGOMYELIN RATIO

IN

HIGH RISK PREGNANCY

THESIS

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By

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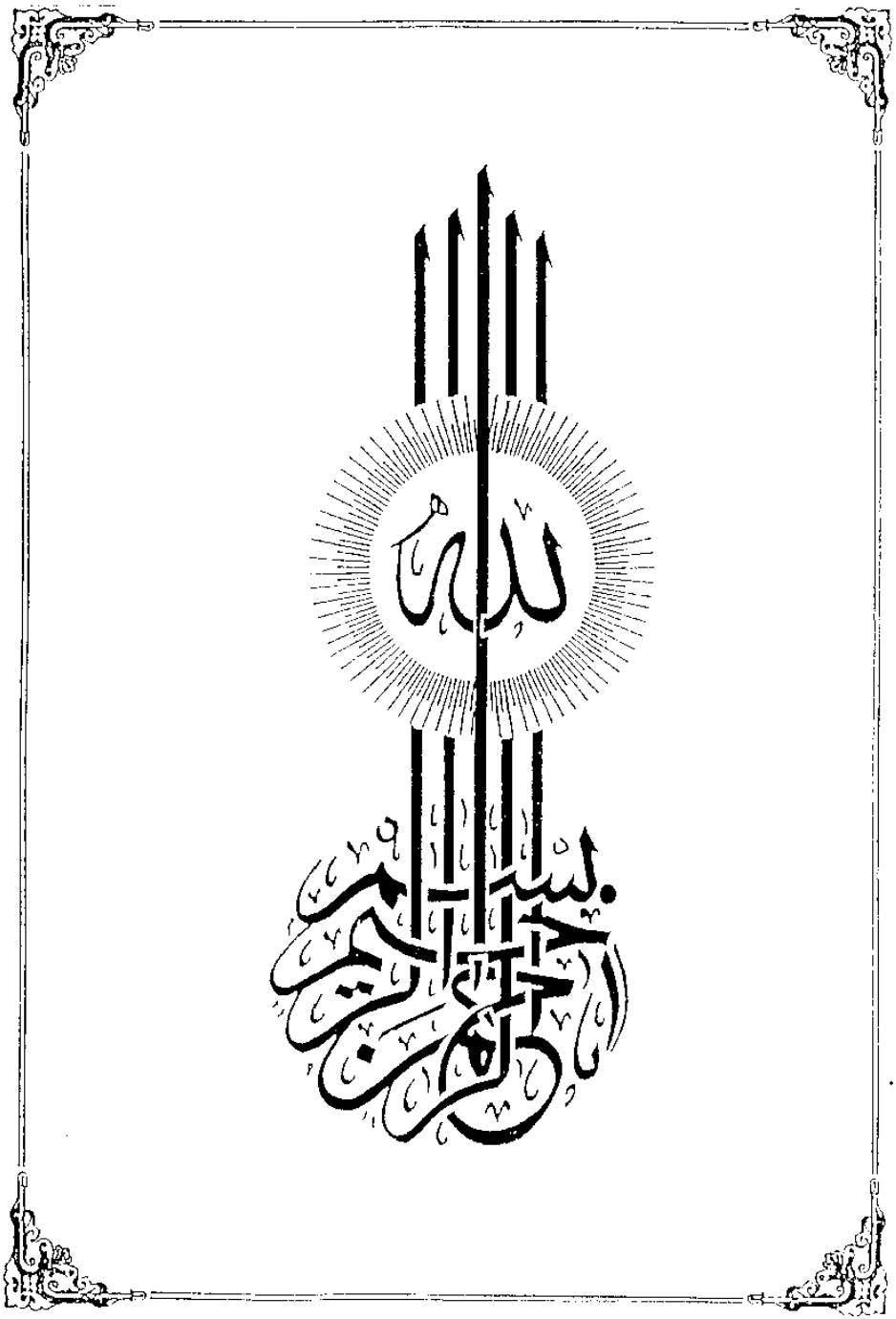
CONTENTS



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INTRODUCTION

Experimental work has shown that the liquor amnii can no longer be regarded as stagnant pool used for the excretion of urine and the passage of meconium in times of stress.

The development of a relatively safe technique of amniocentesis since Bevis' contribution (1953) and increasing knowledge about the liquor constituents has broadened our horizons.

Amniocentesis and amniotic fluid analysis were established as vital diagnostic procedures in fetal medicine by their proven predictive value in the management of rhesus haemolytic disease.

As any high risk pregnancy proceeds, the obstetrician must continually weigh the increasing fetal hazard against the decreasing risks from prematurity as a result of immediate delivery.

The discovery of the role of phospholipids in the respiratory function of the newly borne infant and their estimation

as first established by Gluck and associates (1971) was the solution of this problem.

Unlike clinical, radiological and ultrasonic assessment, the amniotic fluid tests used are, primarily, methods of evaluating the functional maturation of fetal tissues and organs which is more important for neonatal survival and health than is either gestational age or birth-weight.

To date, the most accepted amniotic fluid test for the prediction of fetal pulmonary maturity has been the lecithin : sphingomyelin ratio as described by Gluck and associates (1971).

AIM OF THE WORK

1. Training on amniocentesis.

2. Carry out the estimation of the Lecithin : Sphingomyelin Ratio and introduce it to the routine obstetric work up in Ghamra Hospital.

3. Review of the recent literatures on the amniotic fluid.

REVIEW OF LITERATURE

EMBRYOLOGICAL AND HISTOLOGICAL CONSIDERATIONS

The amniotic fluid is formed very early during the embryonic life.

The amniotic cavity appears during the implantation of the blastocyst as a small cleft between the ectoderm of the inner cell mass and the trophoblast.

The amnion is a membrane which is continuous with the ectoderm of the embryo and bounds the amniotic cavity. It develops either by delamination from the cytotrophoblast or as an extension of the fetal ectoderm.

As the amnion enlarges, it gradually engulfs the growing embryo which prolapses into its cavity so that the amnio-ectodermal junction is carried from the margins of the embryonic disc into the ventral aspect of the embryo.

Distension of the amniotic sac brings it into contact with the interior of the chorion.

The amnion andchorion, though slightly adherent, are never intimately connected and usually can be separated easily, even at term (Wynn, 1974).

The normal amnion is 0.02 to 0.5 mm in thickness. Electron microscopic studies by Bourne (1960) showed that, during early pregnancy, there are columnar cells with secretory features in the amniotic epithelium. These cells contain granules and have a brush border of microvilli with inter and Intracellular canals. Later, progressive differentiation into five separate layers occurs and secretory cells disappear. He was unable to find blood vessels or nerves in the amnion at any stage of development.

These layers are from within outward :

1. The epithelium:

   It consists of a single layer of nonciliated cuboidal cells.

2. Adherent basement membrane.

3. Compact layer :

   It is a relatively strong reticularlayer.

4. Fibroblastic layer :

   It is a loose structure of fibroblasts set in a mesh of reticulin cells and these may be actively phagocytic.

5. Spongy layer :

It is a layer of connective tissue allowing the amnion to slide over the underlying chorion.

However, electron microscopic studies of amnion by Wynn and French (1968) and by Hoyes (1968) have not confirmed such sharply defined layers.

PHYSIOLOGICAL CONSIDERATIONS

Formation and turnover of amniotic fluid :

Lind et al.,(1972) suggested that, during the early phase of fetal development, the amniotic fluid is probably an extension of the fetal extracellular fluid space, the fetal skin acting as a semipermeable membrane. After mid-pregnancy increasing stratification and cornification of the fetal skin prevents diffusion, the fetal urine then becomes the major contributor to the amniotic fluid and the fetal swallowing is probably the major route of fluid removal.

Campbell et al., (1973) reported that the human fetus at term excretes 600 to 700 ml per day of hypotonic urine into amniotic fluid.

Pritchard (1965) reported that fetal swallowing at term removes between 200 and 500 ml of amniotic fluid per day.

Seeds (1980) suggested that the fetal respiratory movements account for amniotic fluid resorption. However, Perks and Cassin (1982) demonstrated that the fetal respiratory tract actively secretes fluid into the amniotic cavity.

Minh and his colleagues (1983) , using the electron microscope, found that the parietal fetal membranes contain long and narrow dead-end channels opening in the direction of the decidua and they suggested that these membranes might be an important route for amniotic fluid removal.

Ross et al.,(1983) reached the same conclusion after their study on the pregnant ewe and added that the amniotic fluid prolactin might have a regulatory function in amniotic fluid volume and osmolar homeostasis.

Towards term, possible minor contributors in amniotic fluid formation include fetal lacrymal , salivary,sweat and sebaceous glands secretions together with cells shed from the fetal skin and vagina in the female fetus.

Rate of production :

Vosburgh et al.,(1948) , by the use of tracer techniques, reported that a complete exchange of water occurred every 2.9 hours and that there was a constant exchange of as much as 500 ml of water per hour between the amniotic fluid and the mother towards term.

Theoritically the daily net gain in volume must be extremely small and it needs only as little as 5 ml per 24 hours to produce a volume of 1200 ml at 35 weeks gestation.

Volume :

Lind et al.,(1972) demonstrated that the amniotic fluid volume in the first half of pregnancy is closely related to fetal weight.

In the second half of pregnancy, Charles et al., (1965) reported that there is no obvious relationship between amniotic fluid volume and fetal weight, perhaps because the larger fetuses swallow more than do smaller ones.

Goodlin et al.,(1983) suggested that, between 29 and 36 weeks of pregnancy, the degree of amniotic fluid volume depends upon the degree of maternal plasma volume expansion.

Amniotic fluid volume can be measured accurately for the clinical management of patients by one of the dye

dilution techniques in the second and third trimesters (Thompson et al,,1971).

Ultrasound measurements of amniotic fluid volume was proved to be accurate in the first trimester by Robinson (1975) and in the second and third trimesters by Geirsson et al.,(1984).

The mean amniotic fluid volume is 30 ml at 10 weeks' gestation, 350 ml at 20 weeks , 950 ml at 30 weeks, 1000 ml at 37 weeks and then it falls sharply (Gadd, 1966) . However, Queenan et al.,(1972) , reported that the peak of amniotic fluid volume was at 34 weeks gestation and the mean of this peak volume was 1000 ml. They also reported that the mean amniotic fluid volume at term was about 800 ml.

After 42 weeks gestation, they demonstrated that the mean volume fell below 500 ml and continued to decrease with prolonged gestation.

Abnormal volumes :

Clinically, when the amniotic fluid volume is too much or too little for the particular stage of pregnancy,