LAMELLAR BODY COUNT IN AMNIOTIC FLUID AS A PREDICTOR OF FETAL LUNG MATURITY IN HIGH RISK PREGNANCIES

Thesis

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بسم الله الرحمن الرحيم

"رب اشرح لی صدری (٢٥) و یسر لی امری (٢٦) و احلل عقدة من لسانی (٢٧) یفقهوا قولی(٢٨)"

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CONTENTS

page

List of abbreviations

DOA	Diamine oxidase
RDS	Respiratory Distress Syndrome
DPPC	DiPalmitoylPhosphatidylCholine
L/S	Licithin / Sphingomyelin
CPAP	continuous positive airway pressure
SP	surfactant protien
LBC	lamellar body count
FLM	Fetal lung maturity
AF	Amniotic fluid
PG	Phosphatidylglycerol
FSI	Foam stability index
TDx	Thermal demand transmitter

List of tables

LIST OF FIGURES

INTRODUCTION

Introduction

Prior to this time, the baby is at risk for developing respiratory distress syndrome (RDS). RDS occurs in about 1% of all pregnancies and it can have serious short- and long-term consequences, involving both the lungs and other organs, that can extend beyond the neonatal period in its most severe forms.(**Halliday HL. et al., 2005).**

When babies are very premature, respiratory distress syndrome (RDS) is the result of a combination of both alveolar epithelial cell immaturity (the lining cells have not yet thinned out) and a deficiency of surfactants. Later in pregnancy ("near term"), severe RDS can sometimes also occur but at this point it is usually the result of insufficient surfactants alone – but the end result can be just as devastating.(**Fantz CR. et al., 2002).**

In the days before early and accurate sonographic pregnancy dating, and when the dictum "once a cesarean, always a cesarean" represented modern practice, one of the leading causes of prematurity and respiratory distress in the newborn was iatrogenic prematurity by repeat cesarean section.(**Sher G. et al., 1997).**

To reduce the appalling rate of neonatal morbidity and mortality from this problem, Gluck introduced the lecithin sphingomyelin ratio (L/S) test on amniotic fluid to predict fetal pulmonary maturity. Used in this context, the decision point for the ratio was highly conservative. It was set high enough to virtually guarantee

that it would not falsely predict lung maturity (In practice 1-2% false mature rate). (**Gluck L. et al., 1997).**

The L/S is based on the principle that surfactant is rich in phospholipid, and that mature surfactant contains high concentrations of lecithin.(**ACOG. 2001).**

Unfortunately the L/S ratio is not an easy test. It involves centrifugation, extraction, thin layer chromatography on fresh activated glass plates, development by heat charring and reading by absorbtiometry. The test is labor intensive, tedious, and slow. Reproducibility is low (± 15%), even in high quality labs.(**Tait JF. Et al., 2000).**

Lamellar body count (LBC) is a newer technique being utilized to assess fetal lung maturity. Final assembly and storage of surfactant occurs within lamellar bodies, which are extruded from type-II pneumocytes into the alveoli. Lamellar body count is, therefore, a relatively direct measurement of surfactant production. (**Boron WF. et al., 2005).**

Furthermore, the similar size of lamellar bodies and platelets allows the LBCs to be conducted on a standard Coulter counter, available in all hospital laboratories. Some authors suggest that lamellar body count replace the lecithin/sphingomyelin ratio for prediction of fetal lung maturity and risk of neonatal RDS given these considerations (**Wijnberger LD. et al., 2001)**.

It is quite clear that lamellar body count is a simple, rapid, inexpensive, and reliable predictor of pulmonary maturity, as demonstrated by several authors. It is

necessary to standardize the technique in a particular institution that is used and the cut offs are determined by that technique. (**Dalence CR. et al., 2002).**

In this thesis, we will illustrate the role of lamellar bodies count in amniotic fluid as a predictor of fetal lung maturity in high risk pregnancy.

Aim of work

To correlate lamellar body count in amniotic fluid with fetal outcome regarding development of respiratory distress syndrome (RDS)

LUNG FUNCTIONAL UNIT

Overview on fetal lung functional unit

The fetal lungs are the last organ system to "mature" so that survival outside the womb is possible. Maturity involves several components.**(Muth E. et al., 2004).**

First, there must be sufficient surface area within the lung to allow sufficient exchange of gases (oxygen in and carbon dioxide out) to support metabolic functions. This is accomplished by millions of small sacs called alveoli that give the lungs a sponge-like appearance (**Clements JA. et al., 1998).**

Second, the alveoli must develop to the point that the inner lining of cells (epithelial cells) that come in contact with inspired air are very thin – gas exchange can only occur over a short distance between the blood vessels in the alveoli and the air that fills the alveoli.(**Clements JA. et al., 1998).**

Third, the alveoli must be able to remain open so that the air can get into them and gas exchange can take place. The first two events are generally quite complete by about 32-34 weeks, however, the third is the most essential component from that point on and it is the focus of our fetal lung maturity testing as we shall explain.(**Clements JA. et al., 1998).**

Alveoli are like little bubbles. The laws of physics predict that because of the high ratio of surface tension to volume of little bubbles, their tendency is to collapse. To prevent this from happening, certain cells in the lungs – the type II alveolar cells – begin to excrete chemicals that can reduce the surface tension in the alveoli. These chemicals are called 'surfactants' and they are a complex combination of phospholipids and apoproteins.(**Ghodrat M. et al., 2006).**

When sufficient surfactants are produced that the alveoli can remain open to function, the fetal lungs are considered 'mature'. Prior to this time, the baby is at risk for developing respiratory distress syndrome (RDS). RDS occurs in about 1% of all pregnancies and it can have serious short- and long-term consequences, involving both the lungs and other organs, that can extend beyond the neonatal period in its most severe forms.(**Halliday HL. et al., 2005).**

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Embryology of the respiratory system

The respiratory system begins at the nasal cavity and consists of a conducting portion and a respiratory portion.

The conducting portion includes nasal cavity, pharynx, larynx, trachea, bronchi, and bronchioles. The respiratory portion consists of the respiratory bronchioles, alveolar ducts, alveolar sacs and the alveoli. Gaseous exchange occurs in the alveoli. The development of the respiratory system involves the endoderm and the mesoderm that surrounds it **(Thomas et al, 2000).**

The larynx is first seen as an outgrowth from the foregut called the respiratory diverticulum or the lung bud. The lung bud is a ventral diverticulum of endoderm