

A study of fetal lung maturity with lower limb epiphyseal centre by USG at primary health care centre

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Abstract

Background: Knowledge of the fetal lung maturity is helpful to make the decision of continuation or termination of pregnancy. It is the key factor for the survival of prematurely delivered newborn baby. **Aim:** To study fetal lung maturity with the help of USG by measuring lower limb epiphyseal centres at primary health care centre. **Material and Methods:** Seventy-two patients who were in pre-labor may be at term or preterm were subjected for this randomized study. Patients were scanned in the Department of Radiology for fetal lung maturity. The findings were correlated with other investigative modality, like free floating particles and biparietal diameter (BPD). **Results:** Nearly all patients with free floating particles have distal femoral epiphysis ≥ 5 mm and proximal tibial epiphysis ≥ 5 mm and almost all patients with biparietal diameter ≥ 9.0 cm showed mature lower limb epiphyseal centres. **Conclusion:** Assessment by USG to determine the fetal lung maturity was useful. Priority should be given to BPD ≥ 9.0 cm (100%), DFE ≥ 5 mm (98%) and PTE ≥ 5 mm (97.7%).

Key Words: Fetal lung maturity, ultrasonography, biparietal diameter, distal femoral epiphysis, proximal tibial epiphysis.

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INTRODUCTION

Survival of the prematurely delivered newborn infant principally depends on pulmonary function. Lung maturation depends on coordinated development of separate anatomic, biophysical and biochemical factors. Knowledge of the fetal lung maturity is helpful to make the decision of continuation or termination of pregnancy.¹ Clinical methods have drawbacks. In many cases patients do not know the exact LMP or date of quickening. Per abdominal examinations can also give erroneous results

in cases such as polyhydramnios or multiple gestation or IUGR. Amniocentesis is an invasive technique.² The epiphyseal ossification centers of the distal femur (DFE) and proximal tibia (PTE) appear and enlarge during the third trimester of pregnancy. Radiological appearance of distal femoral epiphysis and proximal tibial epiphysis are helpful in determination of fetal lung maturity.³ But, use of X-rays is hazardous to fetus. Nowadays, ultrasonography (USG) is available for detection of distal femoral and tibial epiphyseal centre, so, it is wise to avoid radiography to know the fetal lung maturity.⁴ This study was conducted with an aim to study fetal lung maturity with the help of USG by measuring lower limb epiphyseal centres at primary health care centre.

MATERIAL AND METHODS

Seventy-two patients who were in pre-labor may be at term or preterm were subjected for this randomized study. Patients were scanned in the Department of Radiology for fetal lung maturity. The findings were correlated with other investigative modality, like free floating particles and biparietal diameter (BPD).

Technique: The ultrasound scanning was performed with ALOKA SSD-630 real time B mode ultrasound unit with 3.5 MHz convex transducer. Aquasonic jelly was applied all over the abdomen to make good contact between transducer and the skin. The obstetric ultrasound was performed to know the following points:

- Epiphyseal centres: The fetal knee was scanned and the size of distal femoral epiphysis and proximal tibial epiphysis were measured.
- Free floating particles: Largest pocket of amniotic fluid was scanned and observed for linear densities of size 1-5 mm which were suspended but gradually settled in amniotic fluid.
- Biparietal diameter: The measurements were taken with calipers. The skull was measured from outer table to inner table and the largest diameter was used where a clear mid-line echo of thalamus was evident along with septum pellucidum.

RESULTS

In this study on 72 patients, 50 patients showed distal femoral epiphysis ≥ 5 mm. Out of these 50 patients, only one showed negative shake test i.e., 98% of these patients with distal femoral epiphysis ≥ 5 mm and suggest fetal lung maturity. While 45 patients showed proximal tibial epiphysis ≥ 5 mm. Out of these 45 patients, show positive shake test i.e., 97.77%.

Table 1: Correlation between free floating particles and epiphyseal centres of lower limb

Free floating particles	No. of cases	Distal femoral epiphysis		Proximal tibial epiphysis	
		<5 mm	≥ 5 mm	<5 mm	≥ 5 mm
Present	41	01	40	4	37
Absent	31	21	10	23	8

Nearly all patients with free floating particles have distal femoral epiphysis ≥ 5 mm and proximal tibial epiphysis ≥ 5 mm.

Table 2: Correlation between biparietal diameter and epiphyseal centres of lower limb

Biparietal diameter	No. of cases	Distal femoral epiphysis		Proximal tibial epiphysis	
		<5 mm	≥ 5 mm	<5 mm	≥ 5 mm
<9.0 cm	43	20	23	24	19
≥ 9.0 cm	29	02	27	03	26

Nearly all patients with biparietal diameter ≥ 9.0 cm showed mature lower limb epiphyseal centres.

DISCUSSION

In this study on 72 patients, 50 patients showed distal femoral epiphysis ≥ 5 mm. Out of these 50 patients, only one showed negative shake test i.e., 98% of these patients

with distal femoral epiphysis ≥ 5 mm and suggest fetal lung maturity. While 45 patients showed proximal tibial epiphysis ≥ 5 mm. Out of these 45 patients, show positive shake test i.e., 97.77%. Tabsh evaluated 133 patients for lower limb epiphyseal centre to determine fetal lung maturity and found 100% and 95% correlation between PTE ≥ 5 mm and DFE ≥ 5 mm with lung maturity respectively.⁵ Mahony in his study of 116 cases concluded 100% maturity of fetal lung when DFE + PTE ≥ 11 mm.³ Our study and other above mentioned studies show correlation. In the study of 72 patients with BPD >9.0 cm as criteria for fetal lung maturity. 29 out of 72 patients show BPD 9.0 cm. All the patients (29) with BPD >9.0 cm show positive shake test. Out of the remaining 43 patients with BPD <9.0 cm only 32 patients i.e., 74.41% patients show positive shake test. This suggests 100% correlation between BPD >9.0 cm and fetal lung maturity which also corresponds with following studies. Lee *et al* reported positive prediction of absence of respiratory distress syndrome when BPD >8.7 cm.⁶ Hayashi concluded that BPD >9.2 cm in nondiabetic patient was present in all fetuses whose L/S ratio were mature.⁷ In the study of Petrucha the results suggest that ultrasonically determined BPD >9.2 cm and grade III placenta were at least as sensitive as the L/S ratio >2 in predicting fetal pulmonary maturity.⁸ Hadlock in his study concluded that after 37 weeks only 9.5% of patients have false positive prediction of fetal lung maturity.⁹ In the study of Gross, BPD >9.0 cm was associated with 97% of term delivery.¹⁰ In conclusion, fetal lung maturity was predicted by 98% patients with DFE ≥ 5 mm and 97.7% of patients with PTE ≥ 5 mm were in favor of mature fetal lung. By using free floating particles and epiphyseal centres to predict fetal lung maturity 97.5% and 90.2% patients with DFE ≥ 5 mm and PTE ≥ 5 mm show fetal lung maturity respectively.

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