

AMNIOTIC FLUID OPTICAL DENSITY AN INDICATOR OF FETAL LUNG MATURITY

by

K. BUCKSHEE

and

A. GUPTA

Introduction

Amniotic fluid analysis for documentation of fetal pulmonic maturity has been utilized in the correct timing of delivery prior to elective termination of pregnancy. A point is reached in pregnancy where infant survival and development may be more favourable in nursery than in the uterus. Gluck *et al* (1971) demonstrated that Lecithin/Sphingomyelin ratio could be correlated to the maturity of the fetal lung. Sbarra and co-workers (1976) found a relationship between amniotic fluid optical density and Lecithin/Sphingomyelin (L/S) ratio. Thus the present study was conducted to determine the overall accuracy rate of the test and its predictive efficacy for RDS, and its relation to L/S ratio.

Material and Method

Ninety-eight samples of amniotic fluid, of gestation varying from 11-40 weeks were analysed for amniotic fluid turbidity at 400 and 650 nm wave length. Within 1 hour of collection amniotic fluid samples were centrifuged at 3200 rpm for 10 minutes. 2 ml of fluid was used to measure absorbance at 400 and 650 nm wave length. Samples containing meconium

and blood were rejected. Procedure was followed as advised by Sharra *et al* (1976).

Results

Optical density at 400 nm and 650 nm wave length. 98 samples—39 subject.

The mean OD 400 was 0.450 ± 0.307 when the period of gestation was ≤ 20 weeks. It rose to 1.264 ± 0.730 when the gestation was ≥ 36 weeks thereby indicating that OD 400 increases with the period of gestation. The difference between mean OD 400 at different periods of gestation was statistically significant ($P < 0.001$) Table I.

The mean OD 650 was 0.0458 ± 0.0414 when gestation was < 20 weeks. It increased to 0.705 ± 0.510 when gestation was > 36 weeks, thereby indicating that OD 650 increases as the period of gestation increases. The difference between mean OD 650 at different periods of gestation was significant ($P < 0.001$) Table II.

The overall accuracy with OD 400 at ≥ 0.28 at 36 weeks of gestation was only 41.0 per cent. But it increased to 89.8 when 0.7 was used as the cut off point instead of 0.28. Similarly, the overall accuracy with OD 650 at 0.15 at 36 weeks was 92.3 per cent which increased to 94.8 per cent when 0.27 was used as the cut off point instead of 0.15 (Table III).

From: Department of Obstetrics and Gynaecology, All India Institute of Medical Sciences, New Delhi-110 029.

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TABLE I
Amniotic Fluid Absorbance at OD 400 nm Wave Length
N = 39

Gestation in weeks	No. of cases	Range	Mean	S.D.
<20	12	0.056-1.267	0.450	0.307
20 - 27	6	0.265-0.459	0.374	0.072
28 - 35	11	0.240-1.185	0.546	0.299
≥ 36	10	0.240-2.0	1.264	0.730

P < 0.001

TABLE II
Amniotic Fluid Absorbance at OD 650 nm Wave Length
N = 39

Gestation in weeks	No. of cases	Range	Mean	S.D.
<20	12	0.000-0.150	0.0458	0.0414
20 - 27	6	0.015-0.099	0.0510	0.03
28 - 35	11	0.066-0.646	0.215	1.181
≥ 36	10	0.082-1.360	0.705	0.510

TABLE III
The Per cent Correct for OD 400 and OD 650
N = 39

Cut off point	% Correct	False +ve %	False -ve %
OD 400	0.28	41.0	56.4 (22)
OD 400	0.70	89.8	7.7 (3)
OD 650	0.15	92.3	5.1 (2)
OD 650	0.27	94.8	2.6 (1)

Predictive Value for RDS
TABLE IV

Cut off point	% Correct	False +ve %	False -ve %
OD 400	0.7	83.3	0.0
OD 650	0.27	91.7	0.0

The predictive value for DRS OD 400 is better at OD 650, as compared to OD 400. and OD 650 with cut of points ≥ 0.6 and ≥ 0.27 respectively was 83.3% and 91.79%. Thus predictive value for DRS OD 400 and OD 650 in relation to L/S

The correlation coefficient (r) between OD 400 and OD 650 in relation to L/S

TABLE V
False Positive and Negative at OD 650 and OD 400

	False OD 650	+ve /False 0.15	-ve	False OD 400	+ve /False 0.28	-ve
Sharra and Associates 1976 39 cases	0%	6%		3.6%	3.6%	
Moodley <i>et al</i> 1978 27 cases	3%	32%		—	—	
Spellacy <i>et al</i> 1979 78 cases	3%	14.1%		22.1%	24.7%	
Present study 39	5.1%	2.6%		56.4%	2.6%	
B. OD 650	0.27	2.6	2.6			
OD 400	0.70	—	—	5.11	2.6	

ratio was 0.847 and 0.86 respectively was ($P < 0.001$) significant.

Discussion

The ability to determine pulmonary maturity antenatally has greatly enhanced the armamentarium of those who deal with high-risk pregnancy. These values are employed as critical tools in the timing of the delivery of the patients with numerous gestational problems.

Sharra *et al* (1976) reported that measurement of amniotic fluid optical density gave a good index of fetal pulmonary maturity. Initially they suggested OD 400 with cut off point of ≤ 0.28 as an index of fetal maturity. However, the serious disadvantage of using OD 400 nm wave length was that bilirubin, haemoglobin and meconium absorb at this wave length. Therefore, absorbance at OD 400 could be due to any of these three substances. Subsequently they suggested that absorbance at 650 nm could overcome the fallacy faced earlier. An OD 650 with cut off point at 0.15 was suggested as an index of fetal maturity. Sharra and Associates (1976), Copeland (1979), Moodley and Colleagues (1978) and Spellacy *et al* (1979) measured opti-

cal density of amniotic fluid at OD 650 and OD 400 nm wave length. Incidence of false positive with OD 650 varied from 0.3% and false negative varied from 6-32%. At OD 400 incidence of false positive varied from 3.6%-22.1% and false negative varied from 3.6% to 24.7%.

However, in the present study the incidence of false positive with OD 650 at 0.15 as suggested by Sharra *et al* (1976) was 5.1% and false negative was 2.6%. But when cut off point of ≥ 0.27 was used instead of 0.15 the false positive reduced to 2.6% from 5.1%. However, the false negative remained the same.

With OD 400 at 0.28 the incidence of false positive was 56.4% and false negative was 2.6%. But when 0.7 was used as the cut off point incidence of false positive decreased significantly it was 5.1% instead of 56.4%. However, the incidence of false negative remained the same.

Thus the present study revealed that measurement of amniotic fluid absorbance for estimating fetal pulmonary maturity is simple, rapid, reliable and economical test. Its overall accuracy and predictive efficacy for RDS is better at OD 650 as compared to OD 400. The correlation coefficient (r) between OD 650

in relation to L/S ratio was 0.860 which was statistically significant ($P \leq 0.001$).

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