AMNIOTIC FLUID PHENOLIC ACIDS AT DIFFERENT PERIODS OF GESTATION

by

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Introduction

From the changes that occur in the composition of the liquor amnii with advancing gestation, Lind *et al,* (1969) inferred that during early pregnancy (upto about 20 weeks) amniotic fluid is mainly an ultrafiltrate of maternal and fetal plasma, while after this period it gradually assumes the characteristics of dilute fetal urine.

Plasma and urine have different phenolic acid composition Bajaj *et al,* (1973). Using 5.0 ml plasma and 0.2 ml urine, some phenolic acids like—m-hydroxyhippuric acid (m-HHA) and m-hydroxyphenylhydracrylic acid (m-HPHA) are seen as prominent spots in the urine chromatograms, but are almost undetectable in the plasma chromatograms. p-Hydroxybenzoic acid (p-HBA) and p-hydroxyphenylacetic acid (p-HPAA) are seen in both urine and plasma chromatograms, the latter being more intense in urine chromatograms. Spot of another phenolic acid, staining purple with p-nitraniline reagent and having Rf values 0.45, 0.35 in the two solvents used in this study (purple spot), is regularly seen in plasma chromatograms and only occassionally in urine chromatograms. In short, plasma and urine chromatograms have different spot patterns because of different plasma clearances of various phenolic acids. The present study shows the patterns of phenolic acids in amniotic fluid at various periods of gestation to get some insight into the source of amniotic fluid.

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Material and Methods

Amniotic fluid, free from contaminants, was obtained from eighteen pregnant women at the time of delivery or by caesarian section before the rupture of membranes. The gestational ages varied from 22 to 42 weeks. All the mothers were healthy and babies were free from congenital malformations.

The amniotic fluid samples (5 ml) were extracted according to the method described by Smith (1960) for urinary phenolic acids and the spotted extracts corresponding to 5.0 ml samples were chromatographed and evaluated by our own method Bajaj *et al,* (1973).

Results and Observations

In Table I are recorded amniotic fluid

TABLE I

Amniotic Fluid Phenolic Acids (ug/5 ml)

	Gestational age (in weeks	p-HBA	p-HPAA	Purple spot	m-HHA	m-HPHA	m-HBA
Group I (Gestational age 15 weeks or less)	12*	0.3	0.2	0.4	–	–	–
	15*	–	–	3.0	–	–	–
	14*	–	–	3.0	–	–	–
Group II (Gestational age between 32 and 36 weeks)	36	0.1	0.2	0.2	0.2	0.1	–
	36*	0.1	0.1	0.3	–	–	–
	32	1.2	0.8	0.1	0.4	2.0	0.8
	32	1.8	1.0	3.0	0.2	–	0.2
	34	0.6	–	0.1	0.1	–	–
Group III (Gestational age more than 36 weeks)	40	1.4	–	0.3	0.2	–	–
	39*	0.3	0.2	0.4	–	–	–
	40	0.1	0.1	0.2	0.1	0.2	–
	40	0.6	0.8	0.2	0.8	0.4	–
	40*	0.4	–	0.1	–	–	–
	38	0.3	0.3	0.3	0.2	–	–
	37	–	0.6	0.2	0.2	0.2	–
	38	0.5	0.3	0.2	0.2	0.2	–
	40	0.8	2.0	1.8	–	0.3	1.6
	42	1.0	2.5	0.6	0.4	0.2	–
Normal plasma and urinary phenolic acid patterns (Bajaj et al, 1973)	Plasma (ug/100 ml)	5.4±2.7	4.7±6.6	16.1±9.5	0–0.4	–	–
	Urine (ug/1 ml)	1.5 ±0.6	14.0±13.2	–	13.75±9.9	12.5±8.7	–

* Plasma-like pattern (in rest of the cases the pattern is urine like)

Abbreviations: p-HBA (p-hydroxybenzoic acid); p-HPAA (p-hydroxyphenylacetic acid); m-HHA (m-hydroxyhippuric acid); m-HPHA (m-hydroxyphenylhydracrylic acid); and m-HBA (m-hydroxybenzoic acid).

phenolic acids at different lengths of gestation. In cases with gestational ages less than 16 weeks (group I) only p-HBA, p-HPAA and the purple spot, either singly or in combination, were seen; m-HHA and m-HPHA being absent (the phenolic acid pattern of plasma). In Groups II and III (gestational ages more than 30 weeks) m-HHA and m-HPHA were observed in 12 of the 15 cases (the phenolic acid pattern of urine) In the remaining 3 cases chromatograms resembled those in group I. Two cases in Group II (premature) and one in Group III (mature) had m-hydroxybenzoic acid (m-HBA) in the amniotic fluid. This phenolic acid is not detected in urines of persons with normal liver function.

Plasma and urinary phenolic acids in 10 healthy individuals studied earlier Bajaj *et al,* (1973) are also recorded in the Table to give an idea of the plasma and urinary patterns of phenolic acids.

Discussion

In all the cases with gestational ages of 15 weeks or less, amniotic fluid phenolic acids chromatograms resemble those of the plasma, while in 80 per cent of the cases studied in the second half of pregnancy, the phenolic acid pattern was reminiscent of that seen for normal urine, thus supporting the hypothesis that amniotic fluid in the early period of gestation is an ultrafilterate of maternal and fetal plasma, while later on it gradually assumes the characteristics of dilute fetal urine. Absence of m-HHA and m-HPHA in three cases in the later half of pregnancy is difficult to explain, especially when m-HBA is also absent. Further work is needed in this direction. m-Hydroxy benzoic acid is not detected in the urine in normal persons, since it is conjugated to m-HHA in the liver before it is excreted by the kidneys. This phenolic acid has been frequently detected in the urine of patients suffering from liver damage (personal observations, unpublished). It is likely, therefore, that the presence of m-HBA in the amniotic fluid in three cases is an indication of fetal hepatic immaturity. Although it needs further confirmation, but if it proves true, then one thing is apparent from the present study that fetal maturity (at least with respect to certain enzymes) may not always correlate with gestational age; as one of the 3 cases investigated was at full term.

Summary

Amniotic fluid from 18 pregnant women with gestational ages from 12 to 42 weeks was analysed for phenolic acids. The study lends support to the hypothesis that in the first half of pregnancy amniotic fluid is an ultrafiltrate of plasma and later on it assumes the characteristics of dilute fetal urine. In some of the cases in second half of pregnancy m-hydroxybenzoic acid was detected indicating a probable fetal liver immaturity.

References

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