

**STUDY OF ELECTROLYTE CONTENTS IN BLOOD, LIQUOR AMNII AND URINE BEFORE AND AFTER INTRA-AMNIOTIC HYPERTONIC SALINE INSTILLATION FOR TERMINATION OF MIDTRIMESTER PREGNANCY†**

by

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Before the use of intra-amniotic instillation of hypertonic saline first introduced by Aburol in 1934, abdominal hysterotomy was the only procedure for termination of midtrimester pregnancy. The latter being a major surgical procedure is associated with many grave complications amounting to higher incidence of mortality and morbidity. After that many workers tried to terminate midtrimester pregnancy by introducing various substances in the amniotic cavity such as hypertonic glucose solution, urea and uroselectan but these did not gain much popularity due to their many side effects—some being even fatal to the patients.

Due to simplicity, safety and surety intra-amniotic instillation of hypertonic saline has gained tremendous popularity and is being used with increasing frequency as an alternative to abdominal hysterotomy for termination of midtri-

mester pregnancy.

Apart from its effect on the products of conception e.g. foetus and placenta, change in volume and osmolality of amniotic fluid and hormonal changes, there should be some changes in electrolyte contents in blood.

When hypertonic saline (20%, 200 ml in 40 gm. of NaCl) is introduced into the uterine cavity, due to its high osmotic pressure it draws fluid from the adjacent tissues and as a result volume of uterine cavity increases, dilution of the amniotic fluid occurs and exchange of sodium with the adjacent structures takes place and consequently, sodium level in the blood changes. As there is a definite correlation between sodium and potassium, potassium content of blood is expected to undergo similar changes. Though the termination of midtrimester pregnancy by intra-amniotic instillation of hypertonic saline is very popular, very little is known about the distribution of sodium chloride injected and its effect on the maternal body fluids.

The present study aims to measure the sodium and potassium of liquor amnii, blood and urine before and after intra-amniotic instillation of hypertonic saline.

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### Material and Methods

One hundred cases were selected for this study from those who came for mid-trimester terminations of pregnancy to M.T.P. Clinic of Eden Hospital, Medical College, Calcutta during the year 1975. In most of the cases the duration of pregnancy was between 16 to 20 weeks. The following schedule was carried out for estimation of sodium and potassium in blood, urine and liquor amnii.

(1) First sample of blood (Blood—1) taken just before introduction of intra-amniotic hypertonic saline i.e. at 0 hour.

(2) First sample of urine (Urine—1) collected as in (1) above at 0 hour.

(3) First sample of liquor amnii (Liquor—1) collected after introducing the needle in the amniotic sac but before instillation of hypertonic saline.

(4) Second sample of liquor amnii (Liquor—2) collected after instillation of hypertonic saline but before withdrawal of the needle (infusion is usually within 15 minutes).

(5) Second and third samples of blood were collected 12 hours and 24 hours after instillation of hypertonic saline.

(6) Second and third samples of urine were collected 12 hours and 24 hours after instillation of hypertonic saline.

(7) Third and fourth samples of liquor amnii were collected by amnio-centesis 12 hours and 24 hours after instillation of hypertonic saline.

Sodium and potassium contents of blood, urine and liquor amnii were estimated from different samples of Eel. Flame Photometer using standard sodium.

### Analysis of Data

Table I shows distribution of cases according to sodium content in mEq/L in liquor amnii at different intervals after

instillation of hypertonic saline in the amniotic fluid.

Table II shows the distribution of cases according to sodium content in mEq/L in blood at different intervals after instillation of hypertonic saline in the amniotic fluid. High level of sodium content in blood even after 24 hours of instillation of hypertonic saline seemed to be due to slow elimination by kidney with less functional capacity.

Table III shows the distribution of cases according to sodium content in mEq/L excreted in urine at different intervals after instillation of hypertonic saline in the amniotic fluid.

Low sodium excretion estimated after 24 hours may be due to:

(a) Main load of sodium might be excreted before 24 hours.

(b) Bad kidney excretory function.

High excretory value shows good renal function.

Levels of potassium in liquor amnii, blood and urine at different hours were as follows:

#### I. In Liquor Amnii

(a) At 0 hour varied from 3.15 mEq/L to 3.90 mEq/L average being 3.24 mEq/L.

(b) 15 minutes after—between 2.50 mEq/L to 3.55 mEq/L, average being 2.84 mEq/L.

(c) After 12 hours varied between 2.55 mEq/L to 5.40 mEq/L, average being 3.01 mEq/L.

(d) Excess of potassium excretion after 24 hours varied between 3.00 to 4.50 mEq/L.

#### II. In Blood

(a) At 0 hour varied from 3.00 to 3.90 mEq/L average being 3.55 mEq/L.

(b) 12 hours after instillation of hypertonic saline varied from 3.00 to 3.85 mEq/L, average being 3.49 mEq/L.

TABLE I  
Distribution of Cases Within Parenthesis According to Sodium Content in mEq/L in Liquor Amnii at Different Intervals After Instillation of Hypertonic Saline

Time	132 (6)	133 (10)	134 (52)	135 (2)	136 (28)	137 (2)	2101	2151	2201
0 <sup>r</sup> hour	1800	1851	1901	1951	2001	2051	2101	2151	2201
15 minutes	to (1)	to (0)	to (6)	to (11)	to (14)	to (34)	to (14)	to (20)	to (1)
	1850	1900	1950	2000	2050	2100	2150	2200	2250
12 hours	200	251	301	351	401	451	501	551	601
	to (1)	to (0)	to (2)	to (1)	to (12)	to (13)	to (12)	to (7)	to (1)
24 hours	250	300	350	400	450	500	550	600	650
	to (1)	to (4)	to (5)	to (5)	to (11)	to (14)	to (2)		
	250	300	350	400	450	500	550		

TABLE II  
Distribution of Cases Within Parenthesis According to Sodium Content in mEq/L in Blood at Different Intervals After Instillation of Hypertonic Saline

Time	134 (16)	136 (62)	137 (0)	138 (12)	139 (0)	140 (2)	Above (6)
0 <sup>r</sup> Hour	134	136	137	138	139	140	140
12 Hours	Less than	135	141	147	151	156	166
After	135 (1)	to (16)	to (19)	to (5)	to (7)	to (1)	to (1)
	140	146	146	150	155	160	165
24 Hours	Less than	135	141	147	151	156	161
After	135 (1)	to (6)	to (8)	to (5)	to (6)	to (2)	to (11)
	140	146	146	150	155	160	165
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TABLE III  
Distribution of Cases Within Parenthesis According to Sodium Content in mEq/L Excreted in Urine at Different Intervals After Instillation of Hypertonic Saline in the amniotic fluid

Time	12 Hours	Less than (2)	51	101	151	201	251	301
	after		to (3)	to (24)	to (10)	to (9)	to (2)	to
		50	100	150	200	250	300	400
24 Hours			51	101	151	201	251	301
after			to (4)	to (3)	to (3)	to (9)	to (7)	to (23)
			100	150	200	250	300	400

(c) 24 hours after instillation of hypertonic saline varying between 3.10 to 3.35 mEq/L, average being 3.26 mEq/L.

### III. In Urine

Average excess of potassium excretion in 12 hours—2.67 mEq/L.

Average excess of potassium excretion in 24 hours 8.4 mEq/L.

### Discussion

An attempt to correlate the changes in electrolyte concentration in the amniotic fluid, blood and urine was made by King *et al* (1964) who were of the opinion that there was no change in serum sodium. Although radioactive sodium injected into the amniotic sac could be detected in the maternal blood within 30 minutes, there was little or no change in maternal serum sodium concentration. Weingold, *et al* (1965) could not detect any change in the serum sodium and chloride in 24 hours period after intra-amniotic saline injection but found rapid excretion of the electrolyte in the urine.

Anderson and Turnbull (1968) reported sequential change of electrolytes in the amniotic fluid, blood and urine following injection of hypertonic saline. They found that there was a rise in serum sodium and chloride level over first 6 to 8 hours. During this period of high rise of sodium content in blood, the patient complained of thirst. At 10 hours all the values gradually came down to normal. Bhatt *et al* (1975) found no significant changes in sodium and chloride contents in blood, electrolyte excretion in urine gradually rose and subsequently declined after reaching a peak after 6 hours. Electrolytic value in the liquor amnii suddenly increased after intra-amniotic infusion and then gradually came down but remained 4 to 5 times normal at the end of 8 hours.

In the present study it was observed

that soon after intra-amniotic instillation of hypertonic saline there was a sharp rise of sodium in the liquor amnii but this gradually came down after 12 and 24 hours. This is due to gradual dilution of the liquor by influx of fluid into the amniotic sac and also to some extent by the escape of sodium into the blood.

In blood, there was a gradual rise of sodium level from its initial lower level. This rise and fall of sodium content in blood depend upon the rate by which sodium enters the blood stream and also its excretion by the normal healthy kidney.

The high value of serum sodium even after 24 hours of saline infusion is due to slow elimination of sodium by the kidney with its low functional capacity.

The level of sodium in liquor amnii after 12 and 24 hours and also those in blood after the same interval of time vary from one patient to another and does not show steady relationship with the induction-abortion interval.

On detailed study of sodium levels in blood, liquor amnii and urine it is revealed that the induction-abortion interval is decreased when there is quicker escape of sodium from liquor to blood and its comparatively rapid elimination by the healthy kidney. Induction-abortion interval on the other hand, is increased when there is slow absorption of sodium from liquor and/or slow fall of blood sodium level.

There is definite relationship between sodium and potassium level. When sodium level in blood or liquor amnii goes up, the potassium level goes down. In a few cases lowering of potassium level is negligible in spite of higher level of sodium. This can happen after death of the foetus due to the effect of hypertonic saline infusion. On the whole, potassium

levels in the liquor, blood and urine show very little variation and has got no definite relationship with the induction-abortion interval.

#### Summary and Conclusion

1. One hundred cases of midtrimester termination of pregnancy by intra-amniotic hypertonic saline infusion were studied for electrolyte contents in blood, liquor amnii and urine before and after instillation of hypertonic saline.

2. Sodium and potassium contents of blood, urine and liquor amnii were estimated by Flame Photometer at 0 hour, 15 minutes after, 12 hours after and 24 hours after instillation of hypertonic saline in the amniotic sac.

3. Definite correlation could be made between level of sodium in blood, urine and liquor amnii and induction-abortion interval.

The latter was found to be lowered when there was quicker escape of sodium from liquor to blood. Induction-abortion interval was increased when there was also absorption of sodium from liquor and/or slow fall of blood sodium level.

4. Potassium level in the liquor amnii,

blood and urine showed very little variation and was not found to have definite relation with the induction-abortion interval.

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#### References

1. Aburel, E.: *Comunicare La Socioeati Stintelor Medicale*, Tasi, 1934.
2. Anderson, A. B. M. and Turnbull, A. C.: *Acta. Obst. & Gynec. Scandinavia*. 47: 1, 1968.
3. Bhatt, R. V., Patel, N. F., Pathak, N. D., and Doraswami, S.: *Proceedings, 2nd International Conference of Maternal and Perinatal mortality*, Bombay, 1975.
4. King, T. M., Friedman, J. and Steer, C. M.: *Bull. Sloan Hospital for Women*. 10: 14, 1964.
5. Weingold, A. B., Seigal, S. and Stone, W. L.: *Obst. & Gynec.* 26: 622, 1965.