INTRA-AMNIOTIC INJECTION OF HYPERTONIC SOLUTION AS A METHOD FOR TERMINATION OF PREGNANCY

by

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Introduction

A reliable and safe method of termination of pregnancy in midtrimester in India is very essential, especially now, with increasing indications for therapeutic abortions and liberalisation of abortions. The method should be simple, which can be used with minimum medical staff and limited facilities available in small hospitals. The present study was undertaken to evaluate the efficacy of intra-amniotic injection of hypertonic solution as a method for termination of pregnancy after the first trimester.

Aburel in 1934 was the first to describe intra-amniotic injection of 33% saline solution for termination of pregnancy for medical indications, intrauterine death and lethal foetal anomalies. Boero in 1935 injected 2-3 cc of 40% formalin into the amniotic sac with foetal death in pregnant women having medical complications. Burke (1962) and also Playfair (1941) used uroselectan B (Sodium iodomethamate). Portes (1948) used intra-amniotic injection 300-600 cc of normal saline solution for initiating labour. Brosset (1958) used intra-amniotic injection of hypertonic glucose solution for induction of abortion in midtrimester. The variability of methods and the inherent but few acknowledged complications of intra-amniotic injection of hypertonic solution led us to review this method for termination of pregnancy after 1st trimester in our hospital.

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Material and Methods

During the 7 year period 1964 to 1971, in Christian Medical College Hospital, Vellore, pregnancy was terminated in 50 patients by intra-amniotic injection of hypertonic solution for different indications at gestational periods varying from 18 to 38 weeks. In 22 patients pregnancy was terminated for various medical indications at gestational periods varying between 18 to 34 weeks (Table I), and in the remaining 27 patients for intra-uterine foetal death due to various causes at gestational periods varying between 20-39 weeks (Table II). In one patient at 36 weeks of gestation with intra-uterine death due to Rhesus immunization two attempts to inject the hypertonic solution into the amniotic cavity failed due to technical difficulties and induction was done by separation of membranes.

In all these patients, transabdominal

TABLE I

Maternal Indications for Termination of Pregnancy

Maternal Indication	No. of patients
Malignancy (Total cases 10)	
Buccal carcinoma	2
Carcinoma of breast	2
Carcinoma of cervix	1
Carcinoma of thyroid	1
Astrocytoma of frontal lobe	1
Hypernephroma of kidney	1
Recurrent basal cell carcinoma of right mandible	1
Carcinoma of hypopharynx	1
Heart Disease (Total cases 2)	
Mitral stenosis with incompetence and toxaemia of pregnancy ..	1
Heart block	1
Tuberculosis (Total cases 2)	
Advanced bilateral tuberculosis with respiratory distress	1
Tuberculosis of spine with cord compression	1
Others (Total cases 2)	
Cirrhosis of liver with portal hypertension	
Malnutrition with severe anaemia and hypoproteinaemia	1
Toxaemias of pregnancy (Total cases 6)	
Severe pre-eclamptic toxaemia	1
Essential hypertension with superimposed pre-eclamptic toxaemia	3
Antepartum eclampsia	3
Nephrotic syndrome with superimposed pre-eclamptic toxaemia	1
Total	22

TABLE II

Causes of Intrauterine Foetal Death

Cause of Intra Uterine Death	No. of patients
Eclampsia	4
Severe pre-eclamptic toxaemia ..	4
Hypertension with superimposed toxaemia	4
Malignant hypertension	1
Chronic nephritis	1
Rhesus incompatability	1
Mitral stenosis with pulmonary oedema	1
Antepartum haemorrhage	1
Unknown	10
Total	27

amniotomy was done under strict sterile precautions. Patients were asked to pass urine just before the procedure to prevent injury to the bladder. Amniotomy was done half way between the symphysis pubis and the umbilicus or one inch on either side of the midline towards the side of the foetal limbs whenever they could be easily palpated. In those patients where the fundus of the uterus did not reach the level of the umbilicus, midline puncture was made one inch below the fundus of the uterus. A 4 inch No. 18 gauge lumbar puncture needle was introduced into the amniotic cavity under local anaesthesia using 1% procaine hydrochloride. As much liquor as possible was aspirated and a hypertonic solution, either 20% sodium chloride or 50% glucose was injected. 50% glucose was injected whenever pregnancy had to be terminated in patients with medical complications which contraindicate injection of sodium chloride. The amount aspirated varied according to the period of pregnancy and duration of intrauterine death. The amount injected also varied according to the amount of liquor withdrawn. As a rule, 50 cc more than the amount of liquor aspirated was injected. In 3 patients, no liquor could be obtained, but after making sure that the needle was in the uterus varying amounts of hypertonic solution was injected until the uterus distended slightly without discomfort to the patient. In 2 patients, intra-amniotic injection had to be repeated after 3 and 5 days respectively. In one patient, two attempts at transabdominal intra-amniotic

injection failed and transcervical injection was done. All the patients were kept in bed after the injection. Half hourly pulse and blood pressure records were maintained for 1-2 hours after injection.

Results

Forty-nine patients were successfully terminated by the intra-amniotic injection of hypertonic solution. In 24 patients 20% sodium chloride was injected and in the remaining 25 patients 50% glucose was put in. In some patients 10 lakhs of crystalline penicillin and 1 gm of streptomycin were injected along with 50% glucose solution and in all others systemic antibiotic therapy was started with penicillin and streptomycin to prevent infection. The age distribution of patients is given in Table III. The distribution of patients according to their gravidity is given in Table IV.

TABLE III

Age Distribution of Patients

Age groups	No. of patients
15 - 20	6
21 - 25	7
26 - 30	25
31 - 35	9
36 - 40	3
Total	50

Latent Period

The time interval between the intra-amniotic injection and the onset of uterine contractions could be accurately assessed and recorded only in 37 patients. This ranged between 3 hours to 68 hours, the average being 23 hours. The long latent period of 68 hours was in a patient with 20 weeks' pregnancy complicating cirrhosis of the liver with portal hypertension. This was because only 70 cc of 50% glucose was injected after aspirating 70 cc of liquor. In 6 patients, the latent period was shortened by giving intravenous syntocinon drip after 15 to 24 hours.

TABLE IV

Distribution of Patients According to Gravidity

Gravidity	No. of patients
1	6
2	6
3	4
4	5
5	8
6	6
7	8
8	2
9	3
10	1
11	1
Total	50

Duration of Labour

The duration of labour could be assessed only in 37 patients. This ranged between 1.5 hours to 36 hours, average being 10.8 hours. In the remaining 12 patients, only induction delivery interval could be calculated as no record was made when exactly the uterine contractions started in these patients. Induction delivery interval varied from 5.5 hours to 52.5 hours, the average being 31 hours. It is interesting to note that in most of these cases even though the cervix was considered highly unfavourable for induction by the clinical criteria, active labour lasted only few hours.

Delivery

Forty-five patients expelled the foetus and placenta complete with membranes. In 2 patients, intravenous syntocinon drip had to be given as placenta and membranes were retained. In 2 patients, evacua-

tion was done as few bits of placenta and membranes were retained.

Complications

In the present study only one patient had pyrexia of 102°F after intra-amniotic injection of hypertonic saline, which subsided promptly with antibiotics. In one patient who had tuberculous spine with tuberculous granulation tissue causing compression of cord there was a fall in blood pressure to 60 mm/Hg systolic soon after delivery for unknown reasons. Mephentine was given parenterally to this patient to restore the blood pressure to normal. There were no complications, such as postpartum haemorrhage, Clostridium welchii infection, hypernatraemia, accidental vascular deposition of hypertonic solution, and injury to the bladder or intestines in our study.

Maternal Mortality

In the present study, 2 patients died 24 to 36 hours after the therapeutic abortion. Both patients were in a critical condition even before the injection. One patient had severe respiratory distress due to advanced bilateral pulmonary tuberculosis with pre-eclamptic toxaemia and the other patient had multiple secondaries with involvement of liver and ascites due to recurrent basal cell carcinoma of the mandible on the right side. These deaths were due to the primary maternal disease complicating pregnancy and not due to the intra-amniotic injection.

In the present study 23 patients were terminated for various maternal indications with live foetuses. Four were born alive but died due to prematurity within few minutes to 48 hours (Table V).

In 16 patients, placenta with membranes was sent for histopathological examination. In only one it showed mild inflammation with polymorphonuclear leucocytes. Otherwise no significant lesion was found histopathologically in placentae and membranes which could be attributed to intra-amniotic injection.

TABLE V

Details of Foetuses Born Alive

No.	Period of gestation in weeks	Wt. in kgs.	Age at death
1	26	0.5	5 mins
2	24	0.544	15 mins
3	26	1.3	19 hrs.
4	26	0.924	48 hrs

Discussion

Intra-amniotic injection of hypertonic solution was given as the method of choice for termination of pregnancy in midtrimester and intrauterine foetal deaths by various authors (Jaffin 1962; Kerenyi 1969); Wood *et al* (1962); Menon *et al* (1966); Gochberg *et al* (1966); Schiffer (1969); Stroup (1964). This method was found to be very valuable in our study for the following reasons.

(1) Thirty-seven patients needed termination of pregnancy in midtrimester, for which only this method was found to be more successful than any other methods available.

(2) Twenty-five patients had medical diseases complicating pregnancy, who needed termination. In these patients we preferred not to use intravenous syntocinon drip because the risk of over loading the circulation was great, and when using pitocin in renal and heart disease other complications may have to be faced with. Intra-amniotic injection of 50% glucose can be safely used in patients with impairment of renal and liver functions if their primary disease warrants termina-

tion of pregnancy. In our study one patient had renal failure due to severe toxaemia and the other with cirrhosis with portal hypertension where the hepatic function was markedly impaired.

(3) The cost of treatment for the patient could be minimised by using this method. In midtrimester, especially, if high titre syntocinon drips have to be used for induction of abortion, the cost for the patient is very high. Therefore, in our study we could terminate pregnancies, especially during midtrimester and in patients with medical complication successfully at a minimum cost to the patient.

The exact mechanism of action of this method is still controversial. Fuchs. F. (1967) discussed different ways by which intra-amniotic hypertonic solution acts.

(1) *Effect on the Products of Conception*: He maintained that the early effect of the injection is death of the foetus and that placenta showed necrotizing placentitis. But this does not correlate with findings in our study because 4 foetuses were born alive and histopathological examination of placentae and membranes did not show any significant change. This correlates with the findings of Wood *et al* (1962) and Wynn (1967).

(2) *Changes in the Osmolarity of the Amniotic Fluid*: He found that osmolarity of the amniotic fluid of hypertonic saline mixture declined very rapidly but when hypertonic glucose is used this change was found to be very slow, but in our study there was no appreciable difference detected in latent period or in duration of labour between intra-amniotic injection with 20% saline and 50% glucose.

(3) *Hormonal changes*: Oestrogen production reduces markedly and to some extent progesterone production. Progesterone deficiency due to placental damage was thought to be the most important mechanism by which uterine activity is initiated in these patients. But Fuchs. (1967) found that uterine contractions begin before any appreciable change can be demonstrated in placental production of progesterone.

Oxytocin release is also thought to be responsible in cases of hypertonic saline injection, as sodium chloride entering the maternal circulation by influencing the osmoregulating factors may cause release of oxytocin. But this cannot be the only mode of action as hypertonic glucose injection also initiates uterine activity.

(4) Distension of uterus by stimulating the stretch fibres in the myometrium is considered to be the most important way by which uterine activity is initiated after intra-amniotic injection. But this cannot be proved as induction of abortion in many patients was not successful when normal saline or 10% saline is injected into the amniotic cavity (Wagner *et al* 1962).

So from the above discussion it is very clear that the exact mode of action of this method is not yet known.

Complications

Briggs (1964) and MacDonald *et al* (1965) described Clostridium Welchii infection leading to maternal death following intra-amniotic injection of 50% glucose in a dead foetus. But in our study and also as reported by Menon *et al* in 1966, no untoward effect developed when intra-amniotic injection of 50% glucose was used with strict sterile precautions under the cover of antibiotics.

Cameron and Dayan (1966) reported 2 maternal deaths following intra-amniotic hypertonic saline injection due to widespread cerebral infarction. They used 400 cc of 20% sodium chloride in one and

in the other 150 cc of 30% sodium chloride solution. The cerebral infarction was due to the strong hypertonic solutions used. Kerenyi (1969) reported a maternal death due to hypernatraemia following 700 cc of intra-amniotic injection of 20% saline. This death occurred due to leakage of some of the hypertonic solution through the uterine puncture site into the peritoneal cavity from which it was rapidly absorbed into the circulation. The above complication can be easily avoided by minimising the hypertonic solution injected to 200 to 300 cc. and should be injected slowly, watching for any untoward symptoms like abdominal pain or burning in the mouth or headache, to detect early accidental intravascular injection. It is advisable to inject isotonic solution through the needle into the amniotic cavity before removing the needle, so that leakage of hypertonic solution into the peritoneal cavity is minimised.

In our study, there were no such complications.

Summary

Fifty patients had termination of pregnancy by intra-amniotic injection of hypertonic solution in the Christian Medical College Hospital, Vellore, during a 7 year period 1964—1971. In one patient this method could not be used successfully for technical reasons. In the remaining 49 patients, this method proved to be safe, simple and successful, with the average latent period of 23 hours and average duration of labour of 10.8 hours. In our series 25 patients had medical complications associated with pregnancy. Termination of pregnancy was done in midtrimester for 37 patients. Four foetuses were born alive and died after few minutes to 48 hours. There were no complications due to intra-amniotic injection of hypertonic solution. We had two maternal deaths due to the primary disease necessitating termination of pregnancy.

Conclusion

From our study it can be rightly emphasized that intra-amniotic injection of hypertonic solution is simple, safe and very effective for termination of pregnancy when used with proper care and precautions. This can be used by medical staff and does not warrant constant attendance of the obstetrician. It could be safely performed in a small hospital with limited facilities with minimum cost to the patient.

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