

Intra Partum Resuscitation Of Fetal Distress With Low Dose Isoxsuprine Hydrochloride Infusion With Increased Drop Rate: An Observational Study

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Citation

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Abstract

Aim:

To study the efficacy of Lowdose Isoxsuprine Hydrochloride infusion with increased drop rate in the management of Intrapartum Fetal distress.

Background:

Hypotension and tachycardia are the commonest side effects of beta agonist drugs when used as tocolytic agents. Rapid infusion of isotonic fluids is the treatment when such hypotension develops. Low dose Isoxsuprene HCL drip with increased drop rate within the cardiovascular reserve counters hypotension and also helps to improve the uteroplacental perfusion.

Methods:

Twenty three women with singleton pregnancies were studied. Instead of routinely given 40mgs (4amps) of Isoxsuprine Hydrochloride in 500 ml 5% dextrose saline 40 drops/min (delivers 200 micro grms/min), we have given 10 mgs (1amp) of Isoxsuprine Hcl in 500ml dextrose saline 160 drops/min i.e. one fourth dose of the drug with 4 times increased drop rate of infusion, delivering the same dose (200 mcg /min) of the drug. Maternal pulse rate and systolic blood pressure (SBP) were recorded at 0min, 5min, and 10min and at 1hour.

Results:

Effective tocolysis with restoration of normal uterine activity and with rapid recovery of fetal heart abnormalities within 15min was observed in 11 women. In 12 women effective resuscitation of fetal distress but with persistent residual uterine activity was observed. There was a fall of only 3mmHg in mean SBP between 0 and 5min. After this, the mean SBP was maintained between 112 and 109 mmHg throughout the procedure. The mean pulse rate rose by 12/min between 0 and 5min. After this, the mean pulse rate was maintained between 104 and 107/min throughout the procedure. By ANOVA test no statistically significant difference was observed in both SBP (P.0.067) and pulse rate (P.0.066) between the groups and within the groups.

Conclusion: This low dose Isoxsuprene hydrochloride drip with increased drop rate is safe and effective tocolytic technique and helps to resuscitate the fetus in utero. This helps the obstetrician to buy golden minutes to organize definitive measures.

INTRODUCTION

Fetal distress is one of the most common obstetric emergencies in labor room, and it is the indication for 40% of instrumental deliveries and 30% of caesarean sections¹. Only definitive treatment available at present for intra partum fetal distress is to take the baby out from uterus at the earliest^{2,3} preferably within 30min. For the same reason un-

predictable sudden fetal distress in a labor room creates a panic like situation. Fredrec J. Mercier et.al, had reported effective tocolysis and intra uterine revival of fetal distress with intra venous administration of 60 to 90 mcg of nitro glycerine at an interval of 3 to 6 mts (1 or 2 doses)⁴. Nicola K. Weale and Stephen Michael Kinsella et al, had reported effective resuscitation of fetal distress with 250mcg grams of

subcutaneous Terbutaline⁵ along with rapid infusion of I V fluids in addition to the routine measures like oxygen supplementation, and left lateral position. Jignesh J Kansaria et al. had reported effective tocolysis in subjects with preterm labor by initially administering one liter of Ringers lactate IV infusion over a period of one hour followed by Tab Isoxsuprine Hcl 10 mg 6th hrly for 7days⁶. Hypotension and tachycardia are the commonest side effects of tocolysis with beta agonist drugs, which respond well for rapid I.V infusion of isotonic fluids. In this observational study, instead of 40 mg of Isoxsuprine Hcl in 500 ml Dextrose saline at the rate of 40 drops/mn, we tried 10 mg of Isoxsuprine Hcl in 500 ml Dextrose saline at the rate of 160 drops/mn delivering the same dose of the drug. We expected this technique would counter side effects and help the woman to tolerate the beta agonist drug better. Further we expected this technique would result in more effective tocolysis and improvement in utero placental perfusion.

MATERIALS AND METHODS

This observational study was conducted at our institution between Jan 2010 to Dec 2012. Twenty three singleton pregnant women who were either on spontaneous or induced term labor with fetal distress were included in this study. Women with hypertensive disorders of pregnancy, antepartum hemorrhage and women with cardiac decompensation of any reason were excluded. Informed and written consent was obtained from all the participants in this study. The study abide by declarations of Helsinki.

Severe and prolonged late decelerations ($< / = 70$ bpm, lasting for 4 to 10 min), variable decelerations, baseline tachycardia, and diminished or absent 'beat to beat variability' were considered as fetal distress. Fetal distress was detected while on routine intra partum FHR monitoring with hand held ultra sound Doppler, or by labor admission CTG test. When FHR irregularities were detected by hand held Doppler, continuous CTG monitoring followed subsequently. Foot end was elevated, and the women were kept in left lateral position. Discontinuation of on going oxytocin drip, or removal of intra vaginal prostaglandins if any was done.

In this small observational study, instead of routinely given 40mgs (4amps) of Isoxsuprine Hydrochloride in 500 ml 5% dextrose saline 40 drops/min (delivers 200 micro grms/min), we have given 10 mgs (1amp) of Isoxsuprine Hcl in 500ml dextrose saline 160 drops/min i.e. one fourth dose of the drug with 4 times increased drop rate of infusion, delivering

the same dose (200 mcg /min) of the drug with 20.G IV cannula. The drip rate was increased to 180 to 200 drops/min when tocolysis was inadequate due to powerful uterine contractions. The drip rate was reduced to 80 drops/min when adequate resuscitation was achieved, and the infusion was continued at this rate till definitive

measures were undertaken. This infusion was clinically monitored (JVP, auscultation of lung bases) to avoid circulatory over load. Maternal pulse rate and systolic B.P (SBP) were recorded with an automated device (OMRON Healthcare Co.Ltd. Japan) at 0min (before starting of the intervention), 5min, 10min, and at 1hrs. Concomitant FHR patterns and uterine activity patterns were recorded in CTG tracings. Associated and causative factors for fetal distress like cord prolapse, cord round the neck, meconium stained liquor at ARM were recorded. Mode of delivery, Apgar score at 1 min, and 5 min was recorded.

Results of resuscitation of fetal distress were divided in to 2 grades. Complete recovery of FHR abnormality with normalization of uterine activity within **15 min** was considered as grade 1. Complete recovery of FHR abnormality with residual uterine activity or mild hyperactivity within **15 min** was considered as grade 2.

Hypotension was considered as SBP less than 100 mm Hg and was treated with discontinuation of the drip primarily. Rapid dextrose saline infusion was also given when needed. In case of caesarean section, we discontinued tocolysis 20min before anesthesia, and switched over to plain dextrose saline infusion. Other side effects like palpitation, vomiting, and tremors were also recorded. In this study we have not administered oxygen to mothers during the intervention. Statistical analysis was done with SPSS 15 software. Both SBP and maternal pulse rate were analyzed by ANOVA test for multiple comparisons between the groups (0min, 5min, 10min and at 1 hour readings). P value of < 0.05 was considered significant. CTG tracings were analyzed for different types of fetal distress.

RESULTS

Twenty three women underwent intra partum resuscitations of fetal distress. Thirteen women were on spontaneous labor and in 10 women the labor was induced either by Oxytocin drip or by vaginal misoprostol. Ten women had prolonged late decelerations even with normal uterine activity (Fig1). Two women had cord prolepses and 9 7 women had cord round the neck and their CTG tracings showed variable

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decelerations with normal uterine activity (Fig 2). Two women had base line tachycardia with uterine hyper activity (Fig3). Fetal distress could be successfully resuscitated in all these women (Figs.1, 2, 3) with this technique.

The mean SBP at 0min, 5min, 10 min, and at 1hr was found to be 115.61 ± 10.53 , 112.52 ± 13.32 , 112.56 ± 16.75 , and 109.30 ± 15.53 respectively. There was a fall in mean SBP of only 3mm Hg from 0min to 5min readings. After this the mean SBP was stable and maintained between 112 & 109 mm Hg throughout the procedure (Fig.5). The mean pulse rate at 0min, 5min, 10 min, and at 1hr was found to be 91.95 ± 16.57 , 104.47 ± 23.68 , 107.09 ± 24.22 , and 107.95 ± 24.10 respectively. There was a raise in mean pulse rate of 12 beats per min from 0min to 5min readings. After this the mean pulse rate was stable between 104 & 107 beats/min throughout the procedure (Fig.6). No statistically significant difference was observed between the groups and within the groups by ANOVA test for both SBP, and pulse rates, with P values 0.5207 and 0.0622 respectively.

Eighteen women underwent cesarean sections after resuscitation of fetal distress. Five women could be delivered normally after resuscitation. In cesarean group all 18 babies had different grades of meconium stained liquor. In spite of this all the babies were active at birth with median Apgar scores of 9 at 1min and at 5min. In vaginal delivery group three babies had clear liquor, and their Apgar scores at 1min and 5min were 9. One baby had grade two meconium stained liquor and its APGAR score at 1min and 5min was 9. In another baby there was grade 3 meconium stained liquor, and was delivered by forceps. The Apgar score for this baby at 1 min was 5 and at 5min was 7, and required oxygen mask ventilation and NICU admission for 3 days and recovered well.

In this study, intervention and delivery interval ranged from 60 min to 170 min. Details of different types of fetal distress and different grades of resuscitation achieved in each type, and meconium staining of liquor, mode of delivery, Apgar scores at 1min and 5min, and NICU admissions in each type are shown in Table-1.

In this study, three women (13%) developed hypotension with vomiting and they had palpitation and fine tremors. Two women improved spontaneously after discontinuation of the drip. One woman required isotonic fluid infusion .In cases of caesarean section, we discontinued the drip 20min before (spinal) anesthesia, and switched over to plain

dextrose saline infusion. None of the women developed undue hypotension or atonic postpartum hemorrhage during operation.

Figure 1

Fetus with recurrent late decelerations resuscitated with low dose isoxsuprine Hcl rapid infusion

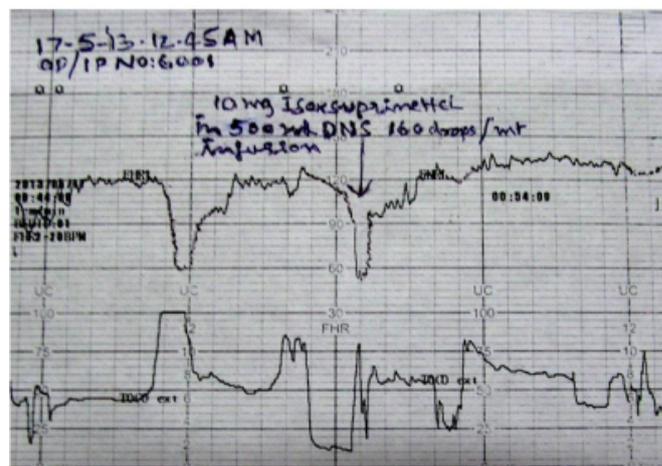


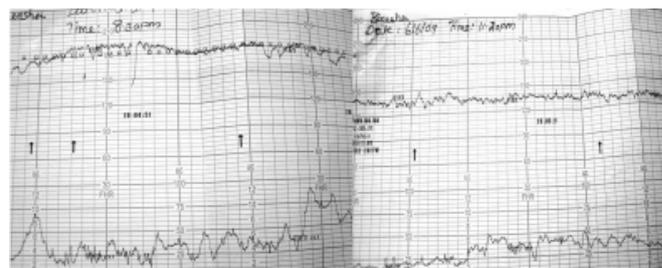
Figure 2

In a woman with cord prolapse with variable decelerations, effective tocolysis and restoration of normal rate and rhythm could be restored with low dose isoxsuprine Hcl rapid infusion.



Figure 3

In a woman with baseline tachycardia with uterine hyper activity, effective tocolysis and restoration of normal rate and rhythm could be achieved with low dose isoxsuprine Hcl rapid infusion



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Figure 4

Systolic B.P (SBP) recorded at 0min 5min, 10min, and at 1hrs. There was a fall in mean SBP of only 3mm Hg from 0min to 5min readings. After this the mean SBP was stable between 112& 109 mm Hg.

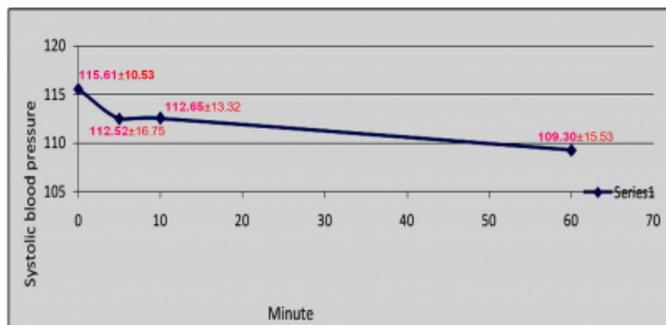


Figure 5

Maternal pulse rate recorded at 0min 5min, 10min, and at 1hrs. There was a raise in mean pulse rate of 12 beats/min from 0min to 5min readings. After this, the mean pulse rate was stable between 104 and 107 beats per min.

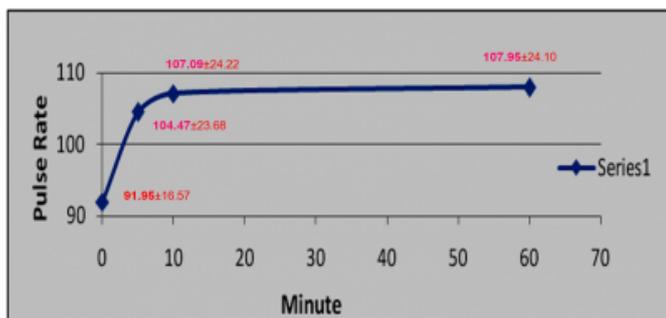


Table 1

Details of different types of fetal distress, and different grades of resuscitation achieved, meconium staining of liquor, mode of delivery, Apgar scores, and NICU admissions in each type are shown.

Type of fetal Distress	N	Mec st liquor	Median APGAR at		NICU Admission	Grade of Resuscitation achieved		Mode of delivery		
			1min	5min		Gr 1	Gr 2	C/S	Veg del	
Prolonged late deceleration	10	10	9	9	0	4	6	10	0	
Variable Deceleration	11	8	9	9	0	6	5	7	4	
Base line Tachycardia with Ut. Hyperactivity	2	2	Baby 1	5	7	1	0	1	0	1
			Baby 2	9	9	0	1	0	1	0
Total	23	20			1	11	12	18	5	

DISCUSSION

Fetal distress is one of the most common obstetric emergencies in labor rooms and it accounts up to 40% of

instrumental deliveries, and 30% of caesarean sections¹. The definitive treatment for intra partum fetal distress is to take the baby out from the uterus at the earliest, preferably within 30 mins from recognition of fetal distress^{2,3}. Delay in delivering a distressed fetus is likely to result in hypoxic ischemic encephalopathy and cerebral palsy or even fetal death⁷. For the same reason, unpredictable sudden fetal distress creates a panic in labor room. This problem is much more serious in rural hospitals where large number of deliveries takes place with suboptimal facilities.

The essential components of fetal distress management may include discontinuation of Oxytocic drugs, tocolysis, foot end elevation with left lateral position and dislodging the head from deep pelvis, oxygen supplementation, and correction of hypotension.

Discontinuation of Oxytocic drugs stops further uterine stimulation. Left lateral position avoids supine hypotension. Elevation of the foot end of the table, and dislodging the presenting part from deep pelvis helps to release pressure on the umbilical cord and also on the presenting part (Head). Huddleston JF et al reported that a rapid expansion of the maternal vascular volume by 500 to 1000 ml by isotonic fluid probably augments cardiac output and uterine blood flow. A fluid load thus presumably helps to stabilize decidual lysosomes⁸. Alternatively, volume expansion might depress the release of oxytocin from posterior pituitary and helps for better tocolysis^{9,10}.

Beta agonist isoxsuprine Hydrochloride increases the maternal heart rate. Increased drop rate of infusion increases the circulatory volume and decreases the blood viscosity¹¹. Both these factors result in increased cardiac output and probably physical dilatation of capillaries (microcirculation) resulting in increased utero placental perfusion. This improved utero placental perfusion facilitates better transfer of oxygen and substrate (glucose) at utero placental bed. Also may facilitates the better availability of beta agonist drug at the receptor sites on uterus, resulting in more effective tocolysis. This increased drop rate of infusion prevents hypotension and makes the woman tolerate Beta agonist drug better. Dextrose saline infusion produces transient hyper glycemia and may facilitate better transfer of glucose to the distressed fetus at utero placental bed. All these mechanisms undo the factors responsible for fetal distress, and results in intra uterine resuscitation of fetal distress.

In our study, 23 parturient women at term labor with fetal distress underwent resuscitation with this technique. The distress was relieved within median interval of 15 min. The intervention delivery interval ranged from 60 min to 170 min. Eighteen women underwent cesarean sections after successful resuscitation. In this group all 18 babies had different grades of meconium stained liquor. In spite of this, all babies were active at birth and their average Apgar scores at 1min and at 5 min were 9. Five women had vaginal deliveries after successful resuscitation. Among this group 3 babies had clear liquor, and their Apgar scores at 1min and at five min were 9. One baby had grade two meconium stained liquor and its APGAR score at 1min and 5min was 9. In another baby there was grade three meconium stained liquor and we delivered this baby by forceps and its Apgar score at 5 min was 7, and required oxygen mask ventilation, and NICU admission for 3 days. Poor Apgar score in this baby could be attributed to forceps delivery on a compromised fetus, in spite of successful intrapartum resuscitation.

We had two women with baseline tachycardia with uterine hyper activity on labor admission CTG. In both these women, effective tocolysis and restoration of normal rate and rhythm could be achieved with this low dose isoxsuprine Hcl rapid infusion.

We had two women with cord prolapse with variable decelerations. In both these women effective tocolysis and resuscitation of fetal distress could be achieved within few minutes after intervention (Fig 2) and caesarean section could be done in a tension free environment.

In our study majority of the babies had different grades of meconium stained liquor. We did not administer oxygen to mothers at the time of fetal resuscitation. In spite of this all

the babies could be successfully resuscitated. This indicates effective improvement in utero-placental perfusion, which could be responsible for better oxygenation of the fetus by this technique¹².

No statistically significant difference was observed between the groups and within the groups by ANOVA test for both SBP, and pulse rates, with P values 0.067 and 0.069 respectively. This indicates that all the women were hemodynamically stable during this intervention.

One of the most serious complications of beta agonist therapy is pulmonary edema. It is uncommon for pulmonary edema to occur in the first 24 hours of therapy, with more than 90% of reported cases occurring after 24 hours of treatment¹³. In our study none of the women developed pulmonary edema. Lower dose of the beta agonist drug, and increased tissue perfusion in organs like liver and kidney which may facilitate rapid metabolism and excretion of the drug, could be the reason for minimal side effects with this technique.

Hypotension, vomiting, palpitation, and tremors developed in only 3 (13%) women in this study and responded well to simple measures like discontinuation of the drip and infusion of isotonic fluids. Hence this technique can be safely recommended for routine resuscitation of intrapartum fetal distress.

On conclusion this life saving technique is safe with minimal side effects, and helps the obstetrician to tide over an acute crisis by permitting him to 'buy some time' to organize definitive measures like caesarean section. We suggest further larger studies with larger sample size to confirm our observations.

References

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