RHEOMACRODEX—A DRUG OF GREAT UTILITY IN THE MANAGEMENT OF FOETAL DISTRESS

by

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Rheomacrodex is a new dextran product of low molecular weight (average mol. wt. 40,000), which prevents or inhibits the extravascular aggregation of red blood cells. Their aggregation or sludging, with consequent improved capillary flow, has been increasingly recognized in the past few years (Kinsley *et al*, 1945; Bigelow *et al*, 1949; Heirbecker and Bigelow, 1950). Gelin (1956, 1957), Borgetrom *et al* (1959) and Thorsen and Hint (1950) have shown that treatment with a low mol. wt. dextran will prevent or reverse the development of R.B.C. aggregation and increase capillary blood flow.

The aim of the present study is to see, if by improving the bood supply to the placental site foetal distress could be alleviated atleast for sufficient time to allow safe vaginal delivery and thus decrease the number of caesarian section. As far as we are aware only scanty reports are available in literature of its use in the management of foetal disttress, although it has been amply used for various other indications.

Material and Methods

Three-hundred and sixty patients with foetal distress in first stage of labour were selected from indoor wards of UISE maternity Hospital attached to GSVM Medical College, Kanpur and from private nursing homes also. Care was exercised in selecting these patients as to avoid any mechanical cause for foetal distress viz. placental separation. A complete history and a thorough clinical examination was done by one of the authors and cases other than vertex presentation, elderly primigravidae and those with bad obstetric history were excluded from this study. None of the cases had any cephalopelvic disproportion.

The foetal distress was diagnosed on the basis of change in the foetal heart rate. (i) A tachycardia of more than 160/mt. or (ii) bradycardia of less than 120/mt. or (iii) Cardiac irregularity.

A case was selected for study. Only when change in the F.H.R. rhythm and tone persisted. The second criteria chosen to diagnose foetal distress was meconium stained liquor, as this may be the earliest sign of foetal distress and it may precede the changes in the foetal heart rate (Browne and Browne, 1964). In those cases where foetal heart rate was used to diagnose foetal distress, membranes were artificially ruptured to see the condition of liquor. An intravenous infusion of 500 ml. of rheomacrodex in

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5% dextrose was then given over a period of 90 mts. Another infusion was given in cases where it was deemed necessary. A complete record of the condition of the mother, the progress of labour indicating the duration, intensity and frequency of uterine contractions was maintained carefully in each case. The foetal heart rate was recorded every ten minutes. If the FHR improved and remained so, the labour was allowed to proceed and spontaneous delivery awaited. Forceps were applied only when second stage of labour was prolonged because this itself could be a cause of foetal distress. If FHR did not show improvement or else showed deterioration and labour did not ptogress satisfactorily caesarian section was resorted to. Sedation to the patients was given as and when required.

The colour of the hind water was noted and also if the baby was covered with meconium. Apgar score of the new born was immediately recorded. Any other notable feature e.g. cord round the neck, length of the cord, true or false knots in the cord and the morphology of the placenta was also studied.

Observations and Results

Ttable 1 shows the character of the foetal distress. Maximum number of cases of foetal distress had bradycardia with irregularity (73-20.3%) and it was in this group that we had maximum number of failures after giving rheomacrodex.

In 36 cases (10.0%), the FHR was normal but the liquor was stained with meconium, 17 (4.71%) cases failed to respond to the given treatment, the rest were successfully treated.

Table II shows the condition of liquor and its relation with FHR.

According to this table out of 324 patients who showed changes in the FHR, 159 (49.07%) had clear liquor, 112 (34.5%) had both hind and fore waters stained with meconium, whereas only 53 (16.04%) cases showed colouring of hind waters alone with meconium. In majority of the cases (49 out of 165 i.e.

TABLE I

Signs of Foetal Distress

Foetal heart changes with or without meconium	Meconium stained liquor with normal FHR	No. of cases	Percentage	Successful cases		Failed cases	
				No.	%	No.	%
1	2	3	4	5	6	7	8
Tachy	—	70	19.4	68	19.8	2	11.8
Tachy & brady	—	38	10.5	37	10.7	1	5.9
Brady	—	52	14.4	49	14.2	3	17.6
Tachy with irr.	—	37	10.3	36	10.5	1	5.9
Brady with irr.	—	73	20.3	68	19.8	5	29.4
Tachy & brody with irr.	—	54	15.0	50	14.5	4	23.5
Normal FHR	Yes	36	10.0	35	11.2	1	5.9

Tachy. = Tachycardia; Brady. = Bradycardia; Irr. = irregularity.

TABLE II
Condition of Liquor

Condition of liquor	Changed foetal heart		Normal Foetal heart	
	No.	%	No.	%
Clear liquor (both hind & fore waters)	159	49.07	—	—
Meconium stained liquor (both hind & fore waters)	112	34.05	30	83.3
Meconium stained liquor (only of hind waters, fore waters clear)	53	16.04	6	16.8

29.7%) the entire body of the babies was also covered with meconium.

Out of 324 cases, in 160 (49.3%) cases the FHR returned to normal within half an hour, 88 (27.11%) patients took one hour, whereas 15 (4.6%) patients took as long as 2 hours. Seventeen (4.7%) women showed no improvement in the FHR or else if FHR returned to normal, this was only for a transitory period.

Table III shows the common causes of foetal distress. The commonest cause of foetal distress was cord round the neck of the baby.

TABLE III
Causes of Foetal Distress

Cause of foetal distress	Number	Percentage
Cord round the neck	95	26.3
Toxaemia of pregnancy	26	7.2
Post maturity	4	1.1
Occipitoposterior position	39	10.8
Placental insufficiency	8	2.2
Unknown cause	99	27.5
More than one cause	89	25.3

On analysis of 17 unsuccessful cases it was found that in 7 cases there was no change in FHR/min after administration of Rheomacrodex, in 5 cases FHR decreased by 6-20/min, in 3 it increased by 20/min and in 2 cases it became irregular. The changes in FHR were noted within 40/min of drug used. Commonest reason for foetal distress was cord around neck in 7 cases (2 had tight cord), 3 were postmaturity cases, 1 had toxaemia of pregnancy and in 6 cases the cause of foetal distress could not be diagnosed.

The mode of delivery in 11 cases (64%) was by lower segment caesarean section and in the rest delivery was conducted with the help of outlet or mid-cavity forceps. Eleven babies cried at birth and their Apgar score was 6 to 7, 6 were asphyxiated with Apgar score 4-5, out of these 1 was severely asphyxiated. There were in all 4 (1.1%) neonatal deaths and none of these was related to Rheomacrodex administration.

Discussion

Rheomacrodex with a molecular weight of 40,000 has been used mainly for improving the blood flow in various disorders characterised by peripheral ischaemia. The mode of action is largely undetermined, although it has been shown to reduce the viscocity of the blood and the intravenous sludging of erythrocytes without affecting the coagulating mechanism or blood typing (Thorsen and Hint 1950; Long *et al* 1961).

Rheomacrodex consists of polymerised glucose molecules with glycoside linkage 1-6 with a small proportion of links of 1-3 and 1-4, hence dextran could conceivably be broken down by polysaccharide

depolymerising enzymes. It is metabolized and joins the common metabolic pool, has been amply shown by 14 C studies in the animals (Gray *et al* 1951) and in man (Hellman 1951). Bienenstock and Harding (1964) failed to demonstrate any significant rise in blood sugar of patients on a constant diet after a three day infusion. Blood sugar was estimated according to the method of Folin and Wu (1920). Alkaline Copper reagents may give rise to false blood sugar reading, because copper forms a complex with dextran.

Rheomacrodex consistently improves the blood flow at capillary level and this has been shown in both laboratory and clinical experiments (Gelin 1956, 1957; Borgstrom *et al* 1959; Thorsen and Hint, 1959). The value of rheomacrodex in acute arterial insufficiency was demonstrated by Bergentz *et al* (1961), who found that the fluidity of the blood was increased in the post capillary venules.

Out of 360 cases of foetal distress studied 36 cases (10.0%) had a normal foetal heart rate but the liquor was meconium stained.

The rest of the cases (324, 90.0%) showed changes in F.H.R. with or without irregularity. Out of 324 patients 49.07% patients showed clear liquor, whereas 34.5% had both hind and forewater stained with liquor, in 16.04% only hind water was meconium stained. Thus we found that 50.9% cases showed a meconium stained liquor. Our findings are in agreement with Gupta and Garg (1963) who studied only 40 cases.

In 99 cases (27.5%) we failed to find out the cause of foetal distress, but amongst the diagonosed cases the commonest cause was cord round the neck. Occipito posterior position and toxaemia of pregnancy were the next most common offenders (10.8% and 7.2% respectively).

In 160 cases (49.3%) the foetal heart rate returned to normal in 30 minutes after starting rheomacrodex infusion, 88 cases (27.16%) took 60 min. thus making a total of 76.5%, whereas 17 (4.7%) women showed no improvement in foetal heart rate even after 120 minutes of rheomacrodex infusion. Gupta and Garg (1973) in their series observed that 58.3% cases showed improvement in 30 minutes a figure slightly higher than ours but agree with us in the finding that (27.8%) women improved in FHR in 60 minutes thus making a total of 86.1%. Jones (1964) has reported somewhat lower figures (74% in 60 minutes). The success rate achieved by the intravenous infusion of rheomacrodex in the present series has been to the tune of 95.2% but in 4.72% we failed to achieve any improvement Gupta and Garg (1973) have also reported a success rate of 95%. Jones (1964) has reported a success rate of 82% in his series of 50 cases.

The mode of delivery in the 324 cases who improved with rheomacrodex infusion in our series was quite encouraging. Two hundred and fifty-two (77.7%) delivered normally, whereas 72 (22.2%) cases needed either outlet or midcavity forceps because of prolonged second stage. Thus we observed that caesarean section could be avoided in 90% cases of foetal distress in first stage of labour if they were managed with low molecular weight dextran "rheomacrodex".

Summary and Conclusions

An intravenous infusion of 500 ml.—1000 ml. of rheomacrodex was used in 360 cases of foetal distress in first stage of labour. Foetal distress was alleviated in 90% cases and usual delivery took place in 77.7% cases, whereas 22.2% of cases

required outlet or mid cavity forceps. We have observed that the commonest indication for a caesarian section is foetal distress. We have in the present study, found that a large number of caesarian sections could be avoided by the use of intravenous rheomacrodex in cases of foetal distress. No special technique or equipment is required for its use.

The advantage of rheomacrodex over dextran is that it does not affect the cross matching of blood (Powley, 1963). We in our series did not encounter any reaction of rheomacrodex. Thersen (1949) reported that the incidence of reactions of all types associated with the infusion of solutions of dextran was only 0.8%, compared with 8.2% of reactions blood transfusion.

This drug should be used with caution in patients with cardiac lesions. Intravenous infusions should be given carefully because leakage from the vein may cause local oedema and tissue damage. It is contraindicated n a few cases like thrombocytopenia, pulmonary oedema and sepsis.

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