COMPARATIVE TRIAL OF DACCA SOLUTION AND A LOW-SODIUM CONTAINING SOLUTION IN INTRAVENOUS THERAPY OF NON-CHOLERA DIARRHOEA

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Introduction and Rationale

Dacca Solution containing Na^+ = 133, K^+ = 13, CO_2^- = 48 and Cl^- = 98 mEq/l is used for treating cholera as well as non-cholera diarrhoea. In many thousands of cases treated at C.R.L. no complications were seen. There were however some discussion as to its suitability for use in paediatric cholera as well as non-cholera diarrhoea of both children and adults who loose a smaller amount of sodium in stool. At the request of W.H.O. Geneva, a comparative trial was initiated to find out the efficacy of Dacca Solution and the solution suggested by W.H.O. for correction of dehydration and electrolyte balance. The solution suggested by W.H.O. was called by us the "Diarrhoea Solution" and has a composition similar to the Dacca Solution except for the contents of sodium and chloride, 116 and 80 mEq/l and glucose 44 mMoles/litre. This presentation is a preliminary report of the trial conducted in non-cholera diarrhoea only.

Materials and Methods

As a first step in the study, patients above 5 years of age with a history of diarrhoea of less than 24 hours duration and who had not been treated with fluid or antibiotic outside were selected for the study. After obtaining an arterial blood sample for chemistry and plasma sp.gr. routine IV therapy was started with either the Dacca Solution or the Diarrhoea Solution. The later solution was manufactured as a single lot in plastic bags at the Institute of Public Health. All patients were kept under clinical surveillance and without food for 24 hours but was allowed to drink distilled water from a measured amount given at their bed side. No antibiotic was allowed for 72 hours. Input and output of fluids were carried out at 4-hour and then 8-hourly for the duration of diarrhoea.

Results

A total of 49 patients have been studied, 10 were positive for Vibrio cholerae and being small in number have been excluded from this analysis. Among the 39 non-cholera diarrhoeal patients who were subjected to this analyses, two were shigellas and one salmonella type-C presenting as acute diarrhoea. From the rest, no pathogenic organism could be grown from the rectal swabs obtained twice at 24-hour interval.

Table 1 shows the mean age of the patients belonging to the Dacca Solution group (N = 11) and the Diarrhoea Solution groups (N = 28) were 30 and 27 years with a mean body weight of 37 and 34 kg. respectively. Approximately 30% of both the groups were severely dehydrated on admission, the rest being moderately dehydrated.

Figure 1 shows the rate of correction of dehydration and acidosis in patients on either type of solution. It is clear that there were no difference between the two types of solutions during the 48 hours. The same was true for sodium also. There was however, a small difference in the 72-hour value for sodium; the mean value for patients on Diarrhoea Solution being a little lower. However this was not statistically significant.

Intake of oral water during the first 24 hours is shown in Table 2. It is clear that there is no difference between the groups receiving the two types of solution. Sodium excreted in the urine is shown in the same table. Patients on Dacca Solution excreted a marginally higher amount of sodium.

Table 3 shows the mean concentration of glucose in blood of patients at intervals. Although the range was fairly large, none developed clinical hypoglycaemia. Chemical hypoglycaemia did occur in some of the patients on both the groups, particularly at 24-hour during which no food was given.

Concentration of electrolyte in stool is the basis of rehydration therapy in cholera and other diarrhoeas. Table 4 shows the results in some of the patients where a spot sample could be obtained by rectal catheter. It is apparent that sodium values in these patient are quite high. Loss of bicarbonate and potassium are also considerable and not much below the mean value of 40 found in cholera.

During of diarrhoea in non-cholera patients is usually short compared to cholera. Table 5 shows the result in these patients. Eleven out of 39 patients did not purge at all after admission. Amongst the 28 patients who did purge, five stopped in 24-hour. All except one stopped putting out liquid stool in 48-hours.

Discussion

It is clear from the results that in this group both the solution are equally effective. The so called high concentration of sodium in Dacca Solution did not cause any problem or raise the amount of water intake and *vice versa*. Sodium excretion in urine was marginally higher in the Dacca Solution group.

The small quantity of glucose in Diarrhoea Solution was not enough to prevent chemical hypoglycaemia in some patients.

Future Plans

The present study in older children and adults has cleared the way for a trial in small children and infants with certain precautions and modifications in the protocol. Small children not only constitute the bulk of patients affected by cholera and non-cholera diarrhoea, they are also the principal victims of hypoglycaemia and electrolyte imbalances. It is possible to cut down the requirement of blood to a considerable extent. Instead of the whole battery of blood tests like pH, CO_2, Na^+, K^+, Cl^-, pl.sp.gr. sugar and osmolarity only CO_2, Na^+, K^+, pl.sp.gr. and sugar will suffice. Only 1.5 ml of whole blood will suffice. Measurements in stool and urine need not be changed.

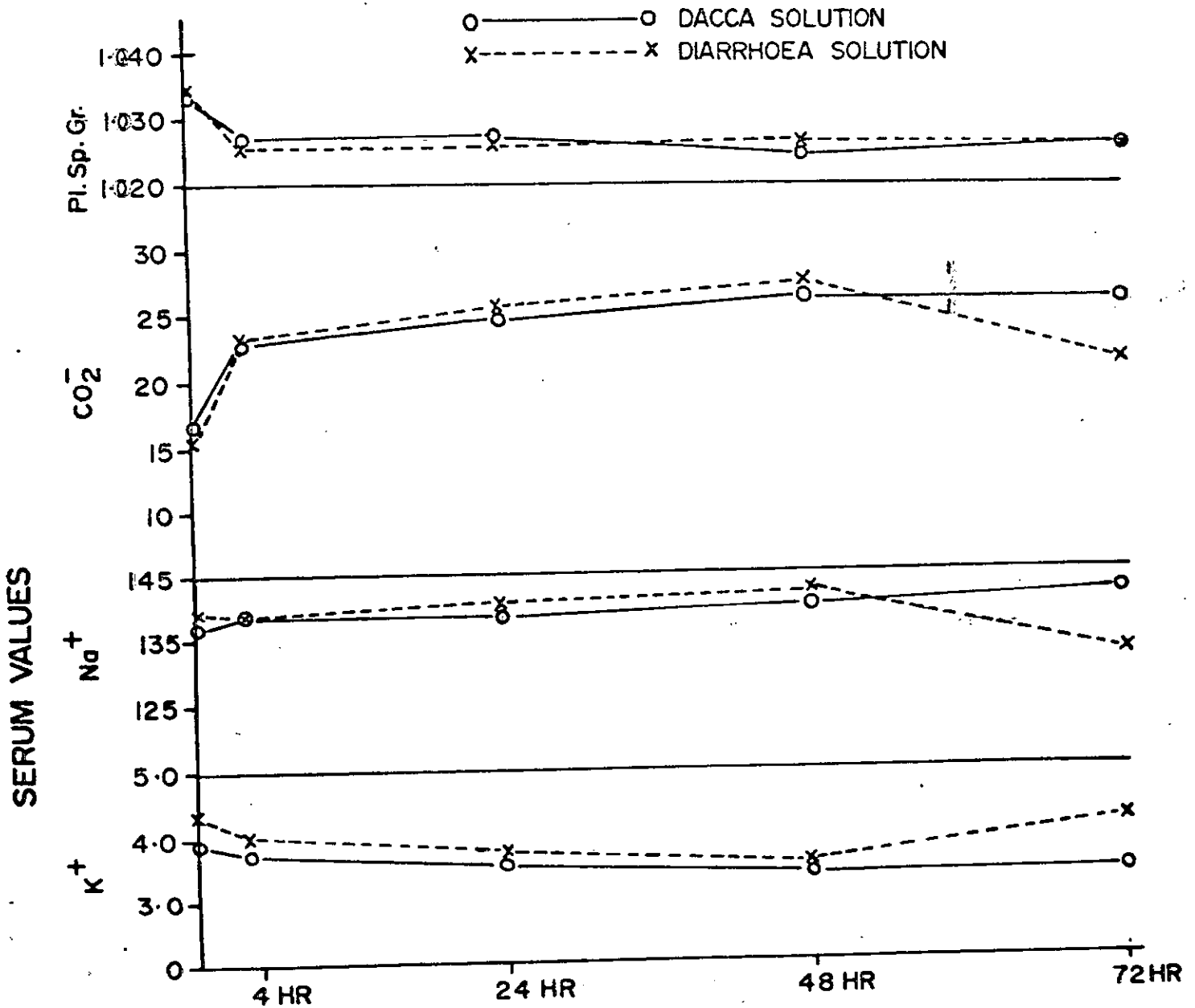
o——o DACCA SOLUTION
x- - - - - - - - x DIARRHOEA SOLUTION
SERUM VALUES
Pl. Sp. Gr.
1·040
1·030
1·020
CO_2^-
30
25
20
15
10
Na^+
145
135
125
K^+
5·0
4·0
3·0
0
4 HR
24 HR
48 HR
72 HR

TABLE 1

AGE, BODY WEIGHT (DISCHARGE), ADMISSION PULSE VOLUME AND DEGREE OF DEHYDRATION IN NON-CHOLERA DIARRHOEA

	Dacca Solution N = 11	Diarrhoea Solution N = 28
Age in years (mean and range)	30.1. (12-50)	26.7 (8-55)
Weight in kg.(mean and range)	36.8 (17.5-53.3)	33.9 (15.5-54.2)
No.pulseless on admission	4 (36%)	13 (50%)
No.severely dehydrated on admission	3 (28%)	9 (32%)
No.moderately dehydrated on admission	8 (72%)	18 (65%)

TABLE 2

MEAN ORAL INTAKE OF WATER AND EXCRETION OF SODIUM IN URINE DURING 1ST 24 HOURS IN NON-CHOLERA DIARRHOEA

	Water intake (in ml)	Sodium in urine (in mEq)
Dacca Solution	333 ± 234*(1) (9 ml/kg)	84 ± 67
Diarrhoea Solution	377 ± 457(2) (11 ml/kg)	71 ± 52

*(1) All drank water
(2) 4/28 did not drink water

TABLE 3

CONCENTRATION OF SUGAR (mg/100 ml) IN BLOOD IN PATIENTS RECEIVING DACCA AND DIARRHOEA SOLUTIONS

	Dacca Solution		Diarrhoea Solution	
	Mean	Range	Mean	Range
0 Hour	101 ± 28	55-182	102 ± 18	65 - 129
4 Hours	68 ± 15	44- 99	64 ± 11	49 - 88
24 Hours	58 ± 9	34- 75	56 ± 12	41 - 90
48 Hours	75 ± 14	54-102	71 ± 14	44 - 94
72 Hours	77 ± 8	57- 87	76 ± 11	60- 88

TABLE 4

ELECTROLYTE CONCENTRATIONS (in mEq/l) OF
SPOT STOOLS IN NON-CHOLERA DIARRHOEA

	Dacca Solution				Diarrhoea Solution		
	N	Na^+	K^+	CO_2^-	N	Na^+	K^+	CO_2^-
0 Hour	9	102±24	36±20	34±13	18	105±26	30±17	44.5±10
4 Hour	7	85±26	43.1±18	33.1±13	17	87±39	40.8±18	43.1±10
24 Hour	6	87±35	48±29	26.2±16	6	99.8±24	28.5±19	42.4±10

No stool could be collected at 48 and 72 hours

TABLE 5

DURATION OF STOOLING IN NON-CHOLERA DIARRHOEA TREATED WITHOUT ANTIBIOTIC

	Dacca Solution N = 11	Diarrhoea Solution N = 28
None after admission	3	8
For 8 hours	8	20
For 9-24 hours	8	15
For 25-48 hours	4	10
For 49-72 hours	0	1
For more than 72 hours	0	1

PROCEEDINGS OF THE 9TH MEETING OF THE SCIENTIFIC REVIEW AND TECHNICAL ADVISORY COMMITTEE OF THE CHOLERA RESEARCH LABORATORY

(a)

and

REPORTS OF THE COLLABORATIVE STUDIES BETWEEN CENTER FOR MEDICAL RESEARCH AND CHOLERA RESEARCH LABORATORY

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