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Intraperitoneal Fluid Therapy in Children

by

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Abstract

The administration of intraperitoneal fluid to 56 children, with gastroenteritis and dehydration, admitted to the Department of Child Health Dr. Soetomo Hospital, was discussed.

The authors especially considered the practical aspects and the danger arising from the administration of intraperitoneal fluids.

Although none of the patients died, some did show restlessness, meteorism, a raised leucocyte-count and a small rise in body temperature.

The authors are of the opinion that the administration of intraperitoneal fluids is not free of danger and it should be reserved for emergency situation only.

Introduction

The administration of fluid to overcome dehydration in children with gastroenteritis is undoubtedly important.

The method of rehydration used is not only dependent on the degree of dehydration, but also on the facilities available and the situation in which the fluid is administered. Two problems are commonly encountered, when attempting to rehydrate children: 1) the lack of trained personnel in remote areas; 2) the reluctance of many parents to allow their children to be admitted to hospital. One way of overcoming these problems that must be considered, is the use of intraperitoneal fluid administration. This method of rehydration was discussed at the WHO Rehydration Course in Surabaya (Pierce, 1971).

Intraperitoneal fluid administration is not extensively used, despite the fact, that this method has been available for more than 50 years. It was initially described by Blackfan and Maxcy (1918) and afterwards there have been many other reports, a.o. (Carter, 1953; Huckstep, 1962).

The use of this method in adults is unsatisfactory, because the fluid absorbed is insufficient to replace the fluid-loss through diarrhoea. However in children the situation is different, and the results obtained by this method of rehydration are

good (Mahalanabis et al., 1970; Ransome Kuti et al., 1969).

The purpose of this research was to find out how far intraperitoneal fluid administration can be effectively applied to the rehydration of children, and to note any side-effects or complications associated with this method.

Material and methods

Fifty-six children, who had been admitted to the Department of Child Health, Dr. Soetomo Hospital with gastroenteritis and moderate dehydration, were included in the study. Patients with associated diseases or severe malnutrition were excluded from the study.

The fluid was administered with a sterile infusion set, which was inserted perpendicularly one or two centimeters below the umbilicus. The fluid given was a mixture of normal saline and 5% glucose, in a ratio of 2 : 1. This fluid was warmed prior to infusion. The total amount of fluid given was 80 ml/kg body weight, administered rapidly in two phases, each with the amount of 40 ml/kg body weight every 4 hours.

With this regime, it was anticipated that the dehydration could be overcome (Pierce, 1973), "maintenance" electrolytes were given orally.

Before and four hours after the administration of fluid, each patient

was examined and the following data were recorded: body weight, pulse and respiration rate, body temperature, state of consciousness, degree of dehydration, the presence of meteorism, the frequency of diarrhoea and vomiting, and the urine output.

Laboratory tests included: leucocyte counts, serum protein levels (using refractometer), PCV (micro-method), serum electrolytes (flame photometer) and CO₂ levels (Van Slyke Method). These tests were also performed on each patient, 24 hours after the intraperitoneal fluid infusion.

In cases of uncontrolled dehydration or when any complication arose, intravenous fluid was administered using Ringer's lactate solution or a mixture of normal saline, glucose and sodium bicarbonate.

Results

Out of the 56 patients included in the study, 36 were males and 20 females. The ages of the patients ranged from 2 to 18 months, details of which are recorded in the tables: 1, 2, 3, 4, 5, and 6 below.

Age	Total
0 — 5 months	8
6 — 12 months	38
13 — 24 months	10

Discussion

Ransom Kuti et al. (1969) and Mahalanabis et al. (1970) showed

the effectiveness of intraperitoneal fluid replacement in children with moderate and "borderline" severe dehydration. This method of fluid administration is usually effective, provided that the fluid-loss through the faeces does not exceed 8 ml/kg body weight/hour (Mahalanabis et al., 1970).

It has been estimated that a dose of 80 ml/kg body weight of fluid, administered intraperitoneally, will be absorbed in 4 to 6 hours (Pierce, 1973).

From the 56 patients were found that, at 8 hours after commencing intraperitoneal fluid administration, 89.3% were fully rehydrated, 7.1% were still mildly dehydrated, whereas only two patients required further infusion.

The first phase of fluid administration in itself, is not sufficient to rehydrate a patient. This can be seen from those patients who showed improvement within 4 hours after commencing intraperitoneal fluid administration. In these cases the rise in body weight after the initial phase of fluid administration, was only 0.6% (statistically not significant, $p > 0.10$). However there was a significant rise in body weight, 4.4% ($p < 0.01$) after the second phase of fluid administration.

It appears that there were more patients with diarrhoea during the

first phase of fluid administration compared with the second phase (see table 2). This is a factor, which cannot be overlooked in explaining the increase in body weight during the second phase of fluid administration. Ransome Kuti et al. (1969) described a similar situation, showed that most of the diarrhoea stopped in 6 hours after the administration of intraperitoneal fluid itself does not increase the incidence of diarrhoea.

The laboratory findings showed a significant fall in P.C.V. and plasma protein suggesting the presence of fluid retention. In two patients (3.6%) the dehydration was not controlled by intraperitoneal fluid administration, it became progressive that is was necessary to give intravenous fluid. It was necessary to delay the second phase of fluid administration with two patients in order to explain why the patients had an acutely distended abdomen, or a significant rise in body temperature (from 37° C to 39° C).

Ransome Kuti et al. (1969) reported 14 (13.3%) failures out of 105 patients, who had had intraperitoneal fluid rehydration. In these 14 cases it was necessary to administer intravenous fluids. The peritoneal membrane is a non selected membrane and diffusion of electrolytes occurring down the concentration gradients (Ransome Kuti et al., 1969).

The results of electrolytes examination in 10 patients revealed that all had isotonic dehydration (Na. = 133 mEq/L), mild hypokalemia (K = 4.09 mEq/L) and acidosis (CO₂ = 11.8 vol.%). As can be seen from the Na, K, Cl levels there was no significant overall effect on electrolyte balance before or after the administration of intraperitoneal fluid ($p > 0.10$).

Although the acidosis was not completely reversed; it can be expected that the body itself will resolve this problem. Many other workers are of the opinion that the administration of intraperitoneal fluid is safe in children (Blackfan and Maxcy, 1918; Carter, 1953; Huckstep, 1962; Ransome Kuti et al., 1969), however Mahalanabis et al. (1970) noted that this is so only if an aseptic technic and sterile fluid is used. There is always a danger of bacterial infection of the peritoneum when using this method.

Significant rises in the leucocyte counts and body temperature after the administration of intraperitoneal fluid, necessitate one to consider the possibility of infection, though it should be realized that these changes may be the result of peritoneal irritation alone.

Mahalanabis et al. (1970) did not report any case of discomfort or respiratory disturbance in patients being given intraperitoneal fluids. However Ransome Kuti et al.

TABLE 1 : *The degree of dehydration*

Degree of Dehydration	Before infusion	4 hours after infusion	8 hours after infusion
—	—	15 (26.8%)	50 (89.3%)
Mild	—	35 (62.5%)	4 (7.1%)
Moderate	56 (100 %)	4 (7.1%)	— (0.0%)
Severe	—	2 (3.6%)	4 (3.6%)

TABLE 2 : *Body weight*

Body weight Phase	Average weight	Percentage rise	Signed Ranksum test of significance
Before infusion (O)	X : 694 gm	—	—
4 hours after infusion (I)	X : 6985 gm	0-I (0.60%)	p > 0.10
8 hours after infusion (II)	X : 7170 gm	0-II (3.24%)	p < 0.01

TABLE 3 : *Diarrhoea*

Phase Diarrhoea	I	II
+	32 (60.4%)	9 (17%)
—	21 (39.6%)	44 (83%)

TABLE 4 : *State of Consciousness*

Phase Sensorium	Before (O)	4 hours (I)	8 hours (II)
Normal	26	23	21
Restless	23	32	32
Apathetic	6	1	3
Sleepy	1	—	—

TABLE 5 : *Meteorism*

Phase Sensorium	Before (O)	4 hours (I)	8 hours (II)
±	5	47	47
—	51	9	9

TABLE 6 : *Laboratory findings*

Phase Lab. Exam.	Before	24 hours	Signed Ranksum test of Significance
P.C.V	36.8 ± 4.20	33.4 ± 3.35	p < 0.01
Plasma protein	742 ± 1.02	640 ± 0.99	p < 0.01
Na	133.63 ± 4.99	134.6 ± 3.63	not significant
Cl	102.2 ± 8.19	99.4 ± 6.77	not significant
K	4.09 ± 1.40	3.49 ± 1.45	not significant
CO ₂	11.80 ± 3.01	13.65 ± 2.74	0.01 < p < 0.05
Leucocyte count	8411	11,772	p < 0.01
Temperature (C)	37.7 ^o	38.20	0.01 < p < 0.05
Pulse rate	127	126	not significant
Respiration rate	40	37	0.01 < p < 0.05

(1969) noted that out of 62 of their patients, 10 underwent much discomfort during the fluid administration and another two developed dyspnoea (although this occurred after premedication with promazine).

Many of our patients were irritable and showed signs of meteorism. This was most pronounced during the initial four hours of fluid administration (see table 4 & 5).

Though many of our patients appeared very pale after receiving the intraperitoneal fluid, their pulse rate remained stable suggesting that the cardiovascular system was not affected. However, we did see obvious dyspnoea in two of our patients. Generally we noted a decreased respiratory rate, which — though small in amount — was significant ($0.01 < p < 0.05$).

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