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## CHOLERA

method of

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### Principles of Therapy

Replacement of water and electrolytes lost in stool and vomitus is the basis of cholera therapy. The following method has been used in our hospitals with a mortality of less than 1 per cent. The care of all cholera patients is greatly facilitated by the use of the Watten cholera cot.

### Rehydration and Correction of Acidosis

Intravenous rehydration is the treatment of choice. Our standard solution, known as 5:4:1, contains 5 grams of NaCl, 4 grams of NaHCO<sub>3</sub> and 1 gram of KCl per liter. This solution has the electrolyte pattern of the average adult cholera stool, i.e., 133 mEq. of Na, 48 mEq. of HCO<sub>3</sub>, 98 mEq. of Cl and 13 mEq. of K. This solution may be used for infants and children if water is given orally.

Severely dehydrated patients are given a quantity of this solution equal to 10 per cent of their body weight rapidly by vein. In the most severe cases rehydration is often begun into the femoral vein with an 18 gauge needle. As soon as peripheral veins become apparent a second infusion is started.

The severity of dehydration is assessed by observation of clinical and vital signs, and the

adequacy of replacement is indicated by the reappearance of radial pulses, skin turgor and a moist tongue. Some of the patients are drowsy or even comatose on admission. Unless initial therapy restores the patient to an alert mental state within one hour, some complication is present.

Patients with moderate to mild dehydration but who are not hypotensive are given an amount equal to 5 to 2.5 per cent of their body weight on admission, or they can be treated with an oral 5:4:1 replacement solution, described later.

The majority of admissions to our cholera ward are pediatric patients. Scalp vein needles, 21 to 23 gauge, are invaluable for starting and maintaining intravenous therapy in young patients. The external jugular, femoral and scalp veins as well as arm and leg veins should be used particularly in severe cases.

### Maintenance Therapy

The basis for maintenance hydration is the replacement, volume for volume, of fluid lost in stool, vomitus, urine and sweat. The careful collection, measurement and recording of stool volume is essential. Vital signs and stool volume should be checked every hour in patients with a stooling rate of more than 700 ml. per hour so that the rate of intravenous replacement can be adjusted to match stool losses.

Patients with lower stooling rate can be checked every 4 hours for a balance of intake and output.

### Oral Therapy

Only within the past two years has oral therapy been feasible. Hundreds of adult patients have been treated with oral therapy alone or oral therapy in conjunction with intravenous fluids. The oral solution contains 110 millimoles of glucose, 120 mEq. of Na, 48 mEq. of HCO<sub>3</sub>, 15 mEq. of K and 87 mEq. of Cl per liter of drinking water. It is desirable that it be warmed to 40 to 45° C. before oral administration. Only adult patients who can handle the cup should be allowed to drink. The solution can be given, however, by thin plastic oro- or nasogastric tubes connected to an infusion bottle. The use of this oral solution has reduced the requirements for intravenous fluids by 70 to 80 per cent. This is important in isolated areas where sterile solutions are scarce and expensive.

When oral maintenance therapy is used, 750 to 1500 ml. per hour is given during the first 4 hours, depending upon the degree of initial dehydration and stooling rate. Thereafter, the volume of stool and vomitus collected during the preceding 4-hour period indicates the volume of

oral solution to be given during the current 4-hour period. If, however, losses exceed the intake, the negative balance must be corrected with intravenous fluids. Additional intravenous fluid is also required if hypotension or oliguria develops. Oral therapy has not been adequately studied in children.

### **Alternate Intravenous Solutions**

It is advantageous during an epidemic to use a single standard solution for all patients, but several other solutions may be used. If only isotonic sodium chloride and isotonic sodium bicarbonate or lactate solutions are available, 1 liter of the bicarbonate or lactate solution should be given first, followed by 2 liters of isotonic sodium chloride. An intravenous solution containing sodium acetate instead of bicarbonate or lactate is highly effective.

### **Alternate Oral Therapy**

Since potassium is well absorbed by cholera patients, potassium losses can be replaced orally. Children who are alert may be given green coconut water or bananas as sources of potassium.

### **Antibiotic and Chemotherapy**

Tetracycline eliminates the vibrio from the intestine, reduces the stool volume and shortens the average period of diarrhea from 5 to 2 days. Adults should be given 250 mg. every 6 hours; children should receive 5 to 10 mg. per kg. of body weight on the same schedule. Medication should be continued for 5 days. Shorter courses of therapy may not eradicate the vibrio, and the patient may thus be discharged and become a factor in the spread of the disease.

Furazolidone, 100 to 200 mg. every 6 hours in the adult is effective but eliminates the vibrio from the stool more slowly. Chloramphenicol is also effective.

### **Other Drugs**

Drugs other than replacement fluids and antibiotics have no known therapeutic value in cholera and may be harmful.

### **Complications**

**Vomiting.** Volumes of vomitus are small compared to stool volumes, but they must be measured, recorded and replaced. Most patients have vomited before admission, but vomiting rarely persists beyond the first 8 hours of therapy. The use of antiemetic drugs in cholera has not been studied because adequate rehydration and maintenance eliminate vomiting.

**Hypoglycemia.** Hypoglycemia is associated with cholera, especially in children. One per cent glucose concentration in the intravenous solution will prevent this complication, but if lethargy or convulsion occurs, 25 to 50 ml. of a 50 per cent solution of glucose should be infused intravenously after obtaining a blood specimen for glucose analysis.

**Hypokalemia.** Rapid infusions of sodium bicarbonate to correct acidosis or of glucose to correct hypoglycemia may depress plasma potassium levels and increase the need for potassium therapy. Potassium can be administered by mouth or by vein.

**Hypocalcemia.** Tetany is seen during the intensive fluid and electrolyte treatment of cholera but is easily controlled by the *slow intravenous* administration of calcium gluconate.

**Muscle Cramps.** Cramps in the rectus abdominus or in the calf of the leg are common during the acute phase of cholera but disappear with rehydration.

**Aspiration Pneumonia.** Pneumonia has been seen principally in a few pediatric cholera patients who have vomited. Suitable antibiotic therapy is added to the basic cholera therapy.

**Uremia.** Uremia usually occurs in patients who have remained at home in shock for long periods before arriving for treatment. The management of uremia is discussed elsewhere in this text.

### **Diet**

After dehydration and acidosis are corrected, appetite returns promptly and a soft or regular diet is well tolerated. This is especially helpful in administering extra potassium.