Symposium on Clinical Aspects of Fluid Therapy

Basic Problems of Fluid Therapy*

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Since fluid therapy is the clinical application of the body fluid pathology, the bases of fluid therapy remain in the consideration of biochemical pathology of the body fluid in patient.

1) Fluid volume and composition of the body

Although the measurement of the body fluid is not yet quite accurate, we estimated total body water by dilution space of anti-pyrine, NAAP or heavy water (DHO), extracellular water by dilution method of mannitol, thiocyanate or bromide, and intracellular water was calculated from the difference.

In the composition of the body in normal adults, the average value of total body fluid volume was 58.2% of the body weight, while in obese subject 40% and in lean subject 70%. Intracellular water was 1.5-2 fold of extracellular water, and in the aged subjects extracellular water was slightly increased and intercellular water was a little less than the younger person.

In fluid therapy the volume to be given is not easily determined. The surface area may be safer standard for the volume estimation. We have been using the standard surface area of the Japanese as 1.48 m.², but recently calculated surface area in 3,200 subjects was 1.6 m.² in male and 1.45 m.² in female.

2) Insensible loss and metabolic water

Insensible weight loss was measured using a special balance by which change of 5 g. can be estimated. Insensible loss in normal subjects was over 1 kg. and often over 2 kg., but in patients in bed it was 500-1,100 g./day or about 600 g./m.²/day. Though insensible

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weight loss is not equal to insensible water loss, fat may be consumed in severe patients, the difference of the both may be so small that can be neglected in fluid therapy. However, insensible gain of water or metabolic water, which is about 200-300 cc, should be considered in fluid therapy, it is safer to calculate the volume of water to be given to patients as insensible loss minus metabolic water.

3) Basic volume of replacement

To the basic requirement of fluid replacement to the patient with no oral intake and with no abnormal fluid loss other than urine, we use the standard 1,400-1,800 cc./day. As to salt 50-70 mEq. of sodium or 3-4 g. NaCl/day, and 50-60 mEq. K is added when the patient has adequate urine volume. This standard of volume of water and salt may be reasonable in the homeostatic limits of safe parenteral fluid therapy of Talbot.

4) Electrolyte disturbance

Electrolyte disturbances can be estimated by making Gamblian diagram of serum or by clinical observation of body fluid exchange. In order to make the osmolarity normal the rate of electrolyte solution to glucose solution should be changed, and to make electrolyte composition in normal correlation the adequate electrolyte solution should be chosen.

5) Consideration for intracellular space

In fluid therapy the intracellular space, though can not be directly known, should be considered especially on potassium and protein. In our balance study of wet muscle of fasting rabbit, before and after giving Talbot's solution, we observed potassium goes easily into intracellular space. As to protein, we noted the administration of essential aminoacids could improve the nitrogen metabolism even in chronic renal failure as indicated by decreasing NPN and urinary nitrogen excretion.