SHORT COMMUNICATION

Oral rehydration in the therapy of simple diarrhea in infants and toddlers

Dolezel Z, Kopecna L, Bartosova D

*IInd Pediatric Clinic, Medical Faculty, Masarykiensis University, Brno, Czech Republic.***zdolezel@med.muni.cz**

Abstract

Acute diarrhea in infants and toddlers is frequent. Especially severe dehydration increases the risk of mortality in these children. In the therapy for uncomplicated diarrhea (dehydration no more than 9 % of body weight loss) it is possible to use oral rehydration solutions (ORS). They are prepared easily, applied immediately, and the composition is also optimal for the body fluids of patients. ORS may be used in general pediatric practice but also during the treatment in hospital. This short report brings new aspects and practical considerations for the use of ORS by the most disadvantaged populations, as well as the need for public health. ***(Short communication)***

Several statements published (2, 3) have reported on some newer aspects in the therapy for dehydration (D) in children. The authors have presented newly drawn theoretical bases of this treatment (5, 6) and also tried to show possibility of applying oral rehydration solutions (ORS). It has been still unknown whether ORS are used in the conditions of primary pediatric care, with what frequency and effects or failure. Our experience with ORS from clinical practice has not been extensive, moreover, there are usually hospitalized children requiring the parenteral application of fluids in the initial phase of rehydration. Therefore, we should like to deal again with these problems and to initiate more concentrated interest in the use of ORS in the therapy for D. Particularly for the reason that at present there are available various preparations that can be used with advantage in the conditions of primary pediatric care as well as during hospitalization.

The success of ORS is determined by its composition — especially the content of electrolytes and bases, the kind of saccharide used, and resulting osmolality. In the past, for diarrhea provoked by Vibrio cholerae, D was utilized as the prototype for the construction of ORS. However, this disease mostly causes great loss of water and electrolytes in faeces. Therefore, the first ORS contained a high concentration of sodium (90 mmol/l) and potassium (20—30 mmol/l), glucose (111 mmol/l) was used as a sweetening agent. The development of concomittant metabolic acidosis was prevented by simultaneous presence of bicarbonates — in a form of $NaHCO_3$, so patients were given both sodium and relevant bases. However, there are significant geographical differences in the etiology of diarrheal diseases. Pathogenic agents are prevailing in industrial regions, including the Central European countries. Here, extreme loss of water, solutes do not occur in the course of diarrhea, and the rise of severe acidosis is of little frequency. In these countries, ORS with the decreased content of sodium (60—75 mmol/l) are prefered, bases are not added at all.

Glucose (G) or some of its polymeres obtained at the starch hydrolysis is most often a sugar component of ORS. Easy accessbility ond low price of saccharose (sugar used in household) could represent an alternative substitution of G, but this disaccharide also has some disadvantages. It must be broken down to relevant monosaccharides and only then resorption is possible. This process can be altered in various ways at simultaneous disease of the GIT. Moreover, a few trials with home-prepared ORS using saccharose (crystal or cube sugar) have shown that these solutions were usually oversweetened (then thay cause

IInd Pediatric Clinic, Medical Faculty, Masarykiensis University, Brno, Ist Pediatric Clinic of Internal Medicine and Oncology, Medical Faculty, Masarykiensis University, Brno, Clinic of Children Infectious Diseases, Medical Faculty, Masarykiensis University, Brno

Address for correspondence: Z. Dolezel, MD, PhD, IInd Pediatric Clinic LF MU, Children's Hospital, Cernopolni 9, CZ-662 63 Brno, Czech Republic.
Phone: +420.5.45122226 Fax: +420.5.577688

osmotic diarrhea and impair the condition) or sugar contained in them was not dissolved perfectly (the resulting ratio of osmotically active particles was not balanced). That is why G has been still used even though there have appeared some ORS utilizing glucose polymers obtained from rice. Rice containts a lot of substances with small molecular weight that have pronounced antisecretory effects, which is desirable in the therapy for diarrhea.

The effectiveness of ORS also depends on its osmolality (Osm). Under physiological conditions, the GIT tolerates the ingested fluids within a broad limits of Osm values. The balance with the levels of Osm in the internal environment of the organism (normal value 290±5 mmol/kg) is reached by the secretion of water and electrolytes, and only then the resorption from the intestinal lumen is realized. In the course of uncomplicated diarrhea, ill children are usually partially dehydrated and have insufficient energetic intake. In the initial phase of treatment, it is rather decisive to prevent the deepening of water loss. From this view, it is advantageous to administer an ORS that is isoosmolal/isotonic or slightly hypoosmolal/hypotonic. The original ORS used according to the WHO recommendation was slightly hyperosmolal/hypertonic. The resulting Osm of ORS is determined by reciprocal ratio between osmotically active substances and a solvent. Particularly sodium and glucose are osmotically active in ORS. With the recommended sodium concentration of 60—75 mmol/l and glucose 111 mmol/l, the final Osm of ORS is really isoosmolal or slightly hypoosmolal towards patient‘s Osm.

In routine practice, there is sometimes problematic relationship between the ORS application and breast-feeding/formula feeding. The original WHO solution for oral rehydration has a very low energetic value — only 80 kcal/l. Recent recommendation (however, provided that clinical state of a child with diarrhea is not altered conspicuously) is a follows:

1. if an infant is breast-fed, breast-feeding can go on and can be combined with ORS,

2. if an infant is given any kind of formula feeding, it can be also combined with ORS; however, the administration of milk with decreased content of lactose or lactose-free milk is advantageous in this method.

For the sake of interest, it is suitable to mention that the efforts of finding out an optimal ORS that could consider even other unfavourable aspects accompanying acute diarrheal disease have been going on. Solutions containing, for example, soluble fibre, salts of zinc (its optimal intake in food neutralizes the effects of some toxin of E. coli, then it also acts even as oxygen scavenger) or adjusted bacterial cultures (particularly those from Lactobacillus family) have been taken into consideration (4, 7, 8).

In our conditions, both in the field practice and hospitals, preparations ORS 200 (made by HIPP) and Kulíšek (made by GOLDIM, s.r.o., Rašínova 422/II, 392 01 Soběslav) can be applied at present in the therapy for uncomplicated diarrhea of infants/toddlers. Manifacturers of the two agents enclosed a detailed prospectus which enables an easy and simple dosage appraisable not only at home but also on travels, holidays, etc. ORS 200 is determined for immediate use (according to the manufacturer, this preparation is suitable for infants since the 4th month of life), solution Kulíšek (it can be used from the 1st week of life) is prepared before its application by mixing with water. The price for 200 ml of ORS 200 preparation is 30 Kč, 1 bag of Kulíšek (for the preparation of 250 ml of solution) is 5 Kč, the solutions are available at the chemist’s, and in the Czech Republic they do not burden the so-called medicament lump sum of general practitioners for children. Both solutions contain natrium citrate that contributes, in comparison with the original WHO solution, to conspicuously better taste and thus even to supposed good tolerance.

The aim of our short statement was to show the problems of oral rehydration in children, to present some supplementary data and to provoke our colleagues in primary as well as hospital care to discuss their practical experience. At the some time, we know that mainly in field practice this method of rehydration can be limited by passive/unsuitable approach of parents of ill children, but even conservatism and rigid working stereotypes of health-care workers can play an important role (1).

References

1. Bachárová L, Hlavačka S, Rusnáková V: Basic estimation of needs for training in evidence-based medicine in Slovakia. Bratisl Lek Listy 2001; 102: 218—225.

2. Doležel Z, Kopečná L: Novější trendy v terapii dehydratace. P. 22—24. In: Bánovčin P, Zibolen M, Nosáľ S (Eds): Diagnostika a terapia v pediatrii VII. Martin, JLF UK 1999.

3. Doležel Z, Kopečná L, Bartošová D: Recentní pohled na léčbu dehydratace. Pediatrie pro praxi 2001; 2: 152—153.

4. Duggan C, Nurko S: „Feeding the gut“: The scientific basis for continued enteral nutrition during acute diarrhea. J Pediatr 1997; 131: 901—808.

5. Holliday MA, Friedman AL, Wassner SJ: Extracellular fluid restoration in dehydration: a critique of rapid versus slow. Pediatr Nephrol 1999; 13: 292—296.

6. Meško D, Pullmann R, Nosáľová G: Vademékum klinickej biochémie. Martin, Osveta 1998, 1647 p.

7. Rhoads M: Management of acute diarrhea in infants. J Parenteral Enteral Nutr 1999; 23: S18—S19.

8. Wapnir RA: Recent progress and future aims in the formulation and use of oral rehydration solutions. Int Pediatr 2000; 15: 205—214.

Received September 8, 2001.
Accepted September 12, 2001.