

Field Medicine in Times of Uncertainty: *A Novel Method of Enema-Based Rehydration*

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Abstract

Objective: In-the-field treatment of symptoms consistent with the clinical diagnosis of cholera in infants and toddlers.

Design: Observational Case Study

Setting: Field hospital and recovery camp in earthquake-ravaged Port-au-Prince, Haiti.

Population: 36 infants and toddlers having symptoms consistent with a cholera diagnosis.

Intervention: A bowel evacuation and rehydration consisting of saline and/or D5 or Lactated Ringers, and probiotic/prebiotic inserted directly into the rectum of the symptomatic child.

Results: The primary outcome was the rapid decline in dehydration and diarrhea symptoms in all 36 infants and toddlers treated.

Conclusion: The field treatment delivered to the population was effective in reducing and eradicating the observed symptoms in the field.

Background

It is estimated that approximately two million children under the age of five die from dehydration as a result from gastroenteritis; this accounts for 18% of all deaths of children under 5.¹⁴ Commonly known forms of rehydration include the use of oral rehydration salts (ORS) or oral rehydration (ORT) and IV rehydration. In the 1800's a third form of rehydration (enema/colonic) was created and perfected by Russell Thacker Trall, M.D. (1812-1877) Dr. Trall published works such as "Diseases of the Throats and Lungs" (1861), "Diphtheria" (1862), "Digestion and Dyspepsia" (1874), and "Hand-Book of Hygienic Practice" (1865) which used water-based therapies as their mechanism of

cure.¹⁷ Water based healing therapies were discussed by Dr. Trall at a meeting at the Smithsonian Institute on the death of soldiers fighting in the Civil War. In his presentation he says:

*"The soldiers of our camps and hospitals were dying off fast of typhoid fever, pneumonia, measles, dysentery, etc., and quite unnecessarily. I knew that the application of our system of hygienic medication would save most of their lives."*¹⁸

As I.V. rehydration became readily available, deaths attributed to diarrhea and dehydration saw a significant decline. However, for practical and clinical considerations, it may be time for all three forms of rehydration -- not only oral and I.V. but also enema -- to be made available to health care workers in the field¹⁵. When to choose each version of rehydration may depend on location, availability of rehydrating agents, and the underlying cause for the dehydration. If there is a need to counter a bad intestinal microbe in the field, enema based rehydration using various techniques may be best as it brings the possibility of treating/displacing/killing the microbe directly in the colon. The use of probiotics/prebiotics, if available, may be complementary to rehydration therapies.

Introduction

¹⁷ Edited Appletons Encyclopedia, Copyright © 2001 Virtualology™ April 2014
<http://www.famousamericans.net/russellthachertrall/>

¹⁸ *THE TRUE HEALING ART: Or, HYGIENIC vs. DRUG MEDICATION AN ADDRESS* Delivered at the Smithsonian Institute, Washington, D. C. by R. T. TRALL, M.D. New York, Fowler & Wells, Publishers 753 BROADWAY Reprinted 1880. Water-Care Journal, March 1880

At 16:53 Haitian time (21:53 UTC) on Tuesday, January 12, 2010, a magnitude 7.0 earthquake occurred with an epicenter near the town of Léogâne, 25 km (16 miles) west of Port-au-Prince.¹ Casualty numbers are estimated by the Haitian government at 230,000², but may be closer to 90,000.³ Six months after the earthquake, an estimated 26 million cubic yards (20 million cubic meters) of debris remained, making most of the capital impassable and leaving thousands of bodies buried. Relief camps built of shelter boxes, tents, and tarps housed an estimated 1.6 million, and nearly no transitional housing had been built. Most of the camps had no electricity, running water, or sewage disposal, and the tents were beginning to fall apart.⁴ The ongoing Haiti cholera outbreak is the worst epidemic of cholera in recent history, according to the U.S. Centers for Disease Control and Prevention.⁵ As of January 2013, more than two years after the earthquake, cholera has killed more than 7,900 Haitians.⁶ The outbreak began in mid-October 2010 in the rural Center Department of Haiti, about 100 kilometers (62 miles) north of the capital, Port-au-Prince. By March 2011, it had killed 4,672 people and hospitalized thousands more, however earlier cases were reported.^{7 8 9} It is thought that the Nepalese soldiers brought cholera to Haiti when they joined the U.N. Peacekeeping Force in 2010 by allowing sewage from their camp to be spilled into a nearby river.¹⁰ Approximately one in 20 (5%) infected persons will have severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock. Without treatment, death can occur within hours.¹¹

Methods

Design

This study was a case series in the field in earthquake-ravaged Port-au-Prince, Haiti, of children and toddlers exhibiting symptoms consistent with the clinical diagnosis of Cholera.

Setting of Uncertainty

Our team arrived Friday, April 30, 2010 and worked in various camps for ten days, including a day at Miller Hospital. We came self-contained with p.o. antibiotics, probiotics, wound care supplies, several

hundred I.V. bags, and appropriate needles and tubing. Partnering with Naturopaths International, Artis Research, and a local charity, we worked in the temporary communities of Haiti comprised of shelter boxes and UN tents. On Tuesday, May 4, 2010, frequent aftershocks led to an absence of medical support. As we arrived, we found a line of patients waiting, along with two Creole (Haitian) translators, so we set up our team in a “shack on a hill” and went to work.

Intervention

Within an hour, our first dehydrated patient showed up with a typical presentation for a dehydrated infant, with sunken fontanels, lethargy, dry lips and oral mucosa, and rapid breathing. We then received a brief history from the mother that the baby was six months old, and had been vomiting with diarrhea for 10 hours. This presentation and timeline was consistent with the clinical diagnosis for Cholera.¹² Her attempts to breast feed or rehydrate had been unsuccessful. Recently the infant’s diarrhea had stopped and her diaper was dry. Quickly came the concern as to how a non-invasive cardiologist could possibly handle a rush of very sick infants, toddlers, children and adults. There was no field test or lab nearby to confirm the suspicion of cholera, but clinically it was identical to what is listed in textbooks. Another challenge was that our pediatric I.V. skills were not sufficiently developed to work effectively in this environment. So in the spirit of necessity being the mother of invention, we plugged tubing into a 250 cc bag of lactated ringer’s solution, and snipped the end off the plastic line. The line was lubricated at the tip of the tube and placed 3 inches into the baby’s rectum as the drip was started. Our goal was to start with 25 cc, and then allow the baby to evacuate it out. At first the baby was placed prone on the mother’s lap, and then after 25 cc, we moved the baby to a 45-degree angle and let the baby evacuate. This presented with varying degrees of success. Sometimes the baby or toddler self evacuated (with aggressiveness), and other times we needed to compress the abdomen in order to make the evacuation more successful. In a few cases, it poured out similar to how it was run in. This process of fill and evacuate was continued for up to 250 cc, and then a slow drip directly into the rectum of 9% saline at around 2-3 ml/min (approximately)

was initiated. If the child was rehydrating but not as responsive we would change to a .5% dextrose solution with .45% or 9% saline until the patient would re-animate. At the end of the rehydration cycle, a powdered prebiotic/probiotic as *Genestra HMF Forte* (Human Micro Flora) by Seroyal USA, Pittsburgh, PA, was placed directly into the child's rectum, by opening up a capsule of a prebiotic/probiotic, and finishing the rehydration's last 50-75 cc. The prebiotic/probiotics were developed by the consortium of Canadian company *Genestra (Seroyal)* as *Human Micro Flora (HMF)*, and *Lab4 (U.K.)* Each individual capsule provided 10 billion colony forming units (CFU) of probiotics as *Lactobacillus acidophilus* (CUL-60 & CUL-21), *Bifidobacterium bifidum* (CUL-20), *Bifidobacterium animalis subsp.lactis* (CUL-34), as well as 100 mg of fructooligosaccharides (FOS). We chose to add the prebiotic/probiotic into the final stage due to its effect with other known intestinal infections such as *C. difficile*.¹³ One advantage of the treatment was its simplicity: We simply had a mother, sitting on a chair in the shade with her baby lying prone or supine on their lap and the I.V. bag hanging from a tree branch. Our peak patient flow was ten patients (subjects) at once. (Fortunately there were plenty of trees and shade near our "shack.") It took approximately 80-100 minutes to perform each intervention, depending on the degree of the issue. In the future, it may be advantageous to start with enema-based rehydration, and as the subject reanimates, move to oral rehydration (ORT). In this instance, only enema-based rehydration was performed in the clinical setting, but it was suggested to the subjects that they continue oral rehydration upon discharge.

Results

In 16 hours we treated over 125 people for various conditions, including diarrhea. A member of the crew was sent to report the incident to Miller Hospital and Notre Dame. However, when we returned to the "shack on a hill" 48 hours later, we found there was no follow up done, possibly due to the localized aftershocks. As Haiti is politically hazardous, we cannot be sure if the hospitals ever received the message, but we verified that there was no "cholera alert" reported. However, upon return, we were pleased to find that all 36 toddlers and infants were alive and thriving, with no symptoms of

dehydration, diarrhea, or the potential cholera. ** We attempted to verify that the same 36 toddlers and infants we treated initially were the ones present in our follow up, by having the mothers sign in once again with their babies name, age, weight (if they knew it), and symptomology. We then had our translator do their best along with our staff to match up each subject to their therapeutic intervention.

Strengths and limitations of study

The study had both strengths and weaknesses. Among the weaknesses was a lack scientific method applied to the "Shack on the Hill Medical Center," as well as the overall diagnostics of the population. If we had been able to better anticipate the conditions before arriving in Haiti, we would have brought Carey Blair media and rectal swabs to confirm the diagnosis in the event we encountered potential cases of cholera.¹⁴ We learned later that a crew from one of the hospitals went to the field site three days after our follow up, but found no recurring diarrhea to treat, and several new cases. They did not, to our knowledge, plate samples in an effort to rule in or out a diagnosis of cholera. Despite the "lack of scientific method," the strengths of the study included that the procedure is easy to perform in the field, low risk, and serves as a low-cost method of bowel evacuation, rehydration, and flora correction. It should be considered for either a research trial or for use again in a field situation. Eventually, with proper study, enema-based rehydration may be listed along with I.V. and oral rehydration (ORT) as either a standalone therapy or as a pre-ORT adjunctive option. If necessity is the mother of invention, we think we should put this mother's invention into use. It may well save thousands of lives.

**Clinical Observation, no testing, no scientific verification, and minimal documentation.

Contributors: DW drafted the manuscript. DW conceived and supervised the study, and conducted the procedure in the field. HU commented on and edited the draft. DW is the guarantor. DW would like to honor contributions from Scott Atran Ph.D., Rich Davis, Barry Ritz, Ph.D., Gottfried Kelermann, Ph.D., and Richard Garwin Ph.D. All authors have read and approved the final version of the manuscript for submission.

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This study may be approved for data sharing, but it has not been explored to date. There is no additional data available. There is no apparent competing of interests or conflict of interests either directly or indirectly related the funding the parties or products used. None of the companies who produced the products participated in the funding of the study.

¹¹ Center for Disease Control and Prevention 24/7: Saving Lives and Protecting People, Cholera - *Vibrio cholerae* infection, <http://www.cdc.gov/cholera/general/#symptoms>

¹² IBID

¹³ Plummer S. et al. Clostridium difficile pilot study: effects of probiotic supplementation on the incidence of C. difficile diarrhea: Int Microbiol 2004; 7: 59-62

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¹⁵ Dippenaar, Hanneke et al. Homemade Sugar-Salt Solution for Oral Rehydration: Knowledge for Mothers and Caregivers. *South African Family Practice* Vol. 47(2) 2005: 51-53

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⁵ "Rapport de Cas" (PDF) (in French). Ministere de la Sante Publique et de la Population. 12 December 2012. Archived from the original on 12 December 2012. Retrieved 20 November 2012.

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⁷ PAHO's Interactive Report of Cholera Outbreak

⁸ "Cholera cases found in Haiti capital". MSNBC. 23 October 2010. Archived from the original on 26 October 2010. Retrieved 9 November 2010.

⁹ UN will not compensate Haiti cholera victims, Ban Ki-moon tells president

World body invokes legal immunity to rebuff claims despite studies identifying UN peacekeepers as source of the outbreak, Rashmee Roshan Lall in Port-au-Prince and Ed Pilkington in New York ,The Guardian, Thursday 21 February 2013 17.49 EST

¹⁰ *After Bringing Cholera To Haiti, U.N. Plans To Get Rid Of It*, Richard Knox

<http://www.npr.org/blogs/health/2013/01/12/169075448/after-bringing-cholera-to-haiti-u-n-plans-to-get-rid-of-it> Posted 1/12/2013