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Intravenous Fluid Management in Infants, Children, and Adolescents: A Summary of Consensus Statements from the Philippine Pediatric Society Task Force on Fluid and Electrolyte Therapy

Francisco E. Anacleto, Jr.,MD,*[1] Christina E. Hoyumpa-Adan,MD,[2] Mellinor Aspuria-Ang,MD,[3] Novette Regina M. Lagunzad,MD,[4] Ma. Victoria C. Ribaya,MD,[4] Marilou G. Tan,MD,[5] Herbert Michael G. Uy, MD[4] and Arturo C. Ludan,MD[6]

Abstract

Objective. To formulate consensus statements for general pediatricians and subspecialists on the intravenous fluid (IVF) prescription in previously-well infants, children, and adolescents.

Design. Comprehensive search of the medical literature, supplemented with basic physiologic concepts and consensus opinion of task force committee members.

Participants. The Philippine Pediatric Society (PPS) formulated a task force group composed of pediatricians with expertise in the field of nephrology, gastroenterology, emergency and critical care to draft the statements. The PPS board members together with representatives from the various accredited hospitals reviewed and revised the statements.

Methods. The task force identified hospitalized previously healthy and well-nourished pediatric patients requiring parenteral fluid therapy who are at risk of developing life-threatening fluid and electrolyte disorders. A comprehensive reference list on IVF treatment protocols was collected. The narrative is dissected into the different phases of fluid therapy.

Results. Ten consensus statements are proposed for the management and monitoring of infants, children, and adolescents requiring IVF therapy. General considerations initiate the report. Principles of fluid resuscitation, rehydration, replacement, and removal are discussed with emphasis on the basic physiologic concepts on fluid and electrolyte balance in pediatric patients.

Keywords: Intravenous fluids, parenteral therapy, consensus statements, pediatric patients

INTRODUCTION

One of the most difficult and controversial concepts in the practice of pediatric medicine is parenteral fluid therapy in infants, children, and adolescents. From the seminal works of Darrow, Finberg, Crawford, Holliday, Ludan, and other renowned "body fluid physiologists", the knowledge of the principles of fluid and electrolyte therapy forms the backbone of acute pediatric care and inpatient management.

The PPS Task Force on Fluid and Electrolyte Therapy, consisting of emergency physicians, intensivists, gastroenterologists, and nephrologists, aims to realign, rationalize, and regulate the conventional and current prescription practices on fluid and electrolytes to better serve the Filipino child. With the dearth of formal evidence, the formulation of consensus statements is based on direct translation of pathophysiology to clinical practice.

The consensus statements are divided according to the different phases of fluid management: *"resuscitate rapidly, rehydrate rationally, replace regularly, and remove routinely"*. This dissection further emphasizes the priorities in fluid management and frames a physiologic picture of the basic components of water and electrolyte therapy.

*Chairman, 2017 PPS Task Force on Fluid and Electrolyte Therapy
[1]Department of Pediatrics and Department of Physiology, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines
[2]Consultant, The Medical City
[3]Pediatric Critical Care Specialist, St. Luke's Medical Center, Global City & Faculty, FEU-NRMF Institute of Medicine
[4]Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines
[5]Pediatric Gastroenterologist, Consultant, Philippine Children's Medical Center, Capitol Medical Center, & Our Lady of Lourdes Hospital
[6]Pediatric Gastroenterologist, Consultant, Capitol Medical Center

Advances in Pediatric Sepsis: Pediatrics in Review

E. Vincent S. Faustino, MD, MHS*

Abstract

Sepsis continues to kill an inexorably high number of children worldwide. Recent pediatric clinical practice guidelines advocate the use of bundles to improve the recognition and early treatment of sepsis. These sepsis bundles are low-cost and can improve outcomes in children with sepsis even in resource-limited settings. The purpose of this presentation is to discuss the rationale, implementation, and results of the use of sepsis bundles in children, as well as advances in the understanding of pediatric sepsis, with recent trials on supportive therapy that is relevant to the care of children with this condition.

INTRODUCTION

Recently, in an article published in the New England Journal of Medicine, a group of prominent critical care specialists advocated for the World Health Organization to recognize sepsis as a global health priority.(1) The group listed a number of recommendations for member countries to consider. They requested the member countries to develop national policies to improve the prevention, diagnosis and treatment of sepsis. They also encouraged the general assembly and the director general to identify successful approaches for integrating timely diagnosis and management of sepsis.

Sepsis has always been in the repertoire of academicians but it hasn't really crept into public awareness. Sepsis should not only be treated as an academician's disease but that it is a public health problem that kills people and, therefore, it should be treated as such.

DEFINITION AND EPIDEMIOLOGY

What is sepsis? For years, the definition of sepsis being used in medicine has not been truly evidence-based. But in 2016, a group of adult critical care practitioners reviewed the evidence and revised its definition. Sepsis is now defined as a life-threatening organ dysfunction caused by a dysregulated host response to infection.(2) In layman's terms, sepsis is a life-threatening condition that arises when the body's response to infection injures its own tissues and organs. The main difference between an infection and sepsis is that with an infection, the body regulates itself and controls the response, such that the body's response does not go awry. In sepsis, this response is inappropriately much more than what the infection requires resulting in a life-threatening condition.

For practitioners to be able to identify sepsis quickly, the sepsis-related organ function assessment score was proposed, which is a simplification of the sepsis definition. There are 3 main factors to consider: respiratory rate > 22 breaths per minute, altered mentation, and systolic blood pressure ≤100 mmHg. While this is an adult definition, it can also be used in adolescents who basically have adult physiology.

A severe form of sepsis is Septic Shock, a subset of sepsis in which the underlying circulatory and cellular or metabolic abnormalities are profound enough to substantially increase mortality. To diagnose this, a patient needs to have sepsis, persistent hypotension requiring vasopressors to maintain a mean arterial pressure of >65 mmHg, plus some measure of organ dysfunction or tissue hypoperfusion, such as serum lactate level ≥2 mmol/L despite adequate volume resuscitation.

Unfortunately, in pediatrics, we still use the definition for sepsis that was promulgated in 2005.(3) This definition requires the presence of a change in body temperature, tachycardia, hyperventilation, and elevated leukocyte count. There are current initiatives to revise this

*Associate Professor of Pediatrics, Yale School of Medicine Yale University, New Haven, Connecticut, U.S.A.
Visiting Professor of Pediatrics, Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines

Methylmalonic Acidemia in a Filipino Child: A Case Report

Therese Marie Rose C. Almeda, MD*

Abstract

Methylmalonic academia (MMA) is an inborn error of metabolism (IEM) with nonspecific signs and symptoms. This is a case of a newborn male who presented with poor suck and cry, tachypnea and hypoglycemia on the fourth day of life. He was initially managed as a case of neonatal sepsis but expanded newborn screening and subsequent urine organic acid analysis showed he had MMA. He was managed by dietary restriction of protein with organic acid free milk and given supplementary L-Carnitine, Cyanocobalamin. He was discharged well after five days of admission.

INTRODUCTION

Inborn errors of metabolism (IEM) occur in an estimated 1 in every 4,000 live births worldwide. They are individually rare but collectively common. IEMs usually present in the neonatal period but can occur at any time, even in adulthood.

Data from the Institute of Human Genetics, National Institutes of Health, University of the Philippines Manila show that from 2001-2015, Methylmalonic Acidemia is the 6th most prevalent inborn error of metabolism in the Philippines. It is seen in 1 in 50,000 but the numbers could be higher because a newborn may die before the condition is diagnosed.

A high index of suspicion is important in clinching the diagnosis because they may present with nonspecific signs and symptoms.

We present a case of Methylmalonic Acidemia in a newborn who presented with poor suck and cry.

CASE REPORT

This is the case of a newborn male who was born full term at 40 weeks age of gestation to a then 35-year-old G4P3 (3003) mother via spontaneous vaginal delivery. Birthweight was 2.9 kilograms. The patient's mother had regular prenatal check-ups and reported an untreated urinary tract infection before giving birth. At birth, patient was noted with good suck, cry, and activity and discharged from the hospital after 48 hours.

The patient was apparently well until the fourth day of life when he was noted to have poor suck, poor cry, and gasping episodes but no cyanosis. He was brought to a local hospital.

On admission at the local hospital, his oxygen saturation was 99% but tachypneic with a respiratory rate of 60. He had subcostal retractions but clear breath sounds. The patient was also hypoglycemic with an initial capillary blood glucose of 20 mg/dL. He had an episode of seizures described as stiffening of upper and lower extremities occurring less than 10 seconds. The patient was managed as a case of Neonatal Sepsis and was started on Ceftazidime, Oxacillin, and Amikacin.

On the seventh day of life, expanded newborn screening results yielded an elevated result for propionylcarnitine which is indicative of either a propionate acidemia or methylmalonic acidemia. Laboratory tests were ordered which showed an arterial blood gas with a compensated metabolic acidosis, negative urine ketones, and serum ammonia which was normal for age. Urine organic acid analysis was sent as a confirmatory test to the National Institutes of Health. This showed increased methylmalonic acid and a coordinated transfer was then facilitated to the Philippine General Hospital.

*Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines

Anterior Mediastinal Mature Teratoma Presenting as Back Pain in a Pediatric Patient: A Case Report

Heziel F. Beluso, MD*

Abstract

Introduction. Mediastinal neoplasms are rare tumors in childhood, which can manifest with various symptoms making the diagnosis very challenging. We present a case of an 11-year old patient who presented with back pain for 4 months.

Case. An 11 year old patient had back pain for 4 months. Consult to various physicians and x-ray showed a massive pleural effusion on the left lung for which then the patient was treated as a case of pulmonary tuberculosis and underwent chest tube thoracotomy in the previous institution. However, repeat chest xray after the procedure still revealed pleural effusion. Chest CT scan showed a mass in the left hemithorax prompting transfer to our institution.

On admission, patient was referred to the Thoracovascular Surgery, Pulmonology and Hematology-Oncology services. Various laboratory examinations were done and she underwent Video assisted thoracotomy surgery. Frozen section showed mature cystic teratoma. She was also found to have empyema and was given appropriate antibiotics. She then underwent left thoracotomy, excision of teratoma. She tolerated the procedure well and was sent home 5 days after the operation.

Discussion. Back pain is common in healthy children and adolescents and could be due to several causes ranging from nonspecific pain or muscle strain to more serious conditions such as tumors. Mediastinal tumors in children are rare and a common diagnostic dilemma. These masses present with symptoms that mimic other disease entities, hence clinicians should be aware of their clinical features, pathology and treatment.

Keywords: mediastinal teratoma, back pain

*Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines

INTRODUCTION

The mediastinum is the second most common site for teratomas in the pediatric population (Friedmann et al, 2003). Primary mediastinal teratomas account for approximately 8-20% of mediastinal neoplasms (Lancaster et al, 1997). Mature teratoma are more commonly seen in infant and young children, ages 0-5 years old(3) (Feryal Gun et al 2011).

Mature teratoma have various clinical presentations. One study observed that neonates present with dyspnea or respiratory distress while older children could be asymptomatic or present with symptoms of acute respiratory infection. One case series found that mediastinal teratoma could present with cough, dyspnea, fatigue and fever, abdominal and back pain and neurologic signs (Feryal Gun et al 2011).

We present a case of an 11-year old Filipino, female patient who presented with back pain for 4 months.

This case report aims to discuss the approach and management of pediatric patients with back pain and evaluation and management of mediastinal mature teratoma.

CASE REPORT

An 11-year old female was transferred to our institution due to anterior mediastinal mass.

The patient was apparently well until 4 months prior to admission when she developed non-productive cough associated with undocumented low-grade fever and night sweat. No consult was done, no medicines taken.

3 months prior to admission the patient experienced intermittent upper back pain and was noted to have malalignment of the spine. She was brought to a tertiary government hospital where chest x-ray was done with note

Japanese Encephalitis B Virus: A Case Report

Caroline Anne P. Escano, MD*

Abstract

Janapanese B encephalitis is the leading cause of vaccine preventable encephalitis in Asia. The disease is vector borne and is largely transmitted in rural areas where humans, pigs, and aquatic birds live closely together. We report a case of an 11y/o female from Nueva Ecija who suddenly develops neurologic symptoms- abnormal movements and seizures. We describe the course, work-up, and management of this neurologic case.

INTRODUCTION

Japanese B encephalitis (JE) is the leading cause of vaccine-preventable encephalitis in Asia and the Western Pacific. Disease spread through mosquito bites in vertebrate hosts, mainly pigs and wading birds. Humans can be infected when bitten by an infected mosquito, particularly *Culex tritaeniorhynchus*.

Worldwide, it is estimated that around 68,000 cases occur annually, 40,000 in the Western Pacific Region alone. JE is thus a significant public health threat. In this paper, we report an 11 y/o female from Nueva Ecija who presents with sudden onset behavioral change and abnormal movements.

CASE REPORT

This is the case of AD, 11 year old female from Nueva Ecija, who came in for behavioral change The patient was apparently well until three six weeks prior to admission, when she developed fever (Tmax 40°C), associated with dizziness and bifrontal dull headache (NRS 8/10). It was lysed with intake of Paracetamol, and had no identified aggravating/alleviating factors. There was no note of cough, diarrhea, blurring of vision, or neurologic deficits at this time.

The following day, the patient still had fever (38-39°C). This time, it was associated with non-projectile post-prandial vomiting which was unrelated to food intake. Symptoms prompted consult at a local health center, where she was given Paracetamol and an unrecalled medication. Due to the persistence of symptoms, she consulted at a local hospital where work-up was done. Urinalysis and cranial CT scan were normal, while lumbar tap showed mild pleocytosis with lymphocytic predominance, low normal sugar and high normal total protein.

She was assessed to have meningitis and was started with IV Ceftriaxone. On the second hospital day, she developed stiffening of all extremities and upward rolling of eyeballs, lasting for<15mins, associated with fever, and was lysed by Diazepam. This recurred during the following days- same semiology, every 2 days, lasting 5mins, with spontaneous resolution. At this time, the patient was still febrile (~38C) and was noted to have episodes of lock-jaw. In between seizure episodes, the patient can still converse, and had no behavioral change. However she was weak-looking and had poor appetite.

At the 7th hospital day, she was noted to have sudden decrease in verbal output described as "umuungol parati". She was unable to communicate and did not follow commands. There was also note of peri-oral twitching and tonically flexed of the lower extremities, causing difficulty in ambulation. Her upper extremities were also noted to repetitively exhibit a twisting/writhing motion.

After 2 weeks, the patient was discharged still febrile (~38C), and with decreased verbal output characterized by incomprehensible sounds (described as "umuungol"). She also had persistent involuntary movements of all extremities.

*Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines

The Effect of Oral Propranolol in Preventing the Progression of Early Stages of Retinopathy of Prematurity: A Meta-Analysis

Jeffrey I. Lappay, MD*, Kristal An C. Agrupis, MD*, Resti Ma. M. Bautista, MD*, Leonila F. Dans,MD*

Abstract

Background: Retinopathy of prematurity (ROP) is one of the leading causes of preventable blindness in the world. Premature infants less than 35 weeks and/or weighing less than 1500 grams are particularly at risk. Cost-effective, readily available and safe treatment modalities leave much to be desired.

Objectives: To determine the effectiveness of oral propranolol in preventing the progression of retinopathy of prematurity (ROP) to stages necessitating standard treatment of intravitreal Bevacizumab and/or laser photocoagulation; and to determine adverse events and effect on overall mortality related to it.

Methodology: A meta-analysis of randomized-controlled trials assessed by two independent authors. A systematic electronic search was conducted using MEDLINE, EMBASE, HERDIN, Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Trials from August to September 2016.

Participants: Randomized controlled trials on preterm infants less than 35 weeks and less than 2000 grams, with documented early stages of ROP given propranolol versus placebo or no treatment.

Outcome Measures: Primary outcome was prevention of ROP progression requiring intravitreal bevacizumab and/or laser photocoagulation. Secondary outcomes were adverse events and overall mortality.

Results: Three randomized controlled trials met the inclusion criteria. Propranolol was shown to significantly decrease the number of preterm infants in early stage of ROP requiring: laser photocoagulation and/or intravitreal bevacizumab treatment (RR 0.42; 95% CI 0.23 to 0.76; I^2=0%), and laser photocoagulation treatment alone (RR 0.49; 95% CI 0.28 to 0.85, I^2=0%). Its effectiveness in preventing ROP treatment with intravitreal bevacizumab alone was not significant, (RR 0.37; 95% CI 0.11-1.20, I^2=0%). When subgroup analysis of preterm given high-dose propranolol was done, no significant risk-difference was observed in terms of adverse events (RD 0.08, 95% CI -0.09 to 0.26, I^2=49%). Propranolol was shown to have no effect on overall mortality (RD 0.00; 95% -0.03 to 0.03, I^2=0%).

Authors' conclusions: Administration of oral propranolol at an early stage of ROP decreased the progression to stages requiring laser photocoagulation and/or intravitreal bevacizumab and laser photocoagulation alone but no significant effect in preventing intravitreal bevacizumab therapy alone. It was also shown that there was no significant difference in the occurrence of adverse events even at high-dose and on overall mortality.

Keywords: Propranolol, retinopathy of prematurity, laser phtotocoagulation, intravitreal bevacizumab

BACKGROUND

Retinopathy of prematurity (ROP) contributes to as much as 50,000 children per year with life-long vision impairment and blindness worldwide.(1) Prematurity is the most important risk factor of this disease. With the advancement in neonatal care and improvement of survival rates among preterm infants, the need for apt screening and timely treatment cannot be overly emphasized.

Several studies among animal models had documented the pathophysiology of ROP. It centers in the abnormal proliferation of retinal blood vessels. Madan and Penn,(2) postulated two distinct phases of ROP pathogenesis in 2003. The initial phase is the retardation of normal retinal vascular growth, primarily due to high oxygen tension in the extra-uterine environment after oxygen supplementation. This further aggravated by other noxious stimuli and/or to the premature withdrawal of certain maternally derived factors at the time of birth. The abnormal proliferation of the retinal blood vessels secondary to relative hypoxia hallmarks the second phase of the disease. This phase is dominated by the release of vascular endothe-

*Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines

Effectiveness of Human Milk for Prevention of Omphalitis and Decreasing Cord Separation Time: A Meta-Analysis

Faustine Richelle C. Ong, MD*, Charlotte Averill Y. Tan, MD*, Kathlynne Anne A. Senen, MD,* Jacinto Blas V. Manataring III, MD*

Abstract

Background. WHO recommends use of dry care as usual practice and chlorhexidine for home deliveries in high-risk areas. Breastmilk has immunologic and antimicrobial properties and has been explored as alternative for cord care. Review of available data may assess its effectivity against infection.

Objectives. To determine the effect of topical breastmilk on development of omphalitis and cord separation time.

Search Methods. We searched MEDLINE, Cochrane Database of Systematic Reviews and Cochrane Register of Controlled Trials, Clinicaltrials.gov and Google scholar. Relevant articles were likewise searched from bibliographies.

Selection Criteria. Randomized and quasi-randomized controlled trials evaluating the effect of topical breastmilk for cord separation time and omphalitis.

Data Collection and analysis. Data were extracted by two authors, using Review Manager for statistical analysis with fixed and random effects model. Outcomes were development of omphalitis, cord separation time and bacterial colonization.

Main Results. Search identified 9 trials. Six trials were reviewed comparing breastmilk and cord care, 2 are awaiting evaluation. Only one trial was found comparing breastmilk and chlorhexidine. Earlier cord separation was seen with breastmilk compared with dry care a mean difference 1.19, 95% CI [-1.57, -0.81]. There was however no statistically significant difference in the prevalence of omphalitis and bacterial colonization with breastmilk and dry cord care.

Authors' Conclusion. The review did not establish significant benefit for topical breastmilk in the prevention of omphalitis, but produced statistically significant evidence on decreasing cord separation time compared to dry care. More trials with larger sample sizes with less risk of bias is recommended.

Keywords: human milk, chlorhexidine, cord separation, omphalitis

*Department of Pediatrics, College of Medicine, University of the Philippines Manila, Taft Avenue, Manila, 1000 Philippines

BACKGROUND

The umbilical cord is composed of 2 arteries and a vein surrounded by a gelatinous substance which connects the maternal and fetal circulation in utero. When the baby is delivered, this is eventually clamped, cut, which will lead to its drying, and eventually falling off. Umbilical cord separation occurs usually within the 4th to 6th postnatal day, but may be as long as 14th to 18th postnatal day among preterm infants.(1) The remaining stump, prior to separation, acts like a healing wound, with the severed vessels still patent, hence acting as a possible site of infection as well as a possible point of entry for invasive pathogens.(2,3)

Cord infections, or omphalitis, presents as a spectrum, wherein it may present as an unhealthy looking cord with umbilical purulent, foul-smelling discharge, to abdominal wall erythema and tenderness, to involving systemic manifestations and at the end of the spectrum, omphalitis with signs of necrotizing fasciitis. Risk factors for cord infection include septic delivery, low birth weight, prolonged rupture of membranes, maternal chorioamnionitis, and umbilical cord catheterization.(4)

Breastmilk has long been acknowledged to be the best source of nutrients for infants. Human milk has also been known to be a rich source of protective factors such as secretory IgA, secretory IgM, lactoferrin, lysozyme, oligosaccharides, toll-like receptors and fatty acids.(5) Due to the many benefits of breastmilk, studies have been done to explore its other uses. Farahani et al. explored its effectiveness in improving rash scores among patients with diaper dermatitis. In this study,