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Original article

Safety of home parenteral nutrition during pregnancy

Miriam Theilla [a, b], Michał Ławiński [c], Jonathan Cohen [a], Eran Hadar [d], Ilya Kagan [a], Marek Perkewick [c, †], Pierre Singer [a, *]

[a] Department of General Intensive Care and Institute for Nutrition Research, Rabin Medical Center, Beilinson Hospital, Petah Tikva, Affiliated to the Sackler School of Medicine, Tel Aviv University, Israel
[b] Nursing Department, Steyer School of Health Professions, Sackler School of Medicine, Tel Aviv University, Israel
[c] Department of General Surgery and Clinical Nutrition, Medical University of Warsaw, Poland
[d] Department of Maternal Fetal Medicine Unit, Helen Shneider Hospital for Women, Rabin Medical Center, Beilinson Hospital, Petah Tikva, Affiliated to the Sackler School of Medicine, Tel Aviv University, Israel

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SUMMARY

Background & aims: Few studies have examined the effect of total parenteral nutrition which is lipid-based given throughout pregnancy to patients unable to obtain adequate nutrition by the oral route. In this study we examined the use of lipid-based home parenteral nutrition (HPN) in 7 pregnant women, commenced either before or during pregnancy, and their intra-pregnant course as well as a 2-year follow-up of their offspring is described.

Methods: HPN was formulated on an individual basis and protein administered in a dose of 0.8–1.1 g/kg during the three trimesters. Lipid emulsions included long chain triglycerides or olive-oil based formulae and all patients received trace elements. Data were collected during the course of pregnancy and at birth while infants were followed for a period of between 6 months and 2 years using medical records and questionnaires.

Results: In total, we studied 9 pregnancies (in 7 women). HPN was administered for a median of 9 months (range 3–9 months). The mean energy provided during the 1st, 2nd and 3rd trimester was 9297 ± 2797 kcal/week, 9148 ± 2629 kcal/week and 8564 ± 4059 kcal/week resp. The mean increase in weight during the pregnancy was 9 ± 5 Kg. The only complications noted during the pregnancy consisted of 3 episodes of catheter-related infections which were successfully treated by antibiotics. The infants were born after a mean of 38.00 ± 1.55 weeks of gestation, with a mean first minute Apgar score of 8.7 ± 1.8 which increased to 9.8 ± 0.4 after 10 min. The mean infant birth weight was 2.45 ± 0.37 kg. No complications were noted at birth apart from one infant who suffered from torticollis which resolved spontaneously. During follow up, a decrease in hemoglobin related to low iron levels was noted in 1 infant, 2 infants were noted to be allergic to pollen and one underwent a scrotal hernia reduction. No developmental problems have been observed, neither physiological nor psychomotor, over the 2-year follow-up period.

Conclusions: The authors suggest, based on, the current study, that lipid-based HPN for pregnant women is a safe method for meeting the nutritional demands of both mother and fetus, and may be administered throughout the pregnancy.

1. Introduction

The use of total parenteral nutrition (TPN) in pregnancy has been largely limited to hyperemesis gravidarum, a phenomenon that occurs in 0.3%–2.0% of all pregnancies, causing intractable nausea and vomiting. This may lead to nutritional deficits, weight loss as well as fluid and electrolyte imbalances affecting both mother and fetus [1]. In a retrospective study, TPN was administered to 20.4% of 599 pregnant women suffering from hyperemesis for limited periods ranging from a few days to one week [2]. The authors showed that short-term support with TPN during the early stages of pregnancy was associated with a decrease in perinatal morbidity. TPN prescribed for this indication has typically been lipid free, since there are no safety studies using lipid-based

* Corresponding author. Department of General Intensive Care, Rabin Medical Center, Petah Tikva, 49100, Israel.
E-mail address: psinger@clalit.org.il (P. Singer).
† In Memory of late Prof. Marek Perkewick.

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parenteral nutrition in pregnancy. The use of home TPN (HPN) during the later stages of pregnancy is, however, rare, being largely restricted to patients with intestinal failure, such as that resulting from short bowel syndrome, Crohn's disease or impaired emptying of the stomach [3]. A recent publication reported only 15 isolated cases in the literature of patients receiving HPN from conception to delivery [4]. Importantly, there are no clear guidelines regarding the monitoring of these patients in order to prevent the known complications of parenteral feeding, particularly as these may require frequent assessment and modification of the volume and composition of their nutrition throughout the pregnancy.

In this study we report the use of lipid-based HPN in 7 pregnant women (and 9 pregnancies) commenced either before or during pregnancy, and describe their intra-pregnant course as well as a 2-year follow-up of their offspring.

2. Subjects and methods

2.1. Participants

All women requiring HPN for more than one month during their pregnancy were included in this study which was conducted between 2012 and 2014 in 2 tertiary care centers, namely the Rabin Medical Center in Israel and the Medical University of Warsaw in Poland. Seven women, 4 from Israel and 3 from Poland, who delivered 9 children (2 women were included for 2 consecutive pregnancies), were included in the study. The study was approved by the Helsinki committees of both medical centers who waived the requirement for informed consent.

2.2. Data collection

Mothers completed questionnaires at the end of the pregnancy which included data regarding demographic details, the medical diagnosis, indications for HPN, composition of the HPN during the 3 trimesters of pregnancy, any complications related to HPN and the occurrence of obstetric complications in each trimester. Data regarding the offspring were collected from both patient medical files and via a telephone interview which was conducted with the mothers, from 6 months up to 2 years following the delivery. This included physical data, i.e. birth weight, body length at birth and head and chest circumference at birth, as well as an assessment of their motor, mental and physical development, presence of any abnormal laboratory tests, development of allergies and presence of any chronic diseases or requirement for chronic medication.

2.3. Home parenteral nutrition formulation

HPN was formulated on an individual basis according to patient weight and subsequently modified in the presence of altered electrolyte values (as determined by monthly routine blood chemistry testing) or according to the stage of the pregnancy and weight progression. Intravenous feeding as administered via Hickman and PICC line catheters which were dressed with Tegaderm film dressings (Health Care, MN, USA) applied. Protein was administered in a dose of 0.8–1.1 g/kg during the three trimesters. TPN was administered intermittently for 12 h/day, 4–7 days/week, in addition to the regular oral diet, where tolerated. Lipid emulsions used included long chain triglycerides (Intralipid 20%, Fresenius Kabi) or olive-oil based formulae (Clinomel 20%, Baxter International Inc., Illinois, USA). All patients received trace elements (70 ml/week of Addamel, Fresenius Kabi, Illinois, USA) and multivitamins (70 ml/week of Cernivit, Baxter Healthcare Corporation, Clintec Nutrition Division, IL, USA).

2.4. Statistical analysis

The data were analyzed using SPSS 21 (SPSS, Chicago, Illinois, USA). Phenomena correlation was used in order to compare continuous variables between the data. Differences were considered significant when P value ≤ 0.05.

3. Results

The mean age of the women was 32.2 ± 5.1 years, mean BMI at the onset of pregnancy 19.3 ± 2.4 kg/m^2 and all had a tertiary education. Four women received HPN on a permanent basis (for a mean of 6.4 years prior to the pregnancy) due to short bowel syndrome, whereas HPN was initiated during the pregnancy in the remaining 3 due to Antiphospholipid Antibody Syndrome with prolonged hyperemesis (n = 1) started at 2 months, ulcerative colitis (n = 1), started at 3 months and anorexia nervosa (n = 1) started at 3 months. The BMI of the patient with anorexia nervosa, who was pregnant after in-vitro fertilization, decreased to 14.5 kg/m^2 due to decreased oral intake, thus justifying nutritional support. HPN was administered for a mean of 7.8 ± 1.2 months during the pregnancies. As shown in Table 1, the mean energy provided during the 1st trimester was 9297 ± 2797 kcal/week (range 5720–13,930 kcal/week), during the 2nd trimester patients received a mean of 9148 ± 2629 kcal/week (range 6440–12,880 kcal/week) while 8564 ± 4059 kcal/week (range 2670–13,160 kcal/week) was provided during the 3rd trimester. The mean increase in weight during the pregnancy was 9 ± 5 Kg. Most of the pregnant women had normal glucose levels of 80–100 mg%, except for one woman who had a tendency for hypoglycemia which occurred shortly after eating orally and the TPN duration of administration was therefore increased to 18 h/day.

The only complications possibly related to HPN which occurred during the pregnancies consisted of catheter-related blood stream infections (CRBSI), 1 in the first and 2 in the second trimester (Table 2). Of these, 2 occurred in one woman. who presented with high fever and rigors on both occasions. Blood cultures revealed coagulase-negative staphylococci and she was treated with IV vancomicin on both occasions with good results and without the need to remove the catheter. It should be noted that this woman also suffered from chronic urinary tract infections during her pregnancy for which she received prophylactic antibiotics throughout the pregnancy. The second woman, who also presented with fever and chills, had a PICC line-related infection. Gram-positive cocci were demonstrated in blood cultures, the catheter was removed and vancomycin administered with a good response. Attempts at enriching her oral diet were successful in meeting her metabolic requirements and she therefore required no further intravenous feeding.

Four infants were delivered by normal vaginal delivery and five by Cesarean section. The infants were born after a mean of 38.00 ± 1.55 weeks of gestation, with a mean Apgar score during the first minute after birth of 8.7 ± 1.8 which increased to 9.8 ± 0.4 after 10 min. The mean birth weight of the infants was 2.45 ± 0.37 kg (Table 3) and no abnormalities were noted at birth apart from one infant who suffered from torticollis which later resolved spontaneously. During follow up, a decrease in hemoglobin related to low iron levels was noted in1 infant, 2 infants were noted to be allergic to pollen and one underwent a scrotal hernia reduction. No developmental problems have been observed, neither physiological nor psychomotor, over the 2-year follow-up period (Table 1).

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