AJPMHS GLOBAL RESEARCH NETWORK

AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 3, Issue 4, 2025 ISSN (E): 2993-2149

Modern Approach to Parenteral Nutrition in Complex Treatment of Patients with Toxic Stage of Burns

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Abstract: Parenteral nutrition (PN) is defined as IV. PP can be administered through a peripheral or central venous device, depending on the osmolarity of the solution. Peripheral PP can be administered through a peripheral venous access device. The osmolarity of the solution should be ≤ 900 mOsm/L. A solution with a higher osmolarity can lead to thrombophlebitis. Central PN requires a central venous access device for safe infusion, as the osmolarity of solutions intended for central PN is > 900 mOsm/L.

Keywords: Parental nutrition , pathogenesis, mechanism, prognosis and treatment.

Introduction: Parenteral nutrition is not usually used in patients with intact gastrointestinal (GI) tract. Compared with enteral nutrition, PP has the following disadvantages:

For patients with gastrointestinal dysfunction or conditions that require complete bowel rest, PN may be the only option, such as (1):

Certain gastrointestinal diseases in children (e.g., congenital gastrointestinal anomalies, prolonged diarrhea regardless of cause)

PN requires patients to ingest 25 to 40 mL/kg of body weight of water per day. Patients requiring fluid, energy, amino acid, lipid, vitamin, and mineral restrictions require less water (see the table of basic daily requirements for parenteral nutrition for adults).

Children requiring parenteral nutrition may have variable fluid needs and may require more energy (up to 120 kcal/kg/day) and amino acids (up to 2.5 or 3.5 g/kg/day).

The basic daily requirement for parenteral nutrition for an adult is

Individual parenteral nutrition solutions can be prepared using sterile techniques. Electrolytes in individual parenteral nutrition solutions can be adjusted based on laboratory results and changes in clinical status.

Standardized commercial solutions for parenteral nutrition are available for institutions that do not have the capacity to prepare individual solutions.

Standardized vitamin and micronutrient preparations are also available and can be added to parenteral nutrition to meet micronutrient needs. The stability of parenteral nutrition solutions depends on many factors. Clinicians should not add electrolytes to standardized parenteral nutrition solutions to avoid the risk of electrolyte precipitation. Since changes to parenteral nutrition solutions may reduce their stability, all changes (e.g., addition of electrolytes or other substances) should be reviewed by an experienced pharmacist.

The composition of macronutrients in parenteral nutrition solutions varies depending on the type of solution:

Peripheral PN: low concentration of amino acids and dextrose to maintain low osmolarity, most calories come from fat.

Central PP: High concentration of amino acids and dextrose provides more energy in less space

The dosage of amino acids is calculated based on the patient's protein needs.

Methods and Materials: The availability of mixed-fat-based lipid emulsions has changed the approach to lipid dosing in parenteral nutrition, allowing for a balance between nutrient delivery and potential side effects. Soybean oil is rich in omega-6 polyunsaturated fatty acids, which have anti-inflammatory and immunosuppressive effects. Thus, conventional lipid emulsions containing 100% soybean oil should be limited to <1 g/kg/day in critically ill patients, but can be dosed up to 1 g/kg/day in stable patients. Mixed-fat-based lipid emulsions contain combinations of soybean oil, olive oil, medium-chain triglycerides (MCTs), and fish oil, which contain less omega-6 polyunsaturated fatty acids and allow for increased total lipid intake. For adults (stable and critically ill), a lipid emulsion consisting of olive and soybean oils at 1–1.5 g/kg/day, or a mixture of soybean oil, MCT, olive oil, and fish oil at 1–2 g/kg/day, may be given. In the United States, a 100% fish oil lipid emulsion is not approved for use in adults but is used as a therapy for children with liver disease associated with intestinal failure. Additional dosing recommendations (e.g., drug admixtures; calcium, phosphorus, and magnesium content) should be reviewed by an experienced pharmacist to ensure the stability of the solution. The American Society for Parenteral and Enteral Nutrition has published recommendations for appropriate dosing of lipid emulsions (1 , 2).

If the total energy provided by amino acids and lipids is less than the total energy required, dextrose monohydrate is usually used to compensate for the deficiency. However, the maximum amount of carbohydrates is usually 5 mg/kg/min; exceeding this amount can lead to hyperglycemia. In addition, overfeeding with energy can lead to excessive CO2 production and fatty liver infiltration; Overfeeding is often associated with excessive carbohydrate intake. The use of lipid emulsions based on mixed fats allows for a reduction in carbohydrate intake and helps to reduce the complications associated with excessive carbohydrate intake.

The amount, type, and concentration of parenteral nutrition solutions will vary depending on patient-related factors, such as comorbidities and age:

For patients with heart, liver or kidney failure: volume restriction (fluid intake). For patients with diabetes: mixed oil-based lipid emulsion providing the upper part of the recommended dosing range to reduce the distribution of dextrose.

Conclusions: As with any central venous catheter, strict sterile technique should be observed during insertion and maintenance. The central line space designated for PP should not be used for any other purpose. The outer tube should be changed every 24 hours before the first PN solution packet of the day is administered. The American Society for Parenteral and Enteral Nutrition recommends the use of a 1.2-micron infusion filter with parenteral nutrition to reduce particulate exposure (1). The dressing should be maintained sterile and changed, usually every 48 hours, using aseptic technique.

If parenteral nutrition is administered outside the hospital, patients and caregivers should be educated on proper catheter care, PN insertion procedures, and how to recognize complications, including signs of infection. Skilled home care is required.

Parenteral nutrition solution is usually started with 100-150 g of dextrose on the first day. The initial volume of parenteral nutrition solution may be limited on the first day, so additional intravenous infusions may be required to meet fluid requirements.

Parenteral nutrition volumes should be increased according to electrolyte stability and clinical status. If the patient is hyperglycemic, blood glucose levels should be monitored and insulin should be administered regularly. No other insulin types are compatible with parenteral nutrition

solutions. The target blood glucose level for patients receiving parenteral nutrition is <180 mg/dL (10 mmol/L) during solution infusion. Regular insulin may be added directly to the parenteral nutrition solution as needed. The usual starting dose is 1 unit of regular insulin per 10 g of dextrose; patients with diabetes may require supplemental insulin. Working with an endocrinologist can help optimize blood glucose control.

Patients should be cared for by a multidisciplinary nutrition team consisting of a physician, dietitian, pharmacist, and nurse, if such a team is available.

Discussion: A complete blood count should be obtained. Body weight, electrolytes, magnesium, phosphorus, blood urea nitrogen, and creatinine should be monitored regularly (e.g., daily for hospitalized patients, weekly for outpatients). Plasma glucose levels should be monitored every 6 hours until the patient's condition and glucose levels are stable. Liver function tests should be monitored at least weekly, but more frequent monitoring may be necessary if the results are abnormal. Triglyceride levels should be monitored at least twice weekly in patients receiving lipid emulsions. Fluid intake and losses should be monitored continuously.

If patients are stable, blood tests may be performed less frequently. Blood tests should not be performed during PP infusion. A complete nutritional assessment (including BMI calculation, anthropometric measurements, and body composition analysis) should be repeated frequently, depending on the patient's clinical status. Adjustments to nutritional assessment may be required more frequently in critically ill patients and less frequently in stable outpatients receiving parenteral nutrition.

Approximately 5-10% of patients receiving parenteral nutrition experience complications related to central venous access.

The incidence of catheter-related sepsis has decreased with the introduction of CDC guidelines emphasizing the importance of sterile technique during catheter insertion (1). The increased use of specialized teams of physicians and nurses performing various procedures, including catheter placement, has contributed to the decline in catheter-related infections.

Infectious complications associated with parenteral nutrition have been reduced by changes in PN management, such as avoiding overfeeding, maintaining optimal blood glucose concentrations, and using mixed fat-based lipid emulsions.

Glucose disturbances are very common. Hyperglycemia can be prevented by frequent monitoring of blood glucose, titration of insulin dose in TPN solution, and subcutaneous insulin injection as needed. Hypoglycemia may result from abrupt discontinuation of concentrated dextrose infusion. Treatment depends on the degree of hypoglycemia. Recent hypoglycemia can be completely reversed with 50% dextrose IV; prolonged hypoglycemia may require infusion of 5 or 10% dextrose solution for 24 hours before resuming parenteral nutrition through a central venous catheter.

Liver complications include liver dysfunction, painful hepatomegaly, and hyperammonemia. These complications can develop at any age but are most common in infants, especially premature infants (whose livers are immature).

Liver dysfunction may be transient, evidenced by elevations in transaminases, bilirubin, and alkaline phosphatase; in response to initiation of parenteral nutrition. There may be a delayed or persistent elevation of levels due to amino acid overload. The pathogenesis is unknown, but cholestasis and inflammation may contribute to the development of this complication. Progressive fibrosis sometimes develops. Fish oil-based lipid emulsions may be useful; 100% fish oil lipid emulsion is used as salvage therapy for this complication in children.

If infants develop liver complications, amino acid intake should be limited to 1.0 g/kg/day.

Deviations in serum electrolyte and mineral levels should be corrected by changing the composition of subsequent infusions or, in the case of urgent correction, by administering

appropriate solutions intravenously. Vitamin and mineral deficiencies are rare when nutritional solutions are used correctly. An increase in blood urea nitrogen may indicate dehydration, which can be corrected by additional water administration in the form of a 5% dextrose solution through a peripheral vein or by increasing the volume of water administered with parenteral nutrition.

Volume overload (defined as weight gain of more than 1 kg per day) may occur in patients with high energy requirements requiring large volumes of fluid. A pharmacist experienced in the management of parenteral nutrition should evaluate the PN solution to determine if its volume can be reduced.

Metabolic bone disease or bone demineralization (osteoporosis or osteomalacia) may develop in patients receiving parenteral nutrition for more than 3 months. The pathogenesis is unknown. As the disease progresses, severe joint pain, pain in the lower extremities, and back pain may occur.

Adverse reactions to the use of fat emulsions (e.g., dyspnea, allergic skin reactions, nausea, headache, back pain, sweating, dizziness) are very rare, but may occur at the beginning of treatment, especially if fats are infused at a rate of > 1.0 kcal/kg/h. Transient hyperlipidemia may occur, especially in patients with renal or hepatic insufficiency; treatment is usually not required. Late adverse reactions to lipid emulsions include hepatomegaly, moderate elevations of liver enzymes, splenomegaly, thrombocytopenia, leukopenia, and, especially in premature infants with acute respiratory distress syndrome, respiratory failure. Temporarily or permanently slowing or stopping the use of the fat emulsion may prevent or minimize these adverse reactions.

Summary: Complications of gallbladder disease include cholelithiasis, sludge syndrome, and cholecystitis. These complications may be caused or worsened by prolonged stasis of bile in the gallbladder. Stimulating gallbladder contractions, increasing fat intake to 20–30% of total calories, and withholding glucose infusions for several hours per day are helpful. Oral or enteral nutrition may also be helpful. Some patients with cholestasis respond to treatment with metronidazole, ursodeoxycholic acid, phenobarbital, or cholecystokinin.

Consider the appropriateness of parenteral nutrition for patients with gastrointestinal dysfunction or diseases requiring functional gastrointestinal rest.

Calculate your needs for water, energy, amino acids, lipids, vitamins, and minerals.

Choose a solution based on the patient's age and organ function; newborns and patients with impaired cardiac, renal, or hepatic function require different solutions.

Use a central venous catheter, maintaining strict sterility during insertion and during operation.

Monitor the patient regularly for complications (e.g., central venous catheter-related; abnormal glucose levels; electrolytes and minerals; liver or gallbladder function; reactions to lipid emulsions; and volume overload or dehydration).

Anorexia, or loss of appetite, is common in patients in the terminal stages of illness.

Measures that lead to an increase in the amount of food consumed include:

Some antidepressants, megestrol acetate, and dronabinol can also stimulate appetite. Metoclopramide speeds up gastric emptying, but it may take 1-2 weeks to achieve maximum effect.

Severe dementia eventually leads to the inability to eat; such patients are sometimes prescribed enteral nutrition. However, there is no convincing evidence that enteral nutrition prolongs life, provides comfort, improves function, or prevents complications (e.g., aspiration, pressure ulcers).

Enteral and parenteral nutrition are uncomfortable and are not usually indicated for patients who are very ill or unable to eat due to dementia.

List of used literature:

1. Kurbonalievich, A. S., Mardonovich, N. R., Muxammadievich, X. M., Anvarovich, O. R., Negmatovich, T. H., & Usmonovna, B. M. (2021). Experience of the Combination of Tiflox and Immunomax in the Treatment of Trichomoniasis Combined with a Bacterial Process. Annals of the Romanian Society for Cell Biology, 2376-2380.
2. Зиядуллаев, Ш. Х., Хайдаров, М. М., & Нуралиева, Р. М. (2014). Иммунный статус здорового населения подростков и юношей. Академический журнал Западной Сибири, 10(3), 80-80.
3. Зиядуллаев, Ш. Х., Турдибеков, Х. И., Хайдаров, М. М., Исмоилов, Ж. А., & Пулатов, У. С. (2014). Генетические маркеры гиперреактивности бронхов при бронхиальной астме. Академический журнал Западной Сибири, 10(3), 19-19.
4. Мурадова, Р. Р., Хайдаров, М. М., & Бегнаева, М. У. (2021). Современные клинико-фармакологические аспекты применения нефротоксичных антибиотиков. Достижения науки и образования, (3 (75)), 98-100.
5. Мурадова, Р. Р., & Хайдаров, М. М. (2021). КЛИНИКО-ФАРМАКОЛОГИЧЕСКИЕ АСПЕКТЫ ПРИМЕНЕНИЯ ГОРМОНАЛЬНЫХ ПРЕПАРАТОВ В ОФТАЛЬМОЛОГИИ. Достижения науки и образования, (3 (75)), 100-102.
6. Мурадова, Р. Р., Хайдаров, М. М., & Омонов, Э. М. (2021). ОПТИМИЗАЦИЯ ТЕРАПИИ БОЛЬНЫХ С ОТКРЫТОУГОЛЬНОЙ ГЛАУКОМОЙ С УЧЕТОМ ПАРАМЕТРОВ СОСТОЯНИЯ МИКРОЦИРКУЛЯТОРНОГО РУСЛА ЦЕНТРАЛЬНОЙ ЗОНЫ СЕТЧАТКИ. Вопросы науки и образования, (10 (135)), 66-69.
7. Siddikov, O., Daminova, L., Abdurakhmonov, I., Nuralieva, R., & Khaydarov, M. OPTIMIZATION OF THE USE OF ANTIBACTERIAL DRUGS DURING THE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE. Turkish Journal of Physiotherapy and Rehabilitation, 32, 2.
8. Азимов, Ш. Т., Шакиров, Б. М., Карабаев, Ж. Ш., Хайдаров, М. М., & Кодиров, В. М. (2008). Ранняя некрэктомия в комплексном лечении детей с глубокими ожогами. Сб. науч. тр. II Съезда комбустиологов России:-М, 159-160.
9. Хайдаров, М. М., Мурадова, Р. Р., & Худойбердиева, Г. С. (2020). Оптимизация премедикации при хирургических вмешательствах в гинекологии. Достижения науки и образования, (5 (59)), 98-102.
10. Muxammadievich, H. M., Uktamovna, M. D., Abdullaevich, S. O., Rustamovna, M. R., & Usmanovna, B. M. (2022). BURN SHOCK IN PEDIATRIC AFTER THERMAL INJURY AND MULTIPLE ORGAN FAILURE SYNDROMES. World Bulletin of Public Health, 8, 140-142.
11. Kurbonalievich, A. S., Fayozjonovich, A. Z., Anvarovich, O. R., Abdullaevich, S. O., & Mukhammadievich, H. M. (2021). Careful Attention To The History Of Chronic Urticaria Is One Of The Important Factors Of Productive Therapy. The American Journal of Medical Sciences and Pharmaceutical Research, 3(02), 55-58.
12. Хакимов, Э. А., Тагаев, К. Р., & Хайдаров, М. М. (2019). Осложнения со стороны желудочно-кишечного тракта у детей с ожоговой травмой. Детская хирургия, 23(1S4), 64-64.
13. Хайдаров, М. М., & Мурадова, Р. Р. (2020). Гепатотоксичность лекарственных средств как одна из проблем современной медицины. Наука через призму времени, (11), 46-49.
14. Мурадова, Р. Р., Хайдаров, М. М., & Тураев, Х. Н. (2022). NEFROTOKSIKLIK-ZAMONAVIY ANTIBIOTIKOTERAPIYANING MUAMMOSI SIFATIDA

(ADABIYOTLAR TAHLILI). ЖУРНАЛ РЕПРОДУКТИВНОГО ЗДОРОВЬЯ И УРО-НЕФРОЛОГИЧЕСКИХ ИССЛЕДОВАНИЙ, 3(2).

15. Хайдарова, М. М. (2016). Особенности изменения показателей клеточного иммунитета у детей при бронхолегочной патологии, протекающей с бронхиальной обструкцией. Медицинские новости, (7 (262)), 58-60.
16. Азимбегова, С. Н., Нуралиева, Р. М., Абдурахмонов, И. Р., Хайдаров, М. М., & Тохиров, С. Т. (2022). МОДИФИКАЦИЯ ЛЕЧЕНИЯ САХАРНОГО ДИАБЕТА 1 ТИПА У ДЕТЕЙ И ПРОФИЛАКТИКА ДИАБЕТИЧЕСКОЙ РЕТИНОПАТИИ. In Биотехнология и биомедицинская инженерия (pp. 202-206).
17. Ашурова, Н., Шакиров, Б. М., Мурадова, Р. Р., Хакимов, Э. А., Хайдаров, М. М., Некбаев, Х. С., & Тожиев, З. Ю. (2022). Особенности термоингаляционной травмы у детей. In Скорая медицинская помощь-2022 (pp. 15-16).
18. Ашурова, Н., Шакиров, Б. М., & Хайдаров, М. М. (2021). ОСОБЕННОСТИ ПРОТЕОЛИЗА В РАЗВИТИИ ОСТРОЙ ОЖОГОВОЙ ПНЕВМОНИИ У ДЕТЕЙ.
19. Мурадова, Р. Р., & Хайдаров, М. М. (2020). ФОТОТОКСИЧЕСКИЕ И ФОТОАЛЛЕРГИЧЕСКИЕ РЕАКЦИИ ПРИ ИСПОЛЬЗОВАНИИ СОВРЕМЕННЫХ ЛЕКАРСТВЕННЫХ СРЕДСТВ И НЕКОТОРЫХ РАСТЕНИЙ. Вопросы науки и образования, (37 (121)), 41-44.
20. Хакимов, Э. А., Тагаев, К. Р., & Хайдаров, М. М. (2019). ГЕМАТОЛОГИЧЕСКИЕ ПОКАЗАТЕЛИ КРОВИ У ДЕТЕЙ С ОЖОГОВОЙ ТРАВМОЙ. Детская хирургия, 23(1S4), 63-63.