Jolanta Piskorz[1], Gustaw Wójcik[2,3], Barbara Sokołowska[4], Włodzimierz Bulikowski[3], Krzysztof Stolarski[1], Joanna Prokop[1]

[1]Department of Anaesthesiology and Intensive Care – Zofia Zamojska Tarnowska Regional Hospital in w Tarnobrzeg;
[2]Department of Diagnostic Imaging - Zofia Zamojska Tarnowska Regional Hospital in w Tarnobrzeg;
[3]Department of Rehabilitation, Physiotherapy and Balneotherapy - Medical University In Lublin;
[4]Health Institute – State College in Biała Podlaska

Parenteral Nutrition and Enteral Nutrition in Acute Pancreatitis
Żywienie pozajelitowe a dojelitowe w ostrym zapaleniu trzustki

Summary
Acute pancreatitis (AP) is a disease of not only the prostate, because in about 25% cases severe form developes, which results in multiple organ failure and death. Nutrition in acute pancreatitis is an integral part of the treatment. The choice of method depends on the nutritional characteristics of the patient, severity of the disease and the complications associated with it. Total parenteral nutrition is used when the use of the digestive tract cannot ensure an adequate daily intake of nutrients, or wnen there are contraindications to enteral nutrition.
AP best results were obtained by feeding patients gastrointestinally (supply of nutrients to the small bowel or the probe) and in the case of enteral feeding in conjunction with parenteral, depending on the needs of the patient. The use of only parenteral nutrition is subject to a greater number of septic and metabolic complications and a higher mortality rate compared with partial or total enteral nutrition.
Using nutritional therapy metabolism of patients should be evaluated in order to prevent complications and to assess the effectiveness of treatment.

Key words: parenteral nutrition, enteral nutrition, pancreatitis

Streszczenie
Ostre zapalenie trzustki (OZT) to choroba dotycząca nie tylko samego gruczołu, ponieważ w ok. 25% rozwija się jej ciężka postać, której skutkiem jest niewydolność wielonarządowa i śmierć. Żywienie w OZT stanowi integralną część leczenia. Wybór metody żywienia zależy od stanu klinicznego pacjenta, ciężkości choroby i powikłań z nią związanych. Całkowite żywienie pozajelitowe stosuje się, gdy drogą przewodu pokarmowego nie można pokryć odpowiedniego zapotrzebowania organizmu na składniki odżywcze, lub gdy są przeciwwskazania do żywienia dojelitowego.
Najlepsze wyniki leczenia OZT uzyskano żywiąc pacjentów drogą przewodu pokarmowego (podaż substancji odżywczych do jelita czczego przez sondę lub jejunostomię) oraz w przypadku stosowania żywienia dojelitowego w połączeniu z pozajelitowym w zależności od potrzeb pacjenta. Stosowanie tylko żywienia pozajelitowego jest obarczone większą liczbą powikłań septycznych, metabolicznych oraz większą śmiertelnością w porównaniu z częściowym lub całkowitym żywieniem dojelitowym.
Stosując leczenie żywieniowe należy prowadzić ocenę metabolizmu pacjentów, aby nie dopuścić do powikłań oraz w celu oceny skuteczności leczenia.

Słowa kluczowe: żywienie pozajelitowe, żywienie dojelitowe, ostre zapalenie trzustki

Introduction

Parenteral nutrition is administering directly into the circulatory system of the body all the necessary nutrients in a form allowing their assimilation in the right quantity and in the right proportions, according to the current needs of the organism [Dróżdż 1994]. The indications for total parenteral nutrition is the condition in which the intestinal tract is not functioning, it is not able to utilize the nutrients in sufficient quantities due to malabsorption or digestion.

Using parenteral nutrition catabolism of the patient's own tissue is limited and thus this creates the conditions to survive the critical period (Goldfinch, Socha, 1994). Contemporary parenteral nutrition, due to choosing the appropriate composition of parenteral mixtures, may also have a therapeutic effect, such as modifying the inflammatory response, enhancing immunity, relieving inefficient liver, kidneys, lungs, affecting the movement of water between cellular spaces (Ciszewska-Jędrasik, Pertkiewicz, 2004) .

Enteral nutrition is used when the patient has a well functioning gastrointestinal tract. Nutrient solutions should be introduced into the digestive tract in a place where they can be absorbed. The choice of route to this type of feeding depends on the underlying disease, the expected duration of the diets and the preferences of the patient.

Pancreatitis is a severe disease with a mortality rate of about 10%. In the course of about 80% moderate or mild, but 20 - 25% develop a severe form of the disease, which may result in organ failure and death. In AP adequate fluid intake and nutrition still creates healing problems. Despite increased knowledge derived from the study of metabolism and clinical nutrition intervention proceedings, there are many concerns regarding the optimal nutritional therapy (Lubos, 2007).

The main pathogenic factor in the development of acute pancreatitis is within the pancreatic enzyme activation and then its selfdigestion. This leads to a variety of pathophysiological changes, from mild inflammation to necrosis of the organ and the development of pancreatic infiltration. Secondary infection and reducing the flow may lead to the development of visceral septic complications and then to a multiple organ failure (Lubos, 2007).

Parenteral nutrition in acute pancreatitis is typically used in conjunction with the enternal feeding to the jejunum. In the most severe cases the patient needs surgery because of septic complications, there is respiratory failure, prolonged paralytic ileus gastrointestinal parenteral nutrition should be used, and once a patient is driven out of shock, a small amount of nutrition to the jejunum should be added.

Parenteral nutrition does not affect the course of the disease however, it prevents starvation, minimizes the loss of tissue and can maintain its activity, thus reducing the risk of surgery, and starvation if the gastrointestinal failure is prolonged (Lubos, 2007).

Parenteral nutrition is an interference with the metabolism of the body, which can cause biochemical disorders, worsen existing or lead to their disclosure [Goldfinch, Socha 1994]. It is therefore necessary to lead the constant guidance of metabolism in patients to assess the efficacy of treatment and avoid complications arising from the use of parenteral nutrition.

Żywienie parenteralne uznawane jest za jeden z bardziej zaawansowanych sposobów terapii dożylnej, jest integralną częścią opieki nad pacjentem. Dożylne podawanie składników odżywczych ratuje zdrowie i życie pacjentów, którzy nie mogą utrzymać dobrego stanu odżywienia wykorzystując przewód pokarmowy. Ryzyko związane z tą terapią musi być dokładnie rozważone w stosunku do potencjalnych korzyści z niej wynikających (Mark, 2006).

Parenteral nutrition is considered to be one of the more advanced methods of intravenous therapy, it is an integral part of patient care. Intravenous administration of nutrients saves the health and lives of patients who cannot maintain good nutritional status using the gastrointestinal tract. The risk associated with this therapy must be carefully considered in relation to the potential benefits arising from it (Mark, 2006).

Objectives

Aim of this study is to present the advantages and disadvantages resulting from the use of parenteral and enteral nutrition in acute pancreatitis.

Ethioparogenesis of the disease

Acute pancreatitis (AP) is an inflammation of the prostate and surrounding tissue sometimes caused by the release of pancreatic enzymes. The most common factors initiating are biliary disease and chronic alcohol abuse - 80% of cases. The remaining 20% are other reasons mi.in drugs, infections, hereditary factors, metabolic, and more (Mark, 2006).

Regardless of the etiology, there is an activation of pancreatic enzymes (tryptase, phospholipase A2, and elastase) within the gland. These enzymes cause tissue destruction, and activation of the complement cascade with the release of inflammatory cytokines. Therefore there sometimes occures inflamation, swelling, and sometimes necrosis. In mild acute pancreatitis an inflammatory process is limited to the pancreas. In severe cases there is a severe inflammation with necrosis and bloody flooding into the prostate and a generalized inflammatory response develops. After 5-7 days, pancreatic necrosis may become infected by intestinal bacteria (Mark, 2006).

Enzymes and cytokines that enter the peritoneal cavity cause chemical burns and create a third fluid space. These, in turn, enter the bloodstream, causing a generalized inflammatory response which might lead to the development of ARDS and renal failure. General symptoms are the result of increased capillary permeability and decrease in vascular resistance. Death within the first few days is usually caused by heart or respiratory failure (Mark, 2006).

Severe acute pancreatitis according to the Atlanta classification can be divided into two stages. The first phase takes about 7-10 days and begins with an aseptic inflammation of the gland, systemic inflammatory response syndrome (SIRS) develops, sepsis and multi-organ failure and even death occure (Poves et al. 2004). In the second phase, there is often necrosis of the pancreas. During this time, patients' lives are still at risk of infection and immune response of pancreatic necrotic amended gland (Casas, 2007).

Nutrition its importance and pathophysiological processesin ap

In patients with acute pancreatitis due to stress, inflammation and pain the basic metabolism increases, which leads to increased energy consumption. 80% of patients with severe necrotizing pancreatitis can daily lose more than 40 grams of protein, resulting in a negative nitrogen balance and it is detrimental to the course of the disease (Meier et al. 2006; Meier, Beglinger, 2006; O'Keefe, 2005).

The way of administration of nutrition is important. Protein or amino acids administered parenterally do not stimulate exocrine pancreatic function, the severity of pancreatic stimulation with enteral feeding depends on the anatomy of supply of nutrients (Lubos, 2007). The diet should be given to the jejunum by gavage established outside the Treitz ligament. However, the supply of intragastric or intraduodenal protein stimulates pancreatic secretory response, which is contraindicated in case of severe acute pancreatitis (Lubos, 2007).

Often there occurs hyperlipidemic in pancreatitis states, which may cause the disease, but also modest increases of lipids are the consequence of mastitis. However, in most published studies in humans intravenous infusion of fat stimulates the exocrine pancreas and increases disease. The plasma lipids during intravenous use should be monitored (Lubos, 2007). If fats are administered to the duodenum, there is a strong external stimulation of the pancreas, while the supply of the same amount to the jejunum minimally stimulates pancreatic function. Minimal stimulation is not specific for fat, but may occur after administration to the jejunum of any nutrient mixture (Lubos, 2007).

In the AP there is a reduced glucose tolerance as a result of reduced insulin sensitivity and insulin secretion deterioration due to damage to the pancreatic islets. Glucose should be carefully administered intravenously due to the risk of hyperglycemia. Part of this can be prevented by using exogenous insulin infusion. The supply of glucose to the jejunum is the weakest stimulus for pancreatic exocrine (Lubos, 2007).

Patients with severe illness or complications requiring surgical treatment should start nutritional therapy as soon as possible. You should always start with aggressive fluid resuscitation because there is a significant volume depletion, caused by the escape of fluid into the abdominal cavity and retroperitoneal space. You may need transfusions of 6-8 liters of fluid a day with appropriate electrolytes.

If the digestive tract is efficient enough to ensure an adequate supply of calories and nutrients there should be introduced enteral nutrition to the jejunum by gavage, in the event of side effects or inadequate supply parenteral nutrition should be included. In the absence of tolerance, enteral and parenteral nutrition should be used and possibly 10-30 ml / h elemental diet should be given to the jejunum, as shown in studies that early enteral nutrition in acute pancreatitis compared to parenteral nutrition is more beneficial in terms of lower incidence of infections, hyperglycemia and reduced mortality (Garcia, 2012).

Parenteral nutrion – monitoring, benefits and disadvantages

Parenteral nutrition is the only form of nutrition in patients with acute pancreatitis which is not recommended, but it is often necessary when there is no possibility of enteric supply. This situation exists, for example, in a prolonged paralytic obstruction. Partial parenteral nutrition is used when it is impossible to provide the right amount of nutrients by the enteral one.

The demand for essential nutrientsin the AP is the energy of about 25-35 kcal / kg mc./24h, protein 1.2 to 1.5 g / kg bw/24 h, carbohydrates 3-6 g / kg bw/24 h according to glucose, preferably not exceed 7mmol / L. Fats to 2g/kg bw/24 h, so that the concentration of triglycerides in the blood serum was higher than 2-3 mmol / l (Lubos, 2007). Parenteral nutrition should be tailored to the needs and capacity of the patient's metabolism, metabolic disorders and co-existing deficiencies or excesses.

Total parenteral nutrition should be complete, and therefore all the necessary nutrients such as amino acids, carbohydrates, fats, water, electrolytes, vitamins and trace elements, must be given in the required quantities (Lubos, 2007). In the AP one should be aware of supplementation of calcium and magnesium, as deficiencies of these elements are often observed due to the formation of insoluble calcium and magnesium soaps.

Monitoring of parenteral nutrition

Using parenteral nutrition can easily lead to serious metabolic complications and deterioration of the general condition of patients. Nutrition should be carefully monitored using the appropriate clinical and biochemical variables. In AP there is a phase of catabolism, impaired water and electrolyte and acid-base balance. Nutrition should be introduced as soon as possible, but not in the phase of severe fluid and electrolyte or acid-base disturbances, these need to be aligned.

Monitoring the nutritional therapy includes:

- daily measurements of weight and keeping information cards in order to control water balance
- testing of electrolytes (sodium, potassium, calcium, magnesium, chloride, iron, phosphate), control of the concentration of vitamins and trace elements
- testing blood glucose levels to monitor its tolerance by the body and control the insulin regimen
- frequent (depending on the clinical situation) measurements of creatinine, urea, albumin, or protein with a short half-life-transferrin, transthyretin
- liver function tests, INR
- weekly test of blood serum cholesterol, triglycerides (Lubos, 2007).

In AP there is a strong catabolism. Daily nitrogen balance should be calculated to monitor the loss of protein and supplement its deficiencies. Physiologically urinary nitrogen loss takes place in the form of urea. Using the appropriate formulas we can calculate the loss of nitrogen in the urine. For this purpose, daily urine collection is carried out and the urea concentration is determined. For the determination of nitrogen balance in patients in the catabolism we have to take into account the fact that the loss of nitrogen in them shall also be due to the elimination of ammonia. Determination of both the urea and ammonia in the urine allows a better evaluation of the loss of nitrogen from the urine.

Complications of parenteral nutrition and disadvantages of its use:

The most serious complication of nutritional therapy is the team re-nourishment (refeeding syndrome). Marinella draws attention to the underestimation of this

complication in clinical practice. This syndrome is characterized by hypophosphataemia, hypomagnesaemia and hypokalaemia, which are the result of the sharp changes in intracellular energy oversupply, particularly carbohydrates (Marinella, 2009).

Adkins said that the re-nourishment syndrome is a potentially fatal phenomenon. It can occur in patients receiving any kind of nutrition both parenteral and enteral and oral after a steady malnutrition or starvation (Adkins, 2009).

Re-nourishment syndrome is also associated with deficiencies of vitamins (especially thiamine) and fluid retention, and this leads to congestive heart failure.

Hypophosphatemia is the dominant feature of the re-nutrition. In the case of catabolism, which we have in AP for the loss of phosphate from the intracellular space. Subsequent high caloric intake leads to the release of insulin and glucose and phosphate fast movement into cells. Subsequent hypophosphatemia leads to impaired neuromuscular dysfunction of parastezjami, seizures and impaired muscle contractility, which results in a weakening of the respiratory muscles and respiratory failure. In severe hypophosphatemia rhabdomyolysis can occure. Phosphorus deficiency also leads to thrombocytopenia and clotting disorders (Lubos, 2007).

Hypokalemia and hypomagnesemia etiology is similar as in the case of phosphorus. Magnesium and potassium deficiency in blood serum leads to arrhythmias. Both hypomagnesemia and hypokalemia are the cause of neuromuscular dysfunction, weakness, paresthesias, seizures, confusion, and respiratory depression.

Niedobór tiaminy wynika z powodu szybkiego jej zużywania w procesie glikolizy. Pogarsza to metabolizm glukozy z następczą kwasicą mleczanową.

Thiamine deficiency resultsfrom its rapid wear in the process of glycolysis. This reduces the metabolism of glucose with subsequent lactic acidosis.

Other metabolic complication caused by parenteral nutrition is fatty liver. It usually occurs as a result of overfeeding, especially with glucose. Obesity is associated with increased serum of transaminases and hepatomegaly (Lubos, 2007).

Total parenteral nutrition used for a longer period of time may cause atrophy of the intestinal villi and the translocation of intestinal bacteria into the bloodstream. Buchman et al says that after 21 days without enteral villi significantly reduce their height and also the number of intestinal epithelial cells becomes reduced [Buchman 1995]. Just a small amount of nutrients to be delivered by the gastrointestinal tract, to prevent the atrophy of intestinal villi.

Parenteral nutrition is associated with a higher incidence of catherer infections by which they are administered. This may include a peripheral vein, central or arteriovenous fistulas. Another complication is venous thrombosis.

Summary and conclusions

Nutrition in acute pancreatitis is an extremely important part of treatment. The choice of method depends on the feeding characteristics of the patient, the severity of inflammation and complications resulting from the development of the disease. The most physiological way of nutrition is the way through the digestive tract - oral or by probing. Parenteral nutrition in this disease entity is typically used when the gastrointestinal tract cannot cover the total daily intake of nutrients. In severe cases of acute pancreatitis when feeding is contraindicated, such

as paralytic ileus, total parenteral nutrition is used. Sometimes it is possible to supply, in this case, a small amount of food in the intestine to prevent the atrophy of intestinal villi.

Using only parenteral nutrition in acute pancreatitis is not a good method of choice. Kalfarentzos et al conducted a prospective randomized study in patients with severe pancreatitis. Patients were treated with parenteral and enteral nutrition in the first 48 hours after admission to the hospital. It has been shown that enteral nutrition was well tolerated, with no adverse effects on the course of the disease. These patients had fewer septic complications and general complications compared with patients nourished completely parenterally. Also, the cost of medical nutrition therapy was higher in patients fed parenterally (Kalfarentzos, 2007).

Windsor at al in conducted studies that compared parenteral and enteral nutrition showed that enteral nutrition reduces the acute phase response in acute pancreatitis, reduces the severity of the disease and improves clinical outcomes. However, damage to the pancreas in the CT image actually does not change (Windsor et al. 1998).

Abou-Assi et al showed that hypocaloric enteral nutrition seems to be safer and less expensive than parenteral nutrition, but only 3% of patients had severe pancreatitis (Abou-Asi et al. 2002).

Mc Clave et al randomized patients to total parenteral nutrition or total enteral nutrition by naso-intestinal tract in a subset of acute pancreatitis from mild to moderately severe. This study demonstrated that enteral nutrition is possible in a mild and moderate pancreatitis, but the results of the two treatment groups did not differ statistically. Parenterally fed patients had a significantly higher concentration of glucose in the early days, the costs of treatment were significantly higher (Mc Clave, 1997).

Nutritional support in severe acute pancreatitis is still controversial when it comes to the merits of enteral and parenteral nutrition. Singh et al conducted a retrospective study of 130 patients with acute pancreatitis. They evaluated the therapeutic efficacy of combination therapy for enteral with parenteral nutrition. In this group of patients, where first used parenteral nutrition (in the first stage of the disease), and the second and third stages were introduced enteral nutrition, there was a greater success with treatment. Evaluation according to the APACHE II and IL-6 were significantly lower in these patients compared with the group, which was introduced earlier enteral nutrition. This study indicates that a combination of parenteral and enteral nutrition can not only improve the natural history of pancreatitis, but also reduce the incidence of morbidity and mortality (Singh et al. 2012).

Xu et al studied the effects of enteral nutrition compared with parenteral feeding on the intestinal barrier function in patients with severe acute pancreatitis. The study was performed on 63 patients: 29 were in the enteral nutrition group and 34 in the parenteral nutrition group. The concentration of endotoxin and the oxidase was determined in both groups of patients. It was observed that the concentration of endotoxin and oxidase significantly decreased in enterally fed patients, therefore, enteral nutrition improves intestinal barrier (Xu et al. 2011).

Another study carried out by Petrov and Whelan on enteral nutrition compared to parenteral administration in the course of acute pancreatitis shows that using enteral nutrition significantly reduces infectious complications and mortality (Petrov, Whelan, 2010).

Meier et al argue that enteral nutrition in acute pancreatitis provides a protective barrier of the intestinal mucosa, causing fewer metabolic complications and sepsis, and

is cheaper. However, total parenteral nutrition is reserved for patients with obstruction of the small intestine or duodenum (Meier, 2002).

Istnieje wiele badań, które donoszą o przewadze żywienia dojelitowego nad pozajelitowym w OZT. Niemniej jednak żywienie pozajelitowe często musi być zastosowane w leczeniu niedoborów żywieniowych w ciężkim ostrym zapaleniu trzustki. Niekiedy na początku choroby stanowi jedyną możliwość odżywiania pacjenta.

There are many studies that have reported a predominance of parenteral enteral nutrition in acute pancreatitis. However, parenteral nutrition must often be used in the treatment of nutritional deficiencies in severe acute pancreatitis. Sometimes on the onset of the disease it is the only possibility nutrition of the patient.

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