

Articolo originale - Original article

Long-term follow-up of home parenteral nutrition

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ABSTRACT: ***Aim:** This study evaluates septic, thrombotic, and hepatic complications, and quality of life of patients on home parenteral nutrition.*

***Methods:** The medical records of patients discharged on home parenteral nutrition from our hospital between January 1986 and March 1999 were reviewed. We had 14 patients, aged 47 ± 12 years, total follow-up time 14,260 patient-days. The major causes of intestinal failure were ischemic bowel disease and radiation enteritis. Quality of life was evaluated by the Sickness Impact Profile (SIP) and the Karnofsky Index (KI).*

***Results:** We recorded a catheter-related infection rate of 0.46 per 100 catheter-days, most of them due to coagulase-negative staphylococci (65%). The catheter occlusion rate was 0.04 per 100 catheter-days. Four patients had altered liver function tests and one had cholestasis. Two patients died of HPN-related causes. Quality of life scores were: SIP 14.6 ± 3.5 and KI 70 ± 20 (M \pm SD).*

***Conclusions:** Home parenteral nutrition ensures prolonged survival in intestinal failure. The most frequent complication was catheter-related infection. The quality of life scores were slightly decreased. (RINPE 2001; 19: 18-24)*

KEY WORDS: Home Parenteral Nutrition, Complications, Quality of life

PAROLE CHIAVE: Nutrizione Parenterale Domiciliare, Complicanze, Qualità della vita

INTRODUCTION

Home parenteral nutrition (HPN) is an established treatment for patients requiring long-term nutritional support for intestinal failure. Since the first report of a patient discharged home on parenteral nutrition in 1967, its usage has sharply increased in many countries (1). In the last report of 1997 from the ESPEN-HAN group, the mean incidence and prevalence of HPN in seven European countries (Belgium, The Netherlands, France, United Kingdom, Poland, Spain and Denmark) were of $3/10^6$ and $4/10^6$ inhabitants/year, respectively (2). The prevalence in the United States is probably 10 times higher than in these European countries (3).

The reasons for this growth are the increasing experience of specialized centers, the good overall survival rates and quality of life in HPN patients with benign diseases, and also the expanding use in cancer patients who represent the largest category on both sides of the Atlantic.

This study was designed to evaluate retrospectively the septic, thrombotic, and hepatic complications, and the quality of life of patients discharged on HPN in our hospital.

PATIENTS AND METHODS

The medical records of patients receiving HPN in our hospital between January 1986 and March 1999 were reviewed. Fourteen patients (12 women and 2 men), aged 33-68 yr (47 ± 12 , M \pm SD) were treated with HPN during this period. The characteristics of patients are presented in Table I.

The causes of intestinal failure were: ischemic bowel disease in 5 patients (36%), radiation enteritis in 4 (29%), severe malabsorption in 2 (14%), pseudoobstruction in 1 (7%), and peritoneal carcinomatosis in 2 (14%).

The total follow-up time was 14,260 patient-days

(median 782, range 30-4620). In the majority of patients the bag of total parenteral nutrition (TPN) was infused through a Hickman catheter during the night.

The diagnosis of catheter-related infections (CRIs) were made following the Center for Disease Control (CDC) definitions (4): exit-site infection, tunnel infection, pocket infection, catheter-related bloodstream infection (CR-BSI). Exit-site infection is defined as the redness, sensitivity, tenderness or induration of 2 cm of skin from the exit-site. Tunnel infection has similar symptoms, but they extend more than 2 cm from the Exit-site. Pocket infection is defined as redness and necrosis of the skin over the entry port, or purulence in the subcutaneous pocket. The criteria by which CR-BSIs are documented are based on the isolation of semi-quantitative or quantitative cultures of a catheter segment, and from peripheral blood cultures from patients with systemic septic symptoms. There must not be any other apparent source of infection elsewhere. If the infection is not documented by laboratory data, defervescence after removal of the catheter verifies the presence of CR-BSI. We used Maki's semi-quantitative method in those patients whose catheters were removed. This method includes rolling the catheter tip in bloody agar. In order to be considered positive, the culture must include more than 15 colony forming units (CFU) of bacteria. In those patients whose catheters were not removed, we used blood cultures from the catheter and

from peripheral vein. In the last years we have employed quantitative blood cultures from paired peripheral vein blood samples and from inside the central catheter. A culture of colonies which is 5-10 times higher in the central catheter than in the peripheral vein indicates CR-BSI.

The diagnosis of catheter occlusion was defined as the inability to infuse fluid, withdraw blood, the necessity for an inordinately high infusion pressure, or a combination of these. The appearance of central vein thrombosis (CVT) may be recognized clinically by symptoms such as pain in the chest, shoulder, neck or intrascapular area, or signs of venous occlusion with swelling of the ipsilateral arm or the superior vena cava syndrome. The suspicion of CVT was confirmed with upper limb phlebography or doppler ultrasounds. The diagnosis of endocarditis was confirmed by trans-thoracic or transesophageal echocardiography.

Hepatic complications of parenteral nutrition were diagnosed with the blood hepatic function tests (elevated serum levels of gamma glutamyl transpeptidase, alanine transaminase ALT, aspartate transaminase AST, alkaline phosphatase and also bilirubin), hepatic ultrasound, and, in some patients, by means of hepatic biopsy.

The study of quality of life (QOL) was done using the Sickness Impact Profile (SIP) and the Karnofsky Index (KI). The questionnaires were completed voluntarily by the patients. The SIP is a non-specific questionnaire that

TABLE I - BASELINE CHARACTERISTICS OF PATIENTS

Patients	Sex	Age	Diagnosis	Nºdays on HPN
1	F	62	coeliac sprue	300
2	F	55	mesenteric thrombosis	2120
3	F	68	mesenteric thrombosis	1200
4	F	50	mesenteric thrombosis	4620
5	F	46	severe malabsorption	965
6	F	54	radiation enteritis	1640
7	F	35	pseudoobstruction	600
8	F	33	radiation enteritis	1140
9	F	35	radiation enteritis	120
10	M	45	mesenteric thrombosis	315
11	F	43	radiation enteritis	1000
12	F	34	mesenteric thrombosis	90
13	M	63	peritoneal carcinomatosis	30
14	F	34	peritoneal carcinomatosis	120

F = Female; M = Male

evaluates a variety of areas of the QOL such as sleep and self-care, emotional function, physical and social activity, eating habits and employment. In normal people the score is <5, in patients with moderate affectation of their QOL it is >15, and in those with severe affectation it is >20. The KI assesses physical capacity and self-sufficiency. The score in normal people is 90-100.

RESULTS

A total of 66 catheter-related infections occurred (1 exit-site infection and 65 CR-BSIs), giving an overall infection rate of 0.46 per 100 catheter-days. There was great variability in the rate of infection among the pa-

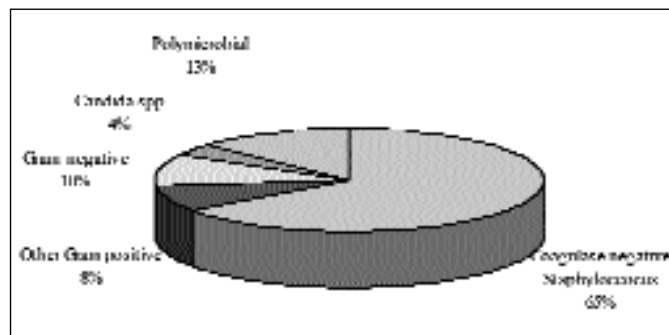


Fig. 1 - Microorganisms causing catheter-related infection in home parenteral nutrition.

tients with a range of 0 to 2.2 per 100 catheter-days (median 0.63/100 catheter-days) (Tab. II).

Of the 48 positive blood cultures, 73% were Gram positive microorganisms (65% coagulase-negative *Staphylococcus*), 10% Gram negative microorganisms, 4% *Candida spp*, and 13% polymicrobial (Fig. 1). Three patients developed endocarditis (2 coagulase-negative S., 1 *Candida*) and 3 presented septic thrombophlebitis (1 coagulase-negative S., 1 polymicrobial, and 1 without microbiological data).

Six catheter occlusions occurred with a rate of 0.04 per 100 catheter-days (Tab. II). In 2 cases the catheter could be salvaged, one after urokinase treatment, and the other one after radiological contrast was infused through it. The treatment was unsuccessful in the rest and the catheters were replaced.

The total number of catheters employed was 39, with a rate of 2.8±2.1 (M±SD) per patient (range 1-7). The median duration of the catheter was 300 days (range 3-2190). The rate of infection per catheter was 1.6±2 (0-10), and the rate of occlusion per catheter was 0.1±0.3 (0-1).

Four patients had altered liver function tests (transaminases and alkaline phosphatase) with hepatic ultrasounds compatible with steatosis. In one of them we performed a hepatic biopsy which revealed steatofibrosis. Another patient developed symptomatic cholestasis and the biopsy showed cholestatic hepatitis. She later died of end-stage liver disease.

Three patients developed cholelithiasis during the

TABLE II - CATHETER-RELATED INFECTIONS AND CATHETER OCCLUSIONS IN PATIENTS ON HPN

Patients	days HPN	Infections	Infections/100 days	Occlusions	Occlusions/100 days
1	300	1	0.33	0	0
2	2120	3	0.14	2	0.09
3	1200	10	0.83	1	0.08
4	4620	11	0.24	2	0.04
5	965	9	0.93	0	0
6	1640	3	0.18	0	0
7	600	4	0.66	0	0
8	1140	10	0.88	0	0
9	120	0	0	0	0
10	315	2	0.63	0	0
11	1000	10	1	1	0.1
12	90	2	2.2	0	0
13	30	0	0	0	0
14	120	1	0.83	0	0

treatment, and 2 of them were cholecistectomized. Six patients died during these years, four of whom from causes unrelated to HPN, and two from causes related to HPN (one due to *Candida* endocarditis, and the other one to liver failure). It was possible to suspend the parenteral nutrition in 3 patients as a result of improvement of the underlying disease and the nutritional status (one with coeliac sprue, and two with radiation enteritis). The other five patients are still continuing with HPN at the end of this study.

We carried out a study of quality of life in six patients. The Sickness Impact Profile (SIP) showed a slightly decreased QOL with a mean score of 14.6 ± 13.5 (7-42) (M \pm SD). The Karnofsky Index also showed a decrease in the QOL in some of the patients with a mean score of 70 ± 20 (range 50-90).

DISCUSSION

In recent years there has been an increase in the number of centers taking care of patients with HPN. In this paper we present our experience in long-term follow-up of a small cohort of patients. We had a large majority of female patients compared to the other series (2, 3), probably due to the small number of cases.

In the majority of our cases the etiology of the intestinal failure was ischemic bowel disease or radiation enteritis. This contrasts with other series in which cancer and Crohn's disease are the major causes (2, 3, 5-7). The number of patients with cancer discharged on HPN has increased in recent years, but there are great differences between countries. In the Netherlands and Italy, this cause represents about 60% of the indications of HPN. In contrast, in the United Kingdom and Denmark it is less than 8% (2). The reasons for this disparity are probably ethical, as in some countries parenteral nutrition is considered as a life sustaining treatment and not only a medical therapy (8). As many hospitals are now discharging oncological patients on HPN, it is probable that this group is difficult to control in the national registers. Moreover, the median duration of the treatment is short (4 months), usually due to progression of the tumor (9). For this reason, some authors prefer to separate these patients from those with permanent intestinal failure.

Catheter-related infection is the most frequent complication that occurs during HPN. We had a higher rate of CRIs (0.46/ 100 catheter-days) with respect to other groups. In series with a small number of adult patients, the rate of CRI has been reported to be 0.6 episodes/ patient/ year (10,11), or 1.7/ 1,000 catheter-days (12). A low rate of CRI can be used as a marker of quality of care, and in series with a larger number of patients its

frequency was much lower. Buchman et al found an overall infection rate of 0.37/ patient/ year in 527 patients studied by the University of California between 1973-1991, and 0.28/ patient/ year in those followed up for more than 10 years (13). In a compilation of HPN literature, Messing indicates a mean annual incidence of CRI between 0.36-0.50 (14). In the United Kingdom HPN register of 400 patients between 1977-1991, the overall CRI was 0.47/ patient/ year, and in Hope Hospital (Salford) which controlled 116 of them, the rate was much lower (0.14 / patient/ year) (7). In a recent European survey in 1997 the rate was 0.93 episodes/ 1,000 catheter-days (unpublished).

It is interesting to note that 35-50% of patients experience episodes of sepsis very rarely, if at all, whereas others suffered from iterative sepsis (15). In our series the rate of infection was low in some patients (0.1-0.2 / 100 catheter-days), while in others it was much higher. In some of them we observed errors in catheter care. As has been reported, we also observed that the frequency of infections decreased with time (13). The majority of the infections were due to coagulase-negative *staphylococci* as is reported in the literature (13,14,16). Most of our CR-BSIs were successfully treated maintaining the catheter *in situ*.

Catheter occlusion can be the result of clotting, malpositioning, kinking, or the formation of a fibrin sleeve around the catheter. In the latter case, infusion continues to be possible but aspiration is no longer feasible. Occlusion may also result from a build-up of fatty deposits or calcium salts in the lumen of the catheter. We observed a low rate of catheter occlusion (0.04/ 100 catheter-days). In another Spanish series the median rate was 0.11/ patient/ year (11). Williams et al reported an incidence of 0.08 episodes/ per year in a series of 48 patients (17). It has been reported that up to one quarter of the occluded catheters may have to be replaced (18). In our experience we had a lower rate of success and only 33% of the occluded devices could be salvaged.

Another important complication is the central vein thrombosis (CVT), associated with a high mortality. We had a rate of 0.02/ 100 catheter-days, which is similar to other series with many more patients. In the United Kingdom 0.063 episodes/ year were recorded (19). The North American register which includes 204 programs and 10,000 patients describes a much lower incidence between 0.01-0.03 episodes/ year (20). In a recent European survey in 1997 the rate of CVT was of 0.07/ 1,000 catheter-days (unpublished). Furthermore, these reports almost certainly underestimate the true incidence of this problem.

In recent years several approaches have been adopted to prevent thrombotic complications of the catheters.

Besides the heparin-lock after the infusion of the bag, the addition of heparin to the nutrition solutions in doses of 3 units/ml of parenteral feeding can decrease the incidence of thrombosis and line occlusion (21). This method is routinely used in some hospitals (17). Unfortunately, heparin may lead to instability of the nutrient solutions when all-in-one lipid containing bags are used.

The use of very low doses of warfarin (1-2 mg/day), which do not significantly influence indices of coagulation, may also protect against thrombosis. In a prospective open non-randomized study in patients with central catheter for TPN, the use of low doses of warfarin reduced the incidence of CVT without prolonging the prothrombin time (22). In a prospective randomized controlled trial in patients with central vein catheters for chemotherapy, these authors later found similar results (23). More recently, a prospective randomized controlled trial conducted by a Spanish group found that low-molecular weight heparin diminished the incidence of CVT in cancer patients with venous access devices (24).

Hepatic dysfunction is a major metabolic complication of parenteral nutrition. The incidence of abnormal enzyme levels has varied in different studies from 15-100% (25). We observed an incidence of 36% in our series, and only one patient developed cholestasis and died of liver failure. In a retrospective survey of 164 HPN from 1978-94 in Salford, they reported abnormal hepatic enzymes in 65% of patients (5% of them had raised bilirubin), and only 1 case of chronic liver disease (25). The best data regarding the incidence of liver dysfunction in adults on long-term TPN have been provided by Bowyer et al (26). They reported an incidence of persistent liver enzyme abnormalities over periods ranging from 8-95 months of 15% (9/60 patients), and only 3 developed severe liver disease. In the series reported by Cavicchi et al of 90 patients on HPN from 1985-96, 65% developed chronic cholestasis and 41% TPN-related liver disease. The prevalence of complicated HPN-related liver disease was $26 \pm 9\%$ at 2 years and $50 \pm 13\%$ at 6 years (27). Chan et al found an incidence of end-stage liver disease in 15% (6/42 patients) (28).

Steatosis remains the most frequently documented pathological correlate of abnormal liver enzymes in relation to TPN in adults, and is a benign, reversible and non-progressive consequence of TPN. Cholestasis tends to be related to long-term administration. It has been reported that patients develop end-stage liver disease at an average of 10.8 ± 7 months after the initial elevation of bilirubin levels (28). Among the factors related to the appearance of liver disease, the excess of calories, glucose and the infusion of more than 1g/Kg/day of omega-6 long-chain triglycerides in the HPN seem to be very important (27, 29, 30). The effect on the liver of the newer lipid emul-

sions (MCT-LCT, oleic, fish oil, structured triglycerides) must be studied in these patients (31, 32).

In our series only 2 patients (14%) died of HPN-related causes during these 13 years. In other studies it has been reported that the mortality rate related to HPN itself is less than 10% (33). The survival probability for patients with benign disease is about 65% at 5 years (34-36). For patients with benign diseases, weaning of HPN is observed in 40-70% of the cases (33).

Quality of life (QOL) has become a major concern in planning and implementing therapeutic programs for chronic illness. In our series, the overall QOL was slightly decreased although it was quite good in the majority of patients. Jeppesen et al recorded worse scores in their HPN patients with the same SIP questionnaire (37). Other authors have evaluated the QOL with different methods (36, 38, 39), and in general the scores were better in younger people, without use of narcotics, and in patients with Crohn's disease. In some of them, the decrease of QOL depended much more on the underlying disease than on HPN. Carlson et al evaluated the QOL in 37 patients with a questionnaire that also included symptoms during the infusion of the parenteral nutrition, and questions regarding the desirability of intestinal transplantation. Despite the fact that 70% of patients had a good quality of life and most of those eligible (16/30) did not express an interest in intestinal transplantation, there were numerous areas in which the patients felt that their QOL left much to be desired (psychological symptoms, sexual and social dysfunction), and most of them were unable to return to work (40).

CONCLUSIONS

While HPN remains the mainstay of treatment for patients with intestinal failure, there are areas that can be improved, such as catheter care, septic and thrombotic complications, hepatic and bone dysfunction, etc. All of these areas could help improve the quality of life in these patients until new treatments, such as intestinal transplantation, have better results.

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