[原著] Abdominal surgery in patients undergoing hemodialysis

Abdominal surgery in patients undergoing hemodialysis

Hiroki Nakamura[1], Toshio Yara[1], Hideaki Shimoji[2]
Hiroshi Miyasato[2], Atsushi Nakachi[2], Tsutomu Isa[2]
Shungo Hiroyasu[2], Masayuki Shiraishi[2] and Yoshihiro Muto[2]

[1] *Division of Surgery, Okinawa Kyoudou Hospital and* [2] *The First Department of Surgery, Faculty of Medicine, University of the Ryukyus, Okinawa, Japan*

(Received on June 15, 1999, accepted on October 6, 1999)

ABSTRACT

Eighteen hemodialysis patients underwent 13 elective and 5 emergency operations. The 10 male and 8 female patients ranged in age from 38 to 81 years with an average age of 62.5 years. An average duration on hemodialysis was 3 years and 4 months. The main cause of chronic renal failure was chronic glomerulonephritis. The underlying diseases requiring abdominal surgery are commonly seen in any general hospital. Elective surgery patients were dialyzed within 24 hours of surgery, whereas emergency surgery patients could only be dialyzed after surgery. Retrospectively, the patients were categorized into two groups; survivors and nonsurvivors. The survivor group included two emergency surgery patients (appendectomy and choledochotomy) while the nonsurvivor group comprised one elective and three emergency surgery patients. Three of the four nonsurvivors died of sepsis secondary to intestinal anastomotic disruption. In conclusion, meticulous attention should be paid when anastomosing the intestine because of impaired wound healing and increased susceptibility to infection unique to chronic hemodialysis patients. *Ryukyu Med. J., 19(2)59~63, 2000*

Key words: abdominal surgery, hemodialysis, sepsis score, preoperative risk factor

INTRODUCTION

The number of patients undergoing chronic hemodialysis have steadily increased since the advent of long-term ambulatory hemodialysis[1-3]. Consequently, the average surgeon now increasingly comes across patients with chronic renal failure requiring major surgery. In addition to the usual perioperative problems, there are additional operative risks including the metabolic and clinical consequences of uremia such as poor wound healing, increased susceptibility to infection and bleeding unique to the anephric patient[1,4]. In an attempt to define the risks involved in performing abdominal surgery on patients undergoing hemodialysis for chronic renal failure, we thus reviewed our surgical experience over the past several years.

PATIENTS AND METHODS

Between September 1988 and December 1996, eighteen hemodialysis patients underwent 13 elective and 5 emergency operations at the Ryukyu University Hospital and its Affili ated Hospitals in Okinawa, Japan. The ten male and eight female patients ranged in age from 38 to 81 years with an average age of 62.5 years. They had been maintained on hemodialysis for an average of 3 years and 4 months (ranging from 3 months to 8 years). The various causes of chronic renal failure in the present series are listed in Table 1.

Table 1 Causes of renal failure

	Survivors (n=14)	Nonsurvivors (n=4)
Chronic glomerulonephritis	11	2
Diabetes mellitus	2	0
Polycystic kidney disease	1	0
Amylodosis	0	1
Unknown disease	0	1

Table 2 lists the underlying diseases requiring abdominal surgery and Table 3 shows the operations performed. The preoperative preparation included adequate hemodialysis of the patients, all of whom were dialyzed within 24 hours of surgery. Anesthesia and intra-operative management were planned together with the anesthetist. General anesthesia was used and fluid administration was severely restricted during surgery in all cases.

Table 2 Underlying diseases in 18 hemodialysis patients

	Survivors (n=14)	Nonsurvivors (n=4)
Gallstones	7	0
Carcinoma of gastrointestinal tract	5	1
Perforation of colon	0	1
Varices of stomach	1	0
Ulcerative colitis	0	1
Acute appendicitis	1	0
Intestinal obstruction	0	1

Table 3 Operative procedures for underlying diseases

	Survivors (n=14)	Nonsurvivors (n=4)
Cholecystectomy	5	0
Choledochotomy	2	0
Colectomy	3	3
Gastrectomy	2	0
Resection of intestine	0	1
Splenectomy	1	0
Appendectomy	1	0

Table 4 Summary of nonsurvivors

Case	Age	Sex	Cause of C.R.F	Hemodialysis maintenance	Underying disease	Operative procedure	Postoperative complication
1	53	F	Amyloid kidney	3 years and 10 months	Perforation of sigrmoid	Hartmann procedure	Cardiac arrest (32)
2	67	M	Chronic G.N.	3 years and 5 months	Sigmoid carcinoma	Low ant. resection	Anastomotic leakage (7)
3	71	M	Chronic G.N.	5 years and 6 months	Ulcerative colitis	Subtotal colectomy	Septicemia (3)
4	80	M	Unknown	1 year	Intestinal obstruction	Intestinal resection	Anastomotic leakage (100)

C.R.F (chronic renal failure), G.N. (glomerulonephritis), ant. (anterior)
Values in parentheses are days from operation to death.

Postoperatively, the patients were carefully monitored for several days, with particular attention being paid to the patient's fluid intake, weight, serum electrolytes and vital signs. It was also necessary to resume hemodialysis within 24 or 48 hours after surgery.

The patients were postoperatively separated into two groups: survivors and nonsurvivors. The preoperative clinicopathological data were summarized, and the sepsis score[4] and preoperative risk factors for abdominal surgery in patients with chronic renal failure[5] were thus calculated in each group (Table 4). The mean values were then compared between the two groups by the Student's t test.

RESULTS

There were 4 deaths (nonsurvivors) in this series, involving 22.2% of the operations performed. Table 4 shows a summary of the nonsurvivors. Case 1 died of cardiac arrest after Hartmann's procedure for a perfora-

Table 5 Preoperative risk factors

	Survivors (n=14)	Nonsurvivors (n=4)	P
Age (years±SD)	60.8±12.7	68.2±11.5	NS
Hemodialysis maintenance (m)	38±27.7	48±15.7	NS
Hemoglobin (g/dl)	9.4±1.6	9.6±2.5	NS
Platelet ($10^4/\mu l$)	21.2±8.1	25.7±11.2	NS
White blood cell ($/\mu l$)	6914.3±3180.4	8950±1586.4	NS
Albumin (g/dl)	3.6±0.4	3.0±1.2	NS
Glucose (mg/dl)	108.5±27.3	111.6±42.3	NS
Emergncy (case/n)	2/14	3/4	$p<0.05$
Intraabdominal infecion (case/n)	1/14	2/4	$P<0.05$

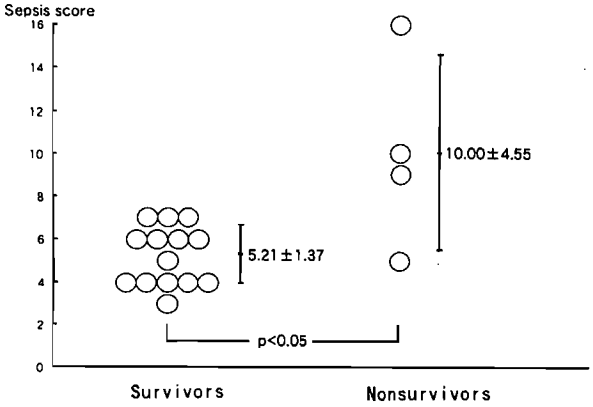

Fig. 1 Sepsis score (Elebute and Stoner[5]).

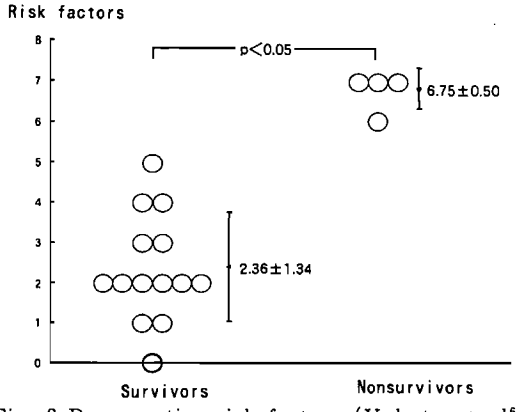

Fig. 2 Preoperative risk factors (Yokota *et al*[6]).

tion of the sigmoid colon. Case 2 died of septicemia due to anastomotic leakage after a resection of the sigmoid colon for recurrent carcinoma. Case 3 died due to clinical manifestations of septicemia after a subtotal colectomy and colostomy for toxic megacolon (ulcerative colitis), and Case 4 died of septicemia secondary to anastomotic leakage after a resection of the small intestine for obstruction. The cause of death in three of four cases was septicemia due to an intraabdominal infection.

The patients were dialyzed during the 24-hour period prior to an elective operation, but four patients (nonsurvivors) could only be dialyzed immediately after an emergency operation. Nine factors were analyzed in the 2 groups (survivors and nonsurvivors) (Table 5).

An emergency operation and intraabdominal infection were found to correlate significantly with postoperative mortality ($P<0.05$).

The grading of sepsis and preoperative risk factors were used to assess the clinical status of the surgical patients undergoing chronic hemodialysis. The grade of sepsis (sepsis score) was determined according the method described by Elebute and Stoner[5]. Fourteen preoperative risk factors by Yokota *et al*[6] were expressed as scores for each patient. The sepsis score was 5.21±1.37 (points) in survivors and 10.00±4.55 (points) in nonsurvivors (Fig. 1). There was a significant difference in the scoring between the two groups ($p<0.05$). The preoperative risk factors were 2.36±1.34 (points) in the survivors and 6.75±0.50 (points) in the nonsurvivors (Fig. 2). The preoperative risk factors also correlated with postoperative death ($p<0.05$).

The indications for elective abdominal surgery were the same as those often seen in any general hospital. Two patients of 14 survivors and 3 of 4 nonsurvivors underwent emergency surgery. One of the survivors underwent an appendectomy for acute appendicitis while the other had a cholecystectomy with a choledochotomy for choledocholithiasis. In the nonsurvivor group, as described above, 3 patients underwent initial emergency surgery (for a perforation of the sigmoid, ulcerative colitis and intestinal obstruction), and 3 patients also had subsequent emergency surgery (colostomy for anastomotic leakage) (Table 2,3,4).

The complications in the survivor group were minor, accounting for 21.4% (three patients). In these patients, the complications included wound infection that was associated with surgery. On the other hand, in the nonsurvivor group the postoperative complications were major and included cardiac arrest, due to a possible amyloid heart, and intestinal anastomotic disruption, which thus resulted in

intraabdominal infection (sepsis). These major postoperative complications greatly contributed to the death of the patients in the nonsurvivor group. Moreover, in the emergency surgery group, all 5 patients underwent emergency operations such as an appendectomy, choledochotomy and intestinal resection. Intestinal anastomotic leakage also occurred in these patients, which later necessitated a reoperation.

The mortality rate in the elective surgery group was 7.7% (1/13). A single death occurred after an intraabdominal infection due to anastomotic leakage following a low anterior resection of recurrent sigmoid carcinoma. The mortality rate in the emergency surgery group was 60% (3/5). As aforementioned, two deaths occurred after sepsis developed, and the remaining one died of cardiac arrest. The mortality rate for the elective surgery group was dramatically different from that of the emergency surgery group. Three of the four deaths were attributable to sepsis due to intestinal anastomotic disruption.

DISCUSSION

There are multiple, severe medical problems that have a direct impact on the surgical care of chronic hemodialysis patients. These complications may be conveniently grouped into four main categories: potential heart failure, metabolic abnormalities, hematopoietic problems and decreased resistance to infection[1,7]. A decreased immune response, both cellular and humoral, as well as lymphocyte dysfunction, has already been well documented in patients with chronic renal failure. Unfortunately, this later defect, in contrast to the three previous ones, cannot be significantly corrected, even temporarily, by hemodialysis treatment[1,2,8,9].

We therefore preoperatively attempted to correct these three medical problems. Ideally, our elective surgical patients underwent hemodialysis 24 to 48 hours preoperatively. On occasion, emergency situations have precluded preoperative hemodialysis. In such cases, emergency surgical patients underwent hemodialysis immediately after surgery. Antibiotics were used preoperatively in both groups; the elective surgical group received prophylactic antibiotics, and the emergency surgical group received appropriate antibiotics throughout the course of their illness.

Intraoperatively, meticulous attention was paid when anastomosing the intestine. Despite such precautions, three patients in the emergency group nevertheless died of septic complications secondary to an intestinal anastomotic disruption. All intestines were anastomosed with absorbable sutures in one layer and with silk sutures in the seromuscular layer. Postoperatively, maintenance fluids were given at about 1.0 ml/kg/hr, plus any replacement for measured losses. Hyperalimentation was used following surgery in most patients after their postoperative conditions stabilized.

Although we paid careful attention to the specific surgical problems inherent in dealing with chronic renal failure, we were not able to achieve favorable results relative to the mortality observed when operating on a normal population. For wound healing[1], most studies reported that adequately hemodialyzed patients healed as well as normal patients, whereas other studies have shown that uremic wound healing failure may be caused by protein-calorie malnutrition rather than by toxic factors. Protein deficiency is known to impair wound neoangiogenesis, a proliferation of fibroblasts, and collagen synthesis. Consequently, the protein deficiency inherent in chronic renal failure is the primary cause for intestinal anastomotic disruption following intestinal resection.

Another important medical problem unique to hemodialysis patients is an increased susceptibility to infection, which remains the main cause of mortality and was the only cause of death in this series. Chronic renal failure produces a compromised host with an immunodeficiency. Adequate hemodialysis can correct hypertension, normalize hyperkalemia and acidosis, and minimize any correctable bleeding or clotting abnormalities. However, it is not able to improve a reduced immune response. Since these immune defects resemble those found in patients suffering from protein-calorie malnutrion, uremic wound healing failure may have the same etiology, therefore aggressive nutritional supplementation may be reasonable and corrective for hemodialysis patients. Recently, some studies using this approach in chronic renal failure patients undergoing intra-abdominal operative procedures successfully improved their mortality rates from 83% to 0[1].

In conclusion, although an acute abdomen is not very common in hemodialysis patients, it is associated with high morbidity and mortality because intestinal anastomotic disruption (impaired wound healing) is the most common cause of acute abdomen. Impaired wound healing may be caused by reduced immune response which can not be corrected even by the recently improved hemodialysis treatments. Fortunately, recent results of abdominal surgery of chronic hemodialysis patients are encouraging since aggressive nutritional supplementation has been shown to dramatically improve their morbidity and mortality rates[1,3,8,9].

Based on the above findings, hemodialysis patients with unexplained sepsis undergoing emergency surgery requiring an intestinal resection should thus be presumed to have intestinal anastomotic leakage.

REFERENCES

1) Eigler F. W. and Jakubowski H. D.: Surgery in chronic renal failure. Experiences with dialysis and transplant patients. International symposium, February 1983. pp.52-75, Georg Thieme Verlag, Stuttgart, 1984.
2) Borlase B., Simon J. S. and Hermann G.: Abdominal

surgery in patients undergoing chronic hemodialysis. Surgery 102: 15-18, 1987.
3) Nakajima F., Shibahara N., Kusaka M., Watsuji T., Yamamoto K. and Katsuoka U.: Increase of major surgery in chronic dialysis patients. Nippon Toseki Gakkai Zasshi 32: 1005-1010, 1999.
4) Hata M., Remmers A. R., Lindley J. D., Sarles H. E. and Fish J. C.: Surgical management of the dialysis patient. Ann. Surg.178: 134-137, 1973.
5) Elebute E. A. and Stoner H. B.: The grading of sepsis. Br. J. Surg. 70: 29-31, 1983.
6) Yokota K., Uchida H., Osakabe T., Nakayama Y., Sato K. and Kakita A.: Abdominal surgery in patients on maintenance hemodialysis due to chronic renal failure II - An analysis of preoperative risk fac tors and surgical results. Nippon Rinsho Gekagakkai Zasshi 53: 1817-1822, 1992.
7) Silberman H.: Renal failure and the surgeon. Surg. Gynecol. Obstet. 144: 775-784, 1977.
8) Bender J. S., Ratner L.E., Magnuson T. H. and Zenilman M. E.: Acute abdomen in the hemodialysis patient population. Surgery 117: 494-497, 1995.
9) Teraoka S., Nakagawa Y., Fujita S., Karanihara T., Nakajima I, Hayashi T., Fuchinoue S., Honda H. and Agishi T.: Perioperative management of the patients with renal failure. Gekachiryo 77: 318-324, 1997.