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Surgical Treatment of Abdominal Aneurysm in Hemodialysis Patient with Polycystic Kidney

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Introduction

The recent remarkable advance in the technique of hemodialysis for patients with devastated renal function has enabled rehabilitation of many of such patients. A number of problems remain to be solved, however, concerning surgical treatment for such patients. The operative risk is fairly low for abdominal aortic aneurysm unless there is a complication. Patients already on dialytic therapy for chronic renal failure, however, should be operated on with utmost caution and also require meticulous management pre-, intra- and postoperatively. Presented below is a case in which surgical treatment was successfully performed for aortic abdominal aneurysm complicating chronic hemodialysis.

Case Report

Patient: A 58-year-old man

The patient had been told of his having hypertension but failed to receive treatment. In May 1975 he came to complain of general fatigue and anorexia. On May 26 he was seen in a hospital and diagnosed as renal failure due to polycystic kidney disease. Peritoneal dialysis was immediately started and then replaced with hemodialysis on July 29. Subsequently he was maintained on hemodialysis of six-hr duration 3 times a week. On Dec. 19, 1982 he developed lumbar ache, which led to the detection of a pulsatile mass thus far unrecognized in the abdomen. As the mass grew with lumbar and abdominal pain persisting, the patient developed diarrhea with mucosanguinous stools, leading to a suspicion of ischemia of the colon.

On Jan. 11, 1983 the patient was transferred to the 1st Dept. of Surgery of our hospital to determine whether surgical treatment was indicated. Both kidneys were affected by cystic disease with their function totally abolished. There was cystic disease of the liver as well.

The aneurysm of the abdominal aorta was found extending to the renal artery proximally and to the common iliac artery distally; an intraaneurysmal thrombus was present.

Dialysis performed on Jan. 18, the day before operation, resulted in improved laboratory values: serum potassium from 5.5 to 3.6 mEq/L, BUN from 81 to 52 mg/dl and creatinine

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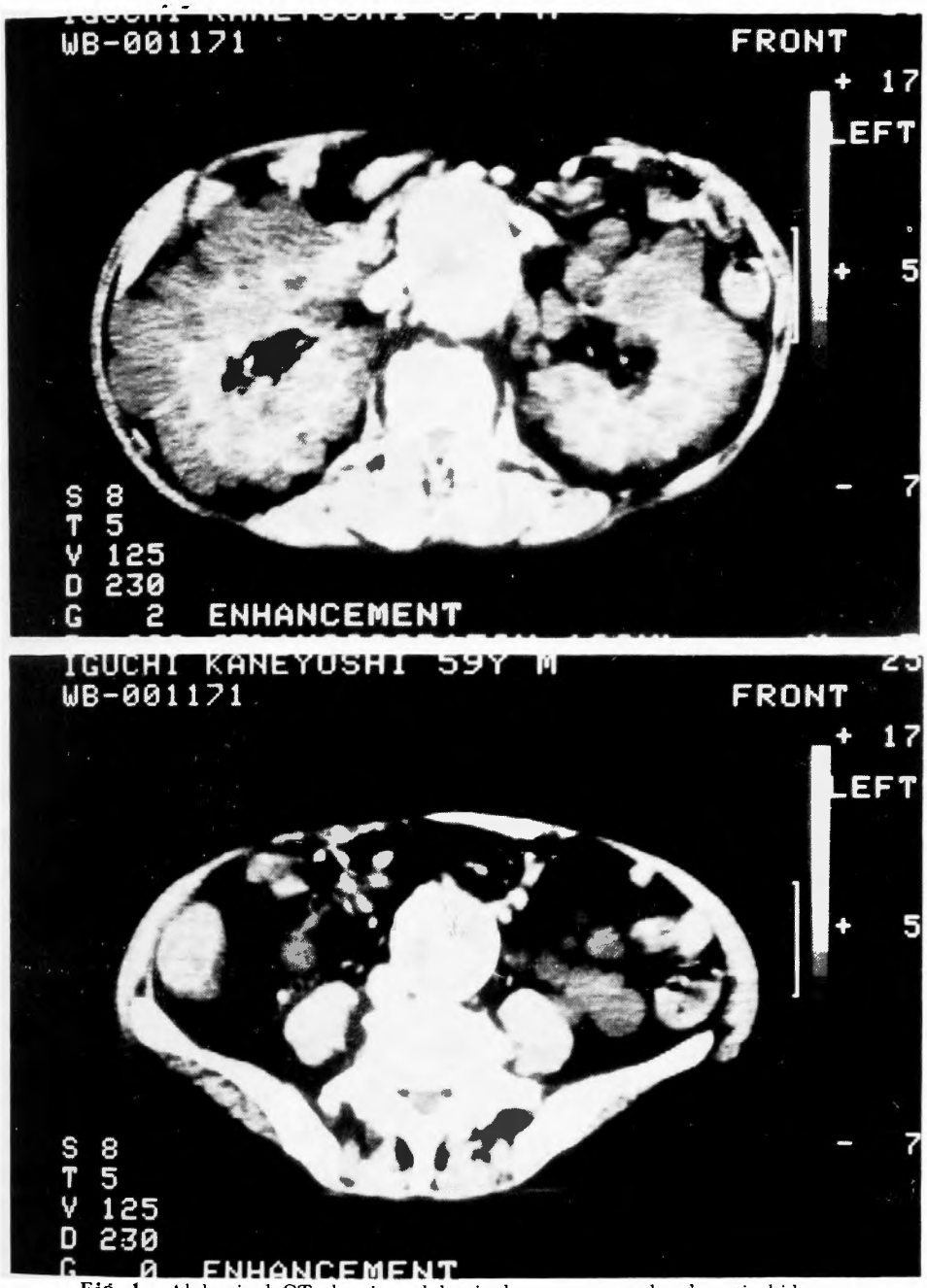

Fig. 1. Abdominal CT showing abdominal aneurysm and polycystic kidneys

from 12.4 to 8.0 mg/dl. The RBC was 535×10^4, hematocrit 46.3 per cent and hemoglobin 14.6 g/dl.

Operative findings: The patient underwent operation on Jan. 19. Laparotomy was done through a midline incision. The kidneys were markedly enlarged with a countless number of cysts of variable size surrounding the aneurysm of the abdominal aorta. Operation for the

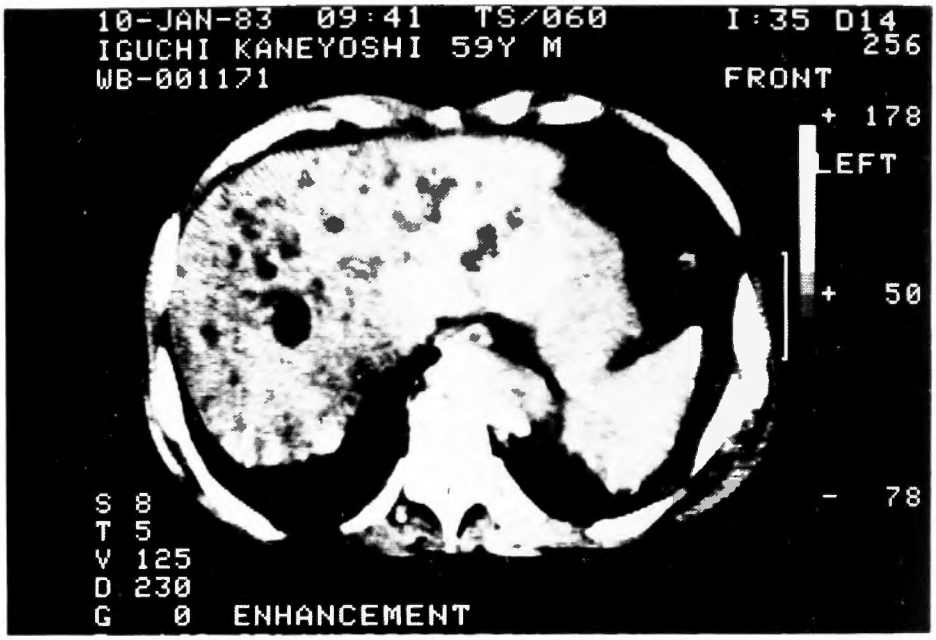

Fig. 2. Abdominal CT showing multiple cysts in liver

aneurysm was preceded by removal of the enlarged left kidney which hampered maneuvers in the field proximal to the aneurysm. Proximally the aneurysm extended across the renal artery. Without hesitation, however, an aortic clamp was placed proximal to the artery because of renal function already abolished. The arterial prosthesis used was a Y-shaped filamentous velour

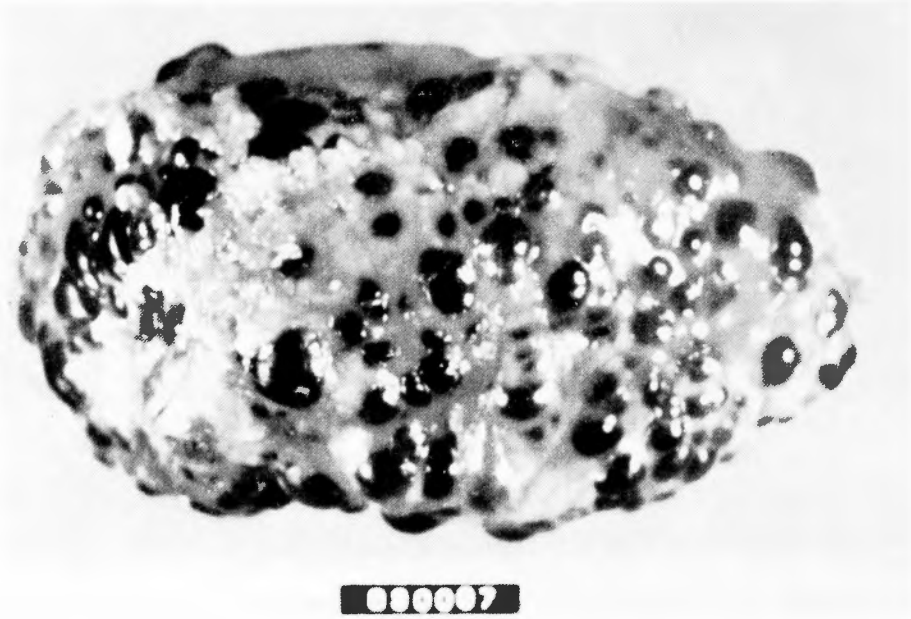

Fig. 3. Gross specimen of left kidney 2000 g by weight

graft of Sauvage with a diameter of 22 mm for the trunk and 11. 5 mm at the periphery, which was preclotted with fibrin adhesive.

The aneurysm extended to the common iliac artery proximally. The graft was anastomosed to the external iliac artery so as to ensure circulation through the internal iliac artery bilaterally. The inferior mesenteric artery was occluded.

The blood shed over the operative field was collected with an aspirator for subsequent re-utilization after washing with saline in Cellsaver. A total of 600 ml of stored whole blood was transfused.

Postoperative course: The intraperitoneal drain was removed the day after operation because of no blood drained. Hemodialysis was resumed on Jan. 20, the day after operation, when the serum potassium level was 5. 8 mEq/L with 80 mg/dl BUN and 9. 8 mg/dl creatinine. The value for these parameters after the procedure was: 3. 3 mEq/L for serum potassium, 40 mg/dl for BUN and 5. 0 ml/dl for creatinine. The procedure was continued for additional 2 days before the patient was placed on maintenance hemodialysis instituted 3 times a week.

Around Jan. 22 pulmonary complications developed with increased expectoration and worsened arterial blood gas values, making respirator therapy necessary. Fifteen days were taken before the patient was withdrawn therefrom.

Discussion

With the advance in the technique of dialytic therapy by means of an artificial kidney there have been an increasing number of patients who receive such therapy for chronic renal failure. At the same time, aggressive surgical intervention has become feasible even in cases where it was formerly believed to be not indicated because of the resultant hypofunction of organs or other derangements.

In the case illustrated above, renal function was totally abolished bilaterally due to cystic kidney disease. The disease is likely to be inherited and is characterized by a host of cysts of varying size encroaching on the renal parenchyma bilaterally. Patients with the disease often have cysts of the liver, spleen or pancreas as well. Two forms of the disease are known: the infantile and the adult. The former results in death of the patient in early life whereas the latter progresses so slowly as to be manifested clinically only at middle age or later in most cases.

A well-elaborated treatment plan and meticulous management during the pre-, intra- and postoperative periods are mandatory for aortic abdominal aneurysmectomy to be performed in patients who have been on dialytic therapy for renal failure. Postoperative hyperkalemia and water imbalance are the most serious threat to the patient with renal failure when he undergoes a major surgical operation. It is desirable to have the patient well prepared for such an operation, if elective at least, so that the patient can be operated on while he is in as good general condition as possible. As a guide to satisfactory preoperative preparation, the serum potassium level shoul be below 5 mEq/L and BUN level somewhere between 40 and 50 mg/dl; the hematocrit should preferably be increased to 30 per cent or so, since the patient often deve-

lops anemia postoperatively. More fundamentally, hemodialysis should be performed less than 24 hr before operation[1,9,11,12]

As to the operative technique of aortic abdominal aneurysmectomy, there is no need for making distinction from that of operation for aortic abdominal aneurysm at large, provided pre- and intraoperative management is satisfactory.

Patients with renal failure are vulnerable to infection, mainly because of immunosuppression by uremic toxin. Utmost precautions should be exercised against contamination of the operative field in performing replacement with an arterial substitute which is foreign to the host; adequate preoperative antibiotic therapy is needed[4,5,10]

In patients with renal failure, the associated proneness to bleeding tendency, together with the use of anticoagulants during postoperative dialysis, makes it necessary to be on the alert for blood oozing from the prosthetic graft or the surgical wounds. An arterial substitute of low porosity may be used to reduce bleeding from the prosthetic implant. We have employed Sauvage filamentous velour grafts which are pliable and highly porous and can fit well to the sclerotic arterial wall of the host; fibrin adhesive has also proved to serve the purpose of pre-clotting[2].

Patients receiving blood transfusions have a high incidence of hyperkalemia postoperatively. Massive intraoperative blood transfusions may result in the necessity for emergency dialysis within 24 hr of operation[4,7,8]

With the aim of sparing the blood for transfusion we have collected the blood from the operative field and reutilized it after washing in Cellsaver.

Excessive fluid replacement may lead to heart failure or respiratory insufficiency[4].

Insensible water loss during operation is reported to amount to approximately 200 g within 1 hr of laparotomy and increase subsequently at a rate of about 100 g per hr[13]. The amount of fluid replacement may be calculated by adding blood loss to these figures. Fluid replacement during operation should be strictly limited. Dialysis in the early postoperative period may be aimed at coping with the overhydration resulting from infusion of solutions to deliver drugs such as hypertensive agents rather than at removing potassium from the body. Delivery of 2000-3000 ml of fluid per day is permissible, once the patient has been placed on dialytic therapy, which makes it possible to eliminate water as needed.

A serum potassuium level of 6.0 mEq/L may be reckoned as critical, warning of the risk of cardiac arrhythmia.[7] If this level of serum potassium is being approached, hemodialysis which is both rapid-acting and reliably useful should be started without delay while administering glucose plus insulin, calcium, sodium bicarbonate or enemas of the exchange resin Kayexalate.

The serum potassium, which, in contrast to BUN or creatinine, will rise immediately after operation, must be monitored by frequent measurement even on the very day of operation.

As stated earlier, excessive fluid replacement may give rise to respiratory failure. It is recommendable to control fluid replacement postoperatively by reference to the pulmonary artery wedge pressure as measured by means of the Swan-Ganz catheter.

The so-called "shock" lung represents a respiratory distress syndrome ensuing from shock

or trauma, which frequently complicates renal failure. A similar syndrome occurs in declamping shock during the course of operation for abdominal aortic aneurysm. Increased permeability of pulmonary capillaries, extravasation of water and infection are considered to be involved, providing predisposing factors for respiratory complications[6,14] Vexing pulmonary complications also did develop in the case illustrated above, probably from multiple causes.

Surgery, hemorrhage or infection can be educe a catabolic response. Postoperatively, such accelerated catabolism may result in earlier deterioration of the patient's general condition by increasing the production of uremic metabolites. Hyperalimentation with a solution of amino acids, electrolytes and glucose is essential during the early postoperative period.[3]

Summary

Prompt surgical treatment is required for aneurysm of the abdominal aorta which will grow rapidly. Surgery should not be avoided for the only reason of the presence of complicating renal failure. A well-elaborated treatment plan coupled with careful management during the pre-, intra- and postopetative periods can prove to be lifesaving. Adequate, early dialysis for removing uremic toxin and excessive water is essential.

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和文抄録

のう胞腎不全症例に合併した腹部の大動脈瘤の外科治療

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岡本 好史，栗津 篤司，小野 恵司，中山 健吾，山田 公弥

58才，男でのう胞腎による腎不全により血液透析を施行中腹部大動脈瘤が発見され，切迫破裂となり手術を施行した．

尚本症例には肝にも多数ののう胞を認めた．急速に増大する腹部大動脈瘤に対しては，早急に多科的処置が必要であり，腎不全の合併ということのみで手術をさけるべきではない．術前，術中，術後にわたる細心綿密な治療計画と管理により救命さすことができる．

早期に十分な透析を行い，uremic toxin を除去し同時に積極的に除水を行うことが肝要である．