

Complications of Dialysis: Selected Topics

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Complications observed in end-stage renal disease may be due to the side effects of treatment or to the alterations of pathophysiology that go with kidney failure.

CHAPTER

7

Complications of Hemodialysis

COMPLICATIONS OF HEMODIALYSIS

Complication	Differential diagnosis
Fever	Bacteremia, water-borne pyrogens, overheated dialysate
Hypotension	Excessive ultrafiltration, cardiac arrhythmia, air embolus, pericardial tamponade; hemorrhage (gastrointestinal, intracranial, retroperitoneal); anaphylactoid reaction
Hemolysis	Inadequate removal of chloramine from dialysate, failure of dialysis concentrate delivery system
Dementia	Incomplete removal of aluminum from dialysate water, prescription of aluminum antacids
Seizure	Excessive urea clearance (first treatment), failure of dialysis concentrate delivery system
Bleeding	Excessive heparin or other anticoagulant
Muscle cramps	Excessive ultrafiltration

FIGURE 7-1

Complications associated with hemodialysis.

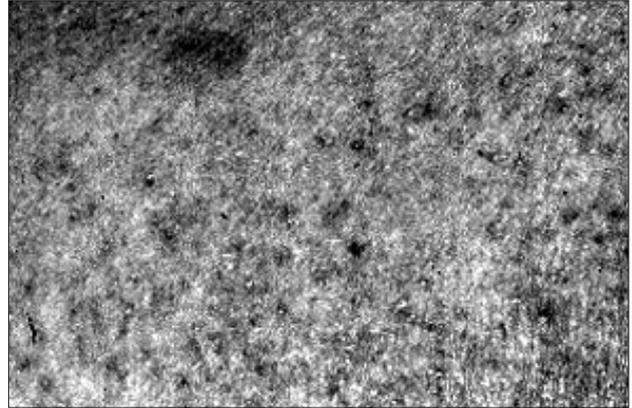


FIGURE 7-2 (see Color Plate)

Dialyzer hypersensitivity. This patient was switched from a cellulose acetate dialysis membrane to a cuprammonium cellulose one. Within 8 minutes of starting hemodialysis he developed apprehension, diaphoresis, pruritus, palpitations, and wheezing. This eruption was seen over the arm used for arteriovenous access for dialysis. (From Caruana and coworkers [1]; with permission.)



FIGURE 7-3

Thrombosis of the left innominate vein. Thrombosis can be a complication of reliance on subclavian catheters for vascular access for hemodialysis. This was discovered during investigation of edema of the left arm.

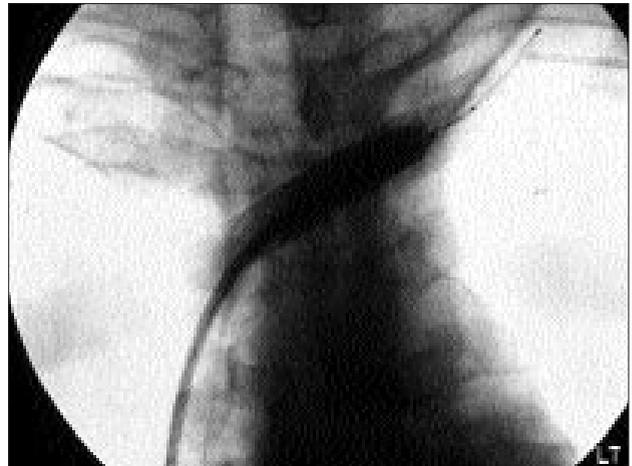


FIGURE 7-4

Dilation of a stricture of the left innominate vein using balloon angioplasty in the patient shown in Figure 7-3.

**FIGURE 7-5** (see Color Plate)

Ischemia of the index finger. Occasionally the arteriovenous fistula results in radial-to-brachiocephalic steal, leaving inadequate blood supply to the fingers. This risk is especially common in diabetic patients.

**FIGURE 7-6**

Dialysis-associated amyloidosis. Multiple carpal bone cysts without joint space narrowing in a patient treated with dialysis for 11 years. This phenomenon has been attributed to inadequate clearance of β_2 -microglobulin using low-permeability, cellulose dialysis membranes. (From van Ypersele de Strihou and coworkers [2]; with permission.)

Complications of Peritoneal Dialysis

**FIGURE 7-7**

Perforation of the bladder on insertion of peritoneal catheter. Bladder perforation can be a complication of blind insertion of a peritoneal catheter. It is recognized by the sudden appearance of glucose-positive “urine” on instillation of the first bag of dialysate. Instillation of radiographic contrast medium confirms the diagnosis.

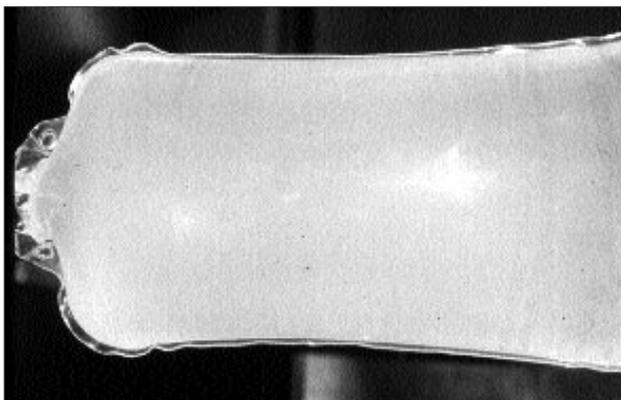


FIGURE 7-8 (see Color Plate)

Peritonitis. In continuous ambulatory peritoneal dialysis (CAPD) peritonitis can easily be recognized by the fact that drained peritoneal fluid becomes opacified. The inability to read the writing on the opposite side of the drained bag (or a newspaper through the bag) correlates with a peritoneal leukocyte count of more than 100 cells per microliter.



FIGURE 7-9 (see Color Plate)

Tunnel abscess in patient undergoing continuous ambulatory peritoneal dialysis. Pericatheter infections are a common source of peritonitis. Sometimes, the findings are more subtle than in this case. Prompt treatment with antibiotics is indicated. If the infection fails to respond, removal of the catheter is indicated.



FIGURE 7-10

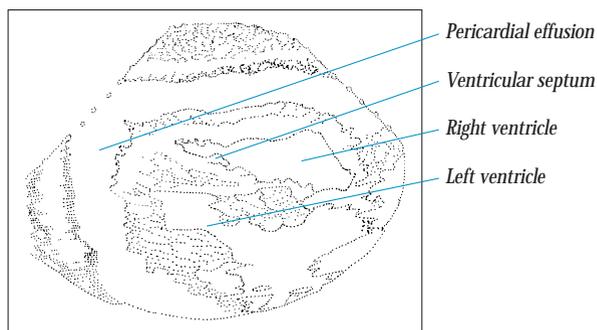
Sclerosing encapsulating peritonitis. This patient had several bouts of peritonitis during the course of her treatment on peritoneal dialysis. She developed partial small bowel obstruction. Abdominal computed tomography revealed a homogeneous mass filling the anterior peritoneum. At laparotomy the mesentery was encased in a "marble-like" fibrotic mass. The patient required long-term home parenteral hyperalimentation for recovery. (From Pusateri and coworkers [3]; with permission.)

Complications of Renal Failure



FIGURE 7-11

Pericardial tamponade. Narrow pulse pressure and a pericardial friction rub suggest pericarditis (a frequent complication of uremia) especially in patients with chest



pain. Pericardial tamponade may present as dialysis-induced hypotension. (Courtesy of T. Pappas, MD, Medical College of Ohio.)



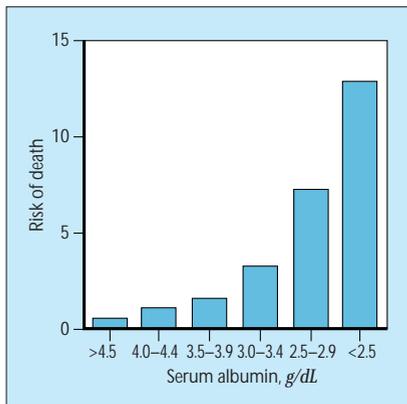
FIGURE 7-12 (see Color Plate)

Perforating folliculitis. The skin of uremic patients can be intensely pruritic. Earlier, it was attributed to deposition of calcium and phosphorus in the skin. Today, we know that is the result of repeated trauma to the skin associated with scratching.



FIGURE 7-13

Acquired cystic disease of the kidney. Abdominal computed tomography demonstrates cystic disease in this patient, who had focal segmental glomerulosclerosis complicated by protein C deficiency and renal vein thrombosis. Eleven years after the initial diagnosis, he developed renal failure requiring hemodialysis. Two years after starting dialysis, he developed hematuria, and these cysts were found. The appearance and clinical course are consistent with acquired cystic disease of the kidney. These cysts carry some risk of malignant transformation.

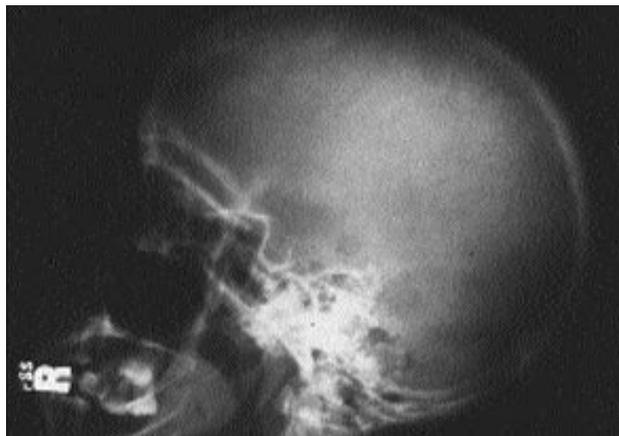
**FIGURE 7-14**

Malnutrition. Malnutrition is an important risk factor for dialysis patients, as reflected in this graph depicting the relation of death to serum albumin values. Albumin may have antioxidant properties. Low concentrations of serum albumin may favor oxidation of lipids, which renders them more atherogenic. (Data from Owens and coworkers [4].)

Radiologic Manifestations of Renal Osteodystrophy

**FIGURE 7-15**

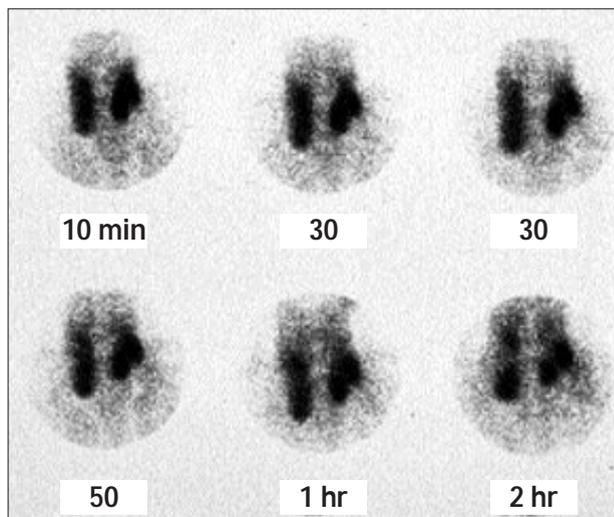
Radiograph of a shoulder involved by osteoporosis. The shoulder joint demonstrates diffuse osteoporosis. There is distal resorption of the clavicle. A small amount of calcification can be seen on the clavicular side of the coracoclavicular ligament. These findings are suggestive of osteitis fibrosa cystica.

**FIGURE 7-16**

Diffuse bone demineralization as demonstrated in skull radiograph. This radiograph demonstrates the generalized granular appearance that is characteristic of the diffuse demineralization seen in renal osteodystrophy.

**FIGURE 7-17**

Radiograph of the hands of a patient who has renal osteodystrophy. The hands demonstrate diffuse bilateral osteoporosis. The resorption of the distal phalanges is best seen in the first and second digits of the right hand. The radial side of the middle phalanges of the second and third digits bilaterally demonstrates subperiosteal bone resorption. Soft tissue calcification is present on the radial side of the proximal interphalangeal joint of the second digit of the left hand.

**FIGURE 7-18**

Parathyroid scan. The patient was injected with 24.6 mCi of ^{99m}Tc Cardiolite. Hyperfunction of four parathyroid glands is seen. This technique is often useful to determine the location and number of parathyroid glands before performing subtotal parathyroidectomy. At operation, diffuse hyperplasia of four parathyroid glands was found. (From Ishibashi and coworkers [5].)

References

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2. van Ypersele de Strihou C, Jadoul M, Malghem J, *et al.*: Effect of dialysis membrane and patient's age on signs of dialysis-related amyloidosis. The working party on dialysis amyloidosis. *Kidney Int* 1991, 39:1012-1019.
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5. Ishibashi M, Nishida H, Hiromatsu Y, *et al.*: Localization of ectopic parathyroid glands using technetium-99m sestamibi imaging: comparison with magnetic resonance and computed tomographic imaging. *Eur J Nuclear Med* 1997, 24:197-201.