

Injuries and Complications of the Lymphatic System Following Renal Transplantation

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Summary

Although major lymph trunks of the recipient are transected during renal transplantation, no lymphatic complications per se have been reported. We believe that these complications are not infrequent but have not been recognized as such because no lymphograms were performed. This report deals with four patients who developed draining sinuses, pelvic abscesses and other masses in whom the correct diagnosis was established by lymphography; namely, that the complications were caused by continuous lymphatic drainage from lymphatic vessels.

The purpose of this paper is to describe four patients who underwent renal transplantation and developed complications directly related to surgical injury of pelvic lymph vessels. Review of the literature reveals a great variety of possible post-operative (1, 7, 9) complications which may develop after renal transplantation, but relationship of such complications to the lymphatic system has rarely been stressed (4, 8). This is particularly surprising since the surgery needed for the placement of a transplanted kidney requires transection of major lymphatics of the external iliac chain. During the preparation of the vascular pedicle the lymphatic and aureolar tissue surrounding the external iliac and hypogastric vessel must be excised. Failure to identify and ligate such vessels may result in post-operative leakage into potential pelvic spaces. Lymphography correctly established the relationships of draining sinuses and/or pelvic masses which developed in four patients who underwent renal transplantation. Brief histories of these patients will be presented.

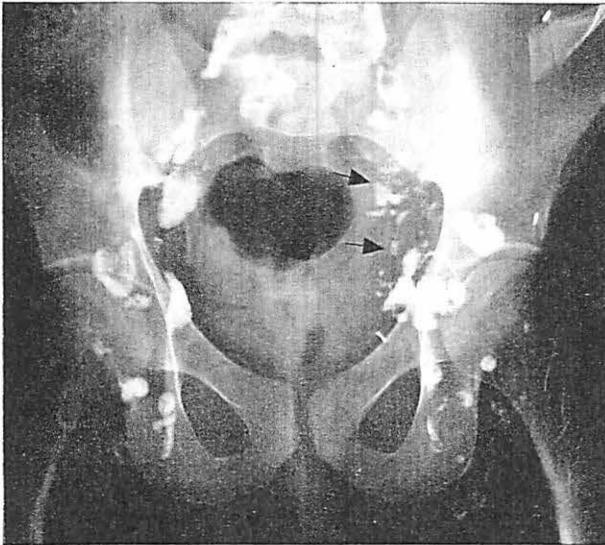
Case Reports

Case 1: A twenty year old female underwent renal transplantation because of renal failure secondary to chronic glomerulonephritis. The donor's kidney was placed into the right iliac fossa. On the sixth post-operative day the patient developed wound infection. This was treated conservatively and she was discharged twenty-eight days after surgery. Three weeks later because of temperature elevation up to 104 °F the patient was readmitted to the hospital. Drainage from a still somewhat open wound was present. Re-exploration showed a perinephric hygroma. A lymphogram performed several days later showed that the fluid originated from transected lymph vessels and decompressed through a lymphatic cutaneous fistula (Fig. 2). The patient was treated conservatively and several weeks later the lymph drainage ceased and the cutaneous fistula closed.



Fig. 1 Normal lymphangiogram done approximately two months after renal transplantation.

a) Oblique view of the pelvic lymphatics. Film taken at the end of injection. Note that the normal lymph channels have been partially replaced by collateral vessels which bridge the gap which was formed at surgery.



b) AP view taken 24 hours later. Multiple small nodes are present in the area where lymphatics have been removed. These small but otherwise normal nodes are characteristic for regenerated nodes. Metallic clips are present in the capsule of the transplanted kidney.

Case 2: This patient is a twenty-two year old female who necessitated renal transplantation because of chronic renal failure secondary to chronic glomerulonephritis. The immediate postoperative period was unremarkable, but one month after discharge from the hospital she developed left lower quadrant pain and slight temperature elevation. Pelvic examination revealed a tender left adnexal mass. A needle aspiration was attempted but no fluid was obtained. Clinically a perinephric abscess was suspected. Because of temperature elevation the wound was re-explored. The lower pole of the kidney was surrounded with 100–150 milliliters of clear fluid. The wound was drained;

Fig. 2 Lymphogram of Patient 1. Films taken at the end of injection. Note the spilled contrast medium around the lower pole of the transplanted kidney (arrow) as well as in the pelvic space (open arrow). The sponge which is lying in the wound is now soaked with contrast medium (curved arrow). The contrast medium reached this sponge through a sinus tract.

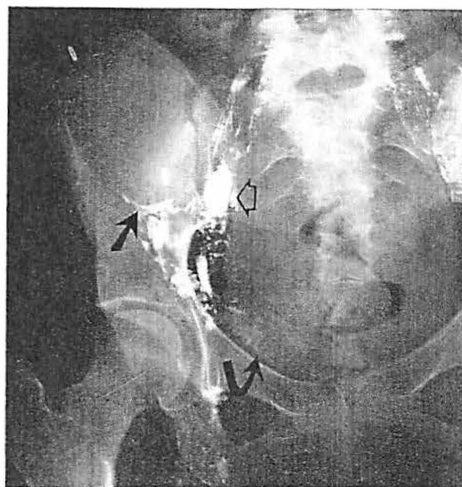
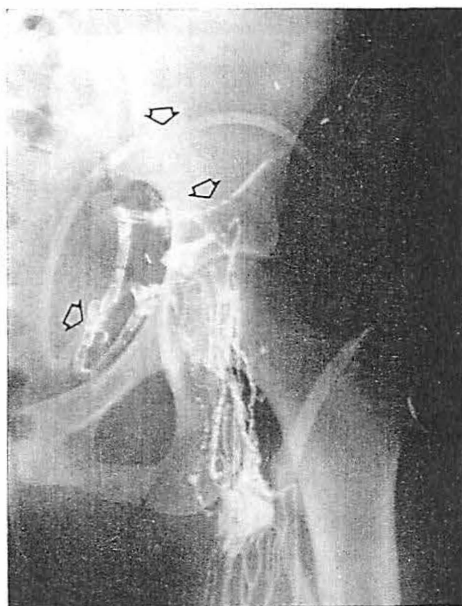


Fig. 3 Case 2. Films taken at the end of the intralymphatic injection. Contrast medium is spilling into pelvic space and enters a drainage tube which was placed through the wound opening (arrow).



however, over the next few days small amounts of slightly hemorrhagic purulent fluid continued to drain. Re-exploration showed a cloudy serous sanguinous fluid around the kidney. The lymphatic origin of the now infected fluid was established after a lymphogram was performed (Fig. 3). The lymphocele was drained and Penrose drains were left in the wound for several days. After the amount of draining lymph decreased, the drains were removed and the patient has done well since.

Case 3: This twenty year old female necessitated a renal transplant because of chronic renal failure due to chronic glomerulonephritis. A cadaver donor kidney was placed



Fig. 4 Case 3. Lymphogram. Films taken at the end of injection. The contrast medium which spills from the transected lymphatics is outlining the sponge which is present in the open wound located in the right side of the pelvis.

in her right iliac fossa. Immediate post-operative urine output was poor but over the next two weeks it increased and finally reached 1500 ml/day. Three weeks after surgery a rapidly growing pelvic mass was felt. The mass displaced the bladder but the ureter was not obstructed. The patient's urine was infected. On the following day a bulge over the incision developed. At the same time the patient's renal functions started to deteriorate. Re-exploration of the kidney bed showed that the kidney was surrounded with approximately 300 ml. of purulent fluid. The fluid was drained and catheters were placed in both ends of the wound. Because of continuous drainage the abscess was drained again and five Penrose drains were now inserted. The wound continued to drain copious amounts of clear yellowish fluid smelling like urine. Urine leakage was suspected but intravenously injected indigo carmine did not appear in the fluid. The lymphangiogram established the correct diagnosis, namely, that the fluid was lymph originating from transected vessels (Fig. 4). The patient was treated conservatively and the drainage ceased after several weeks.

Case 4: A 49 year old female was seen at the University of Utah Medical Center for the past four years. She had chronic renal failure secondary to chronic glomerulonephritis. In 1968 she received a renal transplant from her brother but this had to be removed because of acute rejection. In 1970 a second transplant of a cadaveric kidney was placed in her left iliac fossa. Six weeks after transplantation she was re-admitted because of forty pound weight gain, lethargy, blurring of vision, and swelling of the lower abdomen and left leg. Pelvic examination confirmed the presence of a mass in the left lower quadrant; possibly also extending into the right pelvis. The urine output almost ceased. Acute rejection was suspected; the dose of Prednisone was doubled and over the next nine days the kidney was irradiated to a total dose of 450 rads. Inferior venocavogram, infusion urogram, and cystograms were done in an attempt to better

Fig. 5 Case 4. The urinary bladder has been filled with contrast medium. The bladder is pushed towards the right. The location of the transplanted kidney is marked by the clips. Note the distance between the urinary bladder and the transplanted kidney. At surgery the mass was a large lymphocele.

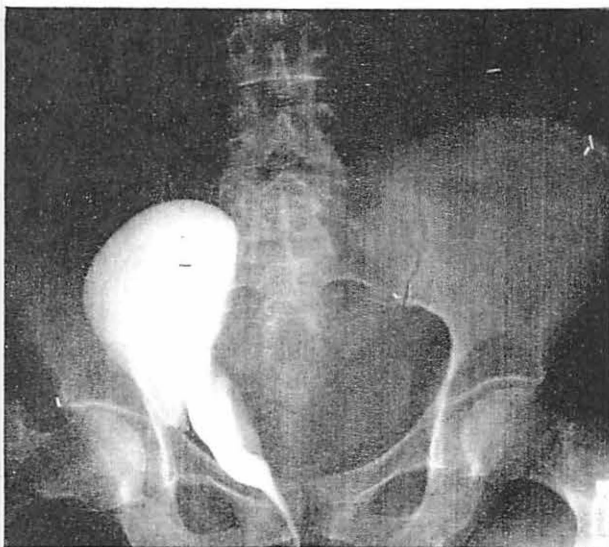


Fig. 6 Case 4. Lymphogram. Film taken 24 hours after injection of contrast medium. Contrast medium collecting in the pelvic space is seen (arrow). The true size of the lymphocele can be appreciated when one sees the position of the urinary bladder and the extrinsic pressure by the lymphocyst on the bladder.



define the mass. The venogram was normal. Kidney function was so poor that an infusion pyelogram failed to demonstrate a collecting system. The cystogram demonstrated a large mass which pushed the bladder to the right (Fig. 5).

Clinically urine leakage or hematoma were suspected. Exploratory laparotomy showed 300 ml. of clear fluid located around the lower pole of the kidney. The kidney was pink and biopsy showed no signs of rejection. Drains were placed around the transplant and the abdomen was closed. Despite the fact that drainage never ceased, it was decided to remove the drains. There was rapid reaccumulation of fluid. A lymphogram showed

that the fluid was lymph accumulating in a large lymphocele (Fig. 6), and re-exploration of the kidney bed yielded one liter of lymph. The patient's general condition continued to deteriorate and she died three weeks after her last operation.

Discussion

Among the many complications which have been described following renal transplantation (1, 7, 9), lymphatic complications resulting from the transection of lymphatic trunks have not been emphasized. It is likely that many of the reported deep wound infections and abscesses represent infected lymphocysts. They are fed by continuous lymphatic drainage from the transected vessels. The incidence of lymphoceles following renal transplantation has been reported by *Schweizer* et al. to be in the range of 2-3% (8).

Lymphocysts are not rare following pelvic surgery. *Dodd* (2) found that 28.9% of patients who has radical pelvic lymph node dissection developed lymphocysts. Since in renal transplantation no attempt is made to purposely dissect lymph vessels and nodes the percentage of lymphocysts is probably much lower. The clinical signs are non-specific; they are pain, swelling, feeling of fullness in the area of incision, and edema of the external genitalia and extremities. In *Dodd's* series 80% were diagnosed two to twelve months after surgical procedure.

Although the lymphocysts can be suspected on plain films of the abdomen or on cystograms or intravenous urograms, a definitive diagnosis differentiating the lymphocysts from leaking urine, hematoma, pelvic tumors, or abscesses unrelated to lymph drainage, can only be made by lymphography. The size and exact location are also best assessed on the lymphogram. According to *McMaster* (5), following injury, blood and lymphatic vessels become more permeable. Blood vessels will contract but lymph vessels may remain open permitting continuous drainage of lymph from the distal segment. In most cases flow ceases within a day or two and the lymph stream is shunted through collaterals (Fig. 1). However, if long segments of lymph vessels are removed, regeneration may not occur and lymphocysts can develop.

In patients with transplanted kidneys it is particularly important to detect the continuous drainage of lymph. These patients are far more susceptible to infection, and because infection may develop this otherwise relatively "benign" complication should be recognized and vigorously treated in order to avoid abscess formation or septicemia.

The treatment of a lymphocyst is frequently difficult. If infection prevails drainage is necessary, however *Dodd* (2) and *Grey* (3) wonder if drains placed in this space do not increase the incidence of complication. They feel that free drainage encourages continuous lymph flow and therefore suggest that if at all possible, patients should be kept under observation in the hope that spontaneous regression will occur.

The best way to prevent complication is to carefully ligate all vessels and tissue filaments around the ileo-hypogastric vessels during surgery. As little as possible dissection and cleaning of the arteries or veins of the host should be undertaken. In any patients who develop deep wound infection, abscesses, dehiscence of wounds or sinus tracts after transplantation, a lymphatic origin of this complication should be suspected and a lymphogram may be performed to prove it.

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The Effect of Ischaemia on Acid Phosphatase, β -Glucuronidase and Lactic Acid Dehydrogenase in Lymph from Hind Paw of the Rabbit

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Summary

The effect of ischaemia of the hind paw of the rabbit on the release of the lysosomal enzymes, acid-phosphatase and β -glucuronidase, and of lactic acid dehydrogenase (LDH) was assessed by measuring the activities of these enzymes in the lymph from the paw before and at varying intervals after the release of a tourniquet applied for 4 hr just above the ankle.

Histologically, this degree of ischaemia produced considerable necrosis of the plantar muscles with ultimate regeneration within 4 weeks.

The levels of activity of the lysosomal enzymes in lymph from the normal paw were less than those in plasma. The mean lymph:plasma ratios were 0.38 for total protein, 0.28 for acid-phosphatase and 0.08 for β -glucuronidase, suggesting that these enzymes in the lymph were derived mainly from the plasma with a degree of molecular sieving at the blood capillary wall. Ischaemia increased the permeability of the capillaries to all these macromolecules, but there was no evidence of any appreciable release of lysosomal enzymes from the injured cells or from the invading phagocytic cells.

During the period of muscle degeneration from 1 to 7 days after release of the tourniquet, the level of activity of β -glucuronidase was significantly less in lymph from the affected paw than in lymph from the normal paw. It seems likely that in the areas of muscle necrosis the enzyme in the tissue fluid originating from the blood plasma was involved in the lytic processes of the damaged muscle cells.