Hemodialysis catheter malposition: How to prevent this fault?

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ABSTRACT

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CASE REPORT

A 26-year-old male, known case of solitary kidney disease presented with respiratory difficulty, sweating and frothy bloody discharge from oral cavity. At eight years of age, left vesicoureteral reflux detected from him and underwent antireflux operation (subureteric transurethral injection with teflon through cystoscopy). Four years later, he underwent antireflux operation of right vesicoureteral reflux. At 13 years of age, renal sonography revealed asymmetric kidney size (right kidney 57 mm, left kidney 85 mm), normal renal function (urea: 50 mg/dL [8.3 mmol/L], creatinine: 0.9 mg/dL [79.56 μ mol/l]) and hematuria (RBC 18–20/hpf). The patient had not followed-up until one week before admission when he developed dyspnea on rest and then he referred to emergency room. No history of fever, oliguria, and dysuria was presented. Physical examination showed tachycardia, high blood pressure (150/105 mmHg), distended neck veins and grade II/VI systolic murmur in apex, left sternal border and pulmonic area. Laboratory analysis revealed leukocytosis WBC $17900 \times 10^3/\mu$ L, hemoglobin 10.6 g/dL and elevated ESR 50 mm/hr. Biochemical tests revealed hyperglycemia (FBS 130 mg/dL), elevated urea and creatinine (urea 184 mg/dL, cr 13.3 mg/dL) and (uric acid 9 mg/dL, Na^+ 137/L, K^+ 5.4 M eq /L), hyperlipidemia (cholesterol: 260 mg/dL, TG:274 mg/dL), increased total CPK and LDH (CPK 1600 U/I, LDH 639 U/I), negative troponin and decreased transferrin saturation percent (TSAT 6%). Urinalysis

showed hematuria (RBC 2–3/hpf) and proteinuria (trace). Urine culture was negative. A 24-hour urine protein collection revealed proteinuria (345 mg), urine creatinine (480 mg) and urine volume (1200 cc). Renal sonography revealed small sized kidneys (right kidney 72 mm, left kidney 67 mm). Electrocardiography (EKG) showed inverted T-wave in precordial leads (V₄–V₆). Transthoracic echocardiography showed normal ejection fraction and 1⁺ mitral regurgitation. On admission, for the patient inserted percutaneous hemodialysis catheter in chest by anesthesiologist and performed hemodialysis for 1.5 hr. One day later, chest X-ray revealed bilateral diffuse patchy infiltration in lungs that was in favor of uremic lung, also it showed hemodialysis subclavian vein catheter misplacement (Figure 1).

Then, hemodialysis catheter removed and percutaneous temporary uncuffed, non-tunneled double lumen catheter inserted in right jugular vein in neck and chest X-ray became normal (Figure 2).

Diagnosis: End-stage kidney disease due to chronic pyelonephritis/Reflux nephropathy. The patient is on hemodialysis and is preparing for kidney transplantation.

DISCUSSION

Cannulation of central veins and placement of catheters for temporary hemodialysis is a common procedure in the management of patients with end stage renal failure. The right internal jugular vein is the site of choice for central venous catheter placement, because it provides a more direct route into the right atrium and therefore helps prevent sheath kinking and further catheter secondary shift, being associated with the lowest complication rate. The procedure can be associated with a variety of malpositions of the catheter and rarely, can lead to significant morbidity and even mortality, if this is not recognized and not corrected early [1]. Non-tunneled percutaneous central vein catheter is usually placed at the bedside, while tunneled catheters can be placed in an interventional suite or operating room using fluoroscopic guidance.

Also study by trerotola demonstrated, using non-tunneled catheter, an incidence of central venous

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Figure 1: Chest X-ray of the patient showing misplacement of temporary hemodialysis catheter in right subclavian vein.

Figure 2: Chest X-ray of the patient showing temporary hemodialysis catheter in right internal jugular vein coursing into right atrium.

thrombosis and/or stenosis of 40–50% with the subclavian rout versus an incidence of 0–10% with the right internal jugular route [2].

A standard teaching and learning process in the medical field involves peer review and evaluation of fundamental mistakes that physicians encounter in clinical practice. These complications can be minimized

and managed effectively by an experienced operator having increased awareness and using better technique [3]. Prior to the placement of central catheters, ultrasound imaging evaluates venous patency in patients who have a history of prior deep vein thrombosis in the region of the proposed access site. Familiarity with ultrasound-guided access is a critical aspect for the practitioner performing frequent central venous catheterization. Static ultrasound can be helpful to localize the vein for access when using techniques that rely on knowledge of anatomic landmarks (i.e, landmark technique), or alternatively dynamic ultrasound can be used to guide the needle into the vein in real time. The use of chest radiographs to establish the correct placement of central neck lines is to be routinely practiced [4]. Also the field of interventional nephrology needs to be viewed as a new road towards improving the dialysis access care provided to chronic kidney disease patients across the globe.

CONCLUSION

Improper placement technique can lead to early dysfunction and inadequate dialysis treatment. The current images are examples of demonstrating improperly placed temporary hemodialysis catheter by non-nephrologist and correction of this mistake by nephrologist. The advent of interventional nephrology in the world has created a new opportunity for the nephrologists to change their roles from thinkers to doers and leaders. The subspecialty is a step towards not only learning the necessary skills to perform dialysis access related procedures but to assume a leadership role in coordinating a medical team to provide the best the possible care.

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Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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