

CASE REPORT

Aglae Charlot,¹ M.D. and Stephen deRoux,^{1,2} M.D.

Biting Through an Arteriovenous Hemodialysis Graft: An Unusual Method of Suicide

ABSTRACT: Patients on long-term hemodialysis often have multiple medical and social problems with associated psychological stress and depression. The suicide rate in this population is higher than the general population, and suicides have been reported following severing or disconnection of hemodialysis vascular access sites. We report a patient on chronic hemodialysis with a history of depression and suicidal ideation who bit into his forearm arteriovenous graft and exsanguinated.

KEYWORDS: forensic science, arteriovenous dialysis graft, hemorrhage, human bite, suicide, chronic renal failure, dialysis

Of the two treatment options available for chronic renal failure (CRF), renal transplant or dialysis, since 1947 dialysis has been most efficiently accomplished by hemodialysis (HD). Hemodialysis requires a dependable and reusable access to the cardiovascular system. This is accomplished by one of three methods: an arteriovenous fistula (AVF), an arteriovenous graft (AVG), or a large bore, double lumen indwelling vascular catheter. Because of the chronicity of their disease and frequently associated comorbid conditions, many of these patients face additional social problems such as the loss of their role in the family or workplace and loss of sexual function, which may lead to depression (1–3). The suicide rate among dialysis patients is significantly higher than in the general population (4–7). There have been previous reports of individuals committing suicide by severing or disconnecting their vascular access sites with resultant hemorrhage (4,8–11); however, there has been no previous report of exsanguination following biting into a vascular access site.

Case Report

A 41-year-old man with a history of atherosclerotic and hypertensive cardiovascular disease with end stage renal disease (ESRD) requiring long-term HD was recently released from the hospital following treatment for chest pain and right forearm phlebitis. Subsequently, he was taken to the emergency room by his family for evaluation. He was acting erratically and was up all night screaming that he did not want to live and repeatedly stated that he wanted to die in peace. He complained of feeling depressed to a psychiatrist. He exhibited passive death wishes and stated “my mind tells me that I am going to die.” Arrangements were made for admission to the psychiatric ward and he was placed on a one to one watch for safety while awaiting a bed. On day 2 following admission to the emergency room he was found to be unresponsive

with agonal respiration. A large amount of blood was found on his bed and the floor. Blood also was noted on his lips and in his mouth. Cardiopulmonary resuscitation was started, however he became bradycardic and then asystolic. Based on his family’s wishes a full autopsy was not performed by the medical examiner’s office; however, his forearms were dissected to evaluate the injuries. There was an AVG of the volar aspect of the left forearm. Overlying the distal end of the graft was a 1.5 cm in greatest dimension irregular skin defect with scalloped margins, consistent with a biting injury by the decedent’s teeth (Fig. 1). The injuries extended down to the graft where there was a 0.4 cm perforation (Fig. 2). On the flexor aspect of the right forearm was an irregular, scalloped skin defect (consistent with human bite marks) measuring 3.0×1.5 cm extending into the underlying soft tissues.



FIG. 1—Volar aspect of distal left forearm with a scalloped 1.5 cm skin defect consistent with a human bite. Scale in inches.

¹New York City Office of Chief Medical Examiner, New York, NY 10016.

²Department of Forensic Medicine, New York University School of Medicine, New York, NY 10016.

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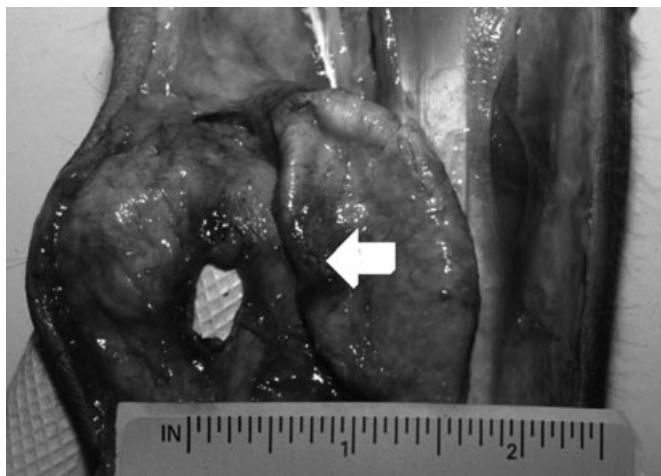


FIG. 2—Left forearm dissection showing a 0.4 cm hole (arrow) in the AV graft underlying the skin defect depicted in Fig. 1. Scale in inches.

Discussion

The treatment of ESRD was revolutionized in 1947 when Kolff (12) described a new way of treating uremia, utilizing a rotating drum dialyzer. Currently, there are three main types of dependable and durable vascular access for HD (two permanent and one temporary). In 1966, Brescia et al. (13) described surgical creation of an AVF between the distal radial artery and an adjacent vein that would provide a continuous flow of 250–300 mL/min, thus increasing the rate of blood flow and pressure inside the vein which subsequently dilated. This continues to be the best method for repeated vascular access for long-term HD. The AVG is surgically created by anastomosing a prosthetic tube (dacron, polyurethane, or polytetrafluoroethylene), usually in a U-shape, to an artery and a vein, predominantly in the upper extremity. For short-term dialysis or while waiting for a fistula or graft to mature a large bore double lumen indwelling catheter may be inserted into a large vein (internal jugular, subclavian, etc.).

Patients on long-term maintenance HD often have numerous medical and social problems leading to an impaired quality of life with associated psychological stress. In addition, some medications used to treat patients with end stage renal disease also may cause depression: these include β -adrenergic blockers and calcium-channel blockers used to control associated hypertension in these patients (2). In 1986, Israel (1) concluded that the incidence and prevalence of depression in dialysis patients varied between 20% and 50%. Kimmel et al. (3) stated that depression was the most common disorder in dialysis patients.

In 1971, Abram et al. (4) found the suicide rate in long-term HD patients to be 100 times that of the general population. When dialysis noncompliance deaths were included as suicides the rate increased to 400 times that of the general population. A decade later Haenel et al. (5) estimated a rate of conventional suicides among dialysis patients in Switzerland at 10 times that of the general population. By adding the death rate due to refusal of therapy to this number, the rate increased to 25 times that of the general population. Neu and Kjellstrand (6) found that 22% of all deaths among dialysis patients were due to stopping treatment. Kurella et al. (7) in a study of 465,563 dialysis patients showed a suicide rate of 0.005% and concluded that persons with ESRD are significantly more likely to commit suicide than persons in the general population. In their review, 9.6% of patients also withdrew from dialysis before death.

Any penetration through the skin and into the graft (incised wound, bite) will result in external hemorrhage. The rate of blood loss will

depend upon the size of the defect and the rate of blood flow in the graft. In adults the average peak systolic velocity of blood flow in the axillary and brachial arteries is 80 and 60 cm/sec, respectively (14). In a normally functioning AVG, the peak systolic velocity typically ranges between 100 and 400 cm/sec (15). In addition, as there is no muscular media in the wall of the graft there is no vasospasm to aid in hemostasis as would occur in a native vessel.

Kasi-Visweswaran et al. (8) reported on two suicides and one attempted suicide in patients who were on HD. They disconnected the ends of their partially external vascular shunts. The shunts in question were expected to have a flow rate of *c.* 250–300 mL/min. They estimated that if both ends of the shunt were disconnected there would be physiologically deleterious blood loss in 4–8 min (one man died within 15 min). However, CRF with anemia probably renders such patients more susceptible to the effects of blood loss. Therefore, the amount of extravasated blood may be less than would be expected for fatal hemorrhage in a healthy individual (11). Other authors have described suicides following disconnecting or severing of dialysis catheters (4,10,11) or incising of an AVF (9). In our case, the patient was able to achieve his suicidal goal while under one on one supervision. Our report illustrates that all possibilities must be entertained when treating a suicidal patient on chronic hemodialysis. It also emphasizes the importance of psychotherapy as an integral part of the management of such patients.

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Additional information and reprint requests:

Stephen deRoux, M.D.

Office of the Chief Medical Examiner of the City of New York

520 First Avenue

New York, NY 10016

E-mail: sderoux@ocme.nyc.gov