G53 Exsanguination Associated With Vascular Access Sites in Hemodialysis Patients

Donna M. Vincenti, MD, and Patricia A. Aronica-Pollak, MD, Office of the Chief Medical Examiner, 111 Penn Street, Baltimore, MD 21201; Joshua M. Sharfstein, MD, City of Baltimore Health Department, 210 Guilford Avenue, Executive Suite, 3rd Floor, Baltimore, MD 21202; and David R. Fowler, MD, Office of the Chief Medical Examiner, 111 Penn Street, Baltimore, MD 21201*

After attending this presentation, attendees will understand some principles associated with death secondary to exsanguination from vascular access sites in hemodialysis patients including the vascular access types, the frequency at which this occurs, associated circumstances under which this occurs, and possible modalities for prevention.

This presentation will impact the forensic community and/or humanity by providing a review of exsanguination deaths that are directly related to arteriovenous fistulas, arteriovenous grafts and venous catheters used for hemodialysis in patients with end stage renal disease. This information can augment knowledge of this lethal complication associated with hemodialysis and thereby reinforce the need for patient, caregiver and health personnel education and vigilance.

Patients with end stage renal failure requiring hemodialysis have three options for vascular access depending on the severity of their disease, their vascular anatomy, and their vascular viability. Native arteriovenous fistulas are the preferred choice for long term dialysis treatment because of their lower rate of breakdown and infection. Arteriovenous grafts can also be used for long term dialysis treatment if the patient's anatomy is not conducive to the creation of a natural fistula but has a greater risk of infection and clotting. Intravenous catheters are preferably used for a short duration, usually for emergency dialysis or while waiting for a fistula to mature. Exsanguination from any of these vascular access sites is a lethal complication for hemodialysis dependent patients.

A retrospective search of cases from January 2000 to July 2006 in the State of Maryland yielded 24 deaths due to exsanguination from arteriovenous fistulas, arteriovenous grafts, and venous access catheters. The age range was from 28 years to 85 years with a mean age of 58 years. Fifteen (63%) of the decedents were male. Eighteen (75%) were African American and six (25%) were Caucasian. Seven access sites (29%) were arteriovenous fistulas and four (17%) were venous catheters. Ten access sites (42%) were arteriovenous grafts. Of these ten grafts, seven (70%) were synthetic, two (20%) were made of natural materials, and one (10%) was comprised both synthetic and natural materials. Exsanguination was due to erosion of an arteriovenous graft or fistula in 14/24 (58%), dislodgement of a venous catheter in 2/24 (8%), dehiscence of graft site sutures in 2/24 (8%), infection involving a graft or fistula in 2/24 (8%), perforation of an artery following venous catheter insertion in one case (4%), erosion due to an aneurysm involving a fistula in one case, one individual who cut her venous catheter at home presumably with scissors for unknown reasons and one individual who pulled out his active dialysis line from his arteriovenous graft in the dialysis center. The manner of death was classified as accident in 11of 24 cases (46%), as natural in nine (38%) and as undetermined in four (17%). Of the 22 of 24 cases tested for ethanol, one case tested positive. Of the 13 of the 24 cases tested for drugs, three (23%) tested positive for illicit drugs. The substances identified included cocaine and morphine. In addition to these three cases, one decedent had pseudoephedrine intoxication that was considered a contributing cause of death.

Although the complications related to vascular access sites for hemodialysis are many and varied, the results indicate that death by exsanguination is an important risk for patients. Dialysis centers should educate patients about this potential and instruct them to periodically look for signs of fistula/graft compromise including fistula/graft failure, infection, or aneurysm formation. In addition, dialysis centers should consider encouraging patients to carry a tourniquet at all times after proper training as to its use. Therefore, if a fistula/graft does erode or perforate, one can survive until emergency care can be initiated.

Hemodialysis, Exsanguination, Arteriovenous Fistula/Graft

 ** Presenting Author*