Time to Hemostasis after Traction Removal of Tunneled Cuffed Central Venous Catheters

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PURPOSE: Many patients undergo placement of tunneled cuffed central venous catheters (TCCVCs) for indications including administration of medical therapy and hemodialysis. They are removed when no longer needed or if there is a device complication. There is no consensus regarding the necessity of routine preremoval coagulation studies or platelet count, so this study was performed to determine if abnormal coagulation status affects the time to hemostasis (TH) after traction removal of TCCVCs.

MATERIALS AND METHODS: Adult patients referred to our group for removal of a TCCVC placed via a jugular or subclavian route were considered candidates for inclusion. Blood was submitted for evaluation of prothrombin time (PT) and International Normalized Ratio (INR), activated partial thromboplastin time (aPTT), and platelet count. Catheters were removed with the traction technique, and presence of hemostasis was assessed at 5-minute intervals of manual compression.

RESULTS: Between November 19, 2001, and April 20, 2004, 179 subjects were enrolled and completed the study. There were 165 subjects in whom TH was within the first 5-minute interval and 14 in whom more than 5 minutes was required. Statistically significant factors associated with prolonged TH were primary diagnosis of end-stage renal disease ($P = .005$), use of antiplatelet agents ($P = .03$), and procedure performed by a "low-volume" operator ($P = .002$).

CONCLUSIONS: Routine preremoval evaluation of coagulation parameters is not necessary. Patients who are likely to have abnormal platelet function but not abnormal platelet number appear to be at risk for prolonged TH, but even in those cases, the THs are rarely more than 15 minutes.

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Abbreviations: aPTT = activated partial thromboplastin time, ESRD = end-stage renal disease, INR = International Normalized Ratio, PT = prothrombin time, TCCVC = tunneled cuffed central venous catheter, TH = time to hemostasis

MANY patients undergo placement of tunneled cuffed central venous catheters (TCCVCs) for indications including administration of medical therapy, apheresis, and hemodialysis. When the TCCVC is no longer needed or if there is a complication related to the catheter (eg, mechanical failure of the catheter or suspected infection), the catheter is removed. This is accomplished by a surgical cutdown procedure (1) or the use of the traction technique (2).

Some physicians require laboratory evaluation of parameters that may suggest increased bleeding risk, including prothrombin time (PT) and International Normalized Ratio (INR), activated partial thromboplastin time (aPTT), and platelet count, before catheter removal. In a small informal survey of Society of Interventional Radiology members performed before initiation of this study in 2001, 44% of respondents ($n = 7$) routinely checked

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INR and platelet count before performing traction removal of TCCVCs and 56% ($n = 9$) did not (data on file, M.S. Stecker, 2001).

Although administration of blood products or cessation of anticoagulants or antiplatelet agents might be required in some patients to prevent prolonged bleeding after catheter removal, identification of patients who might benefit from these actions is difficult. The cost of routine coagulation and platelet studies in this large population is substantial. Additionally, attempted correction of abnormal parameters in a patient who does not require it unnecessarily expends limited resources, needlessly exposes that patient to the risks of transfusion (eg, infection and transfusion reaction) or thrombotic complications, and incurs a sizeable cost.

There have been many scientific reports regarding placement of tunneled central venous catheters, but there have been few pertaining to their removal, and particularly little attention has been paid to whether routine evaluation of PT, INR, aPTT, or platelets before traction catheter removal affords any benefit to safety and efficacy of the procedure. If coagulation status does not significantly affect time to hemostasis (TH), performing those studies before removing tunneled catheters is unnecessary. The purpose of this study was to determine if abnormal coagulation status affects TH after traction removal of TCCVCs.

MATERIALS AND METHODS

This prospective nonrandomized study was approved by our institutional review board. All study subjects signed institutional review board–approved informed consent to participate in the study.

Inclusion and Exclusion Criteria

All patients 21–80 years of age with a TCCVC placed via a jugular or subclavian route who were referred to Indiana University Hospital and Wishard Memorial Hospital (Indianapolis, Ind) interventional radiology services for tunneled catheter removal between November 11, 2001, and April 20, 2004, were considered candidates for inclusion in the study.

Minors, pregnant women, mentally disabled patients, and prisoners were excluded from the study. Patients with catheters placed via a route other than the jugular or subclavian route (eg, translumbar or transfemoral) and those with noncuffed tunneled central venous catheters were excluded. Patients with catheters that cannot be removed by traction (eg, Schon catheter; AngioDynamics, Queensbury, NY) or for which traction removal is commonly complicated by catheter fracture and cutdown is our preferred method of removal (eg, Tesio catheter; Medcomp, Harleysville, Pa) were excluded. Patients in whom traction removal technique failed, requiring removal by cutdown, were also excluded. By institutional review board mandate, recent laboratory tests performed for reasons unrelated to the study needed to be reviewed before patient enrollment. Potential study subjects with severely abnormal coagulation parameters, who had not received any corrective therapy, that met any one of the following threshold criteria were not included in the study: (i) aPTT greater than 100 seconds less than 4 hours before planned enrollment, (ii) INR greater than 4.0 within 1 day of enrollment, or (iii) platelet count less than 10,000/mm^3 within 3 days of enrollment. Patients who were receiving a continuous unfractionated heparin infusion could be included in the study if the infusion was discontinued for at least 2 hours before enrollment. Patients who were believed to be unsuitable for the study by the investigators (eg, clinically unstable condition or treatment with a IIb/IIIa platelet inhibitor) were not enrolled in the study. A patient could be enrolled in the study only one time regardless of the number of times that (s)he presented for catheter removal during the course of the study.

Definitions

Catheter time was defined as the duration an individual catheter was in place and was the interval between placement or last exchange (whichever was more recent) and removal. Access time was defined as the duration the particular venous access site was being used, including catheter exchanges, and was the interval between initial de novo catheter placement and catheter removal. If the subject had only one catheter from the time of initial placement to removal, the access time and catheter time were equal. Therefore, catheter time could be less than or equal to access time.

Procedure

After obtaining informed consent from the subject, 15 mL blood (3) was aspirated and discarded from each catheter port to remove the heparin dwell. Next, 10 mL blood was obtained through the catheter and sent for laboratory evaluation, including PT/INR, aPTT, and platelet count. After commencement of the study, it was noted that the aPTT was markedly increased (≥60 sec) in 10 of the 22 subjects (45.5%) for whom data was available. Of these 10, nine (90%) had hemodialysis catheters, compared with two of the other 12 subjects (16.7%; $P = .002$). The increase in aPTT was thought to be a potential result of the much higher heparin concentration used for hemodialysis catheter dwelling between uses. Therefore, the blood draw protocol was modified after enrollment of the first 23 subjects per institutional review board amendment beginning January 23, 2002: if the catheter was being used for hemodialysis, after the initial 15 mL blood discard per lumen, each lumen would be flushed with an additional 30 mL of sterile saline solution, followed by a second 10-mL blood discard per lumen. If both lumens of the TCCVC were occluded and the subject agreed, blood was obtained via a peripheral venipuncture.

The skin and catheter at the tunnel exit site were prepared and draped with sterile technique with chlorhexidine gluconate scrub. Local anesthesia (1% lidocaine buffered with sodium bicarbonate except in those with history of allergy, in which cases an appropriate local anesthetic agent was used) was administered subcutaneously, particularly around the polyester cuff. Gentle blunt dissection through the tunnel exit site was used to loosen the cuff. Traction was applied to the catheter to effect its removal. Manual compression of the insertion vein with the subject in a sitting or semirecumbent position, if able, was used to prevent bleeding for at least 5 minutes. Compression was