

CASE REPORT

Unforeseen Heparin Leak from Hemodialysis Catheter Leading to a Fatal Outcome

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Abstract

Hemorrhage is a non-neglected non-mechanical non-infectious complication that should be kept in mind during the follow up of dialysis patient with a tunneled catheter. Other complications are either mechanical dysfunction or infectious related catheter. Infection related catheter bacteremia is a more common complication leading to serious morbidity and mortality. We report a case of heparin leak to the systemic circulation evolving silently to a fatal outcome.

Keywords: Heparin Lock; Tunneled Catheter; Hemodialysis; Hemorrhage

Introduction

Use of central vascular catheters is associated with increased morbidity and mortality compared either to arterio venous fistula (AVF) or to graft (AVG). Usually, tunneled dialysis catheter is reserved for a chronic base, lasting for months and years. However, the patency of these devices could be intriguingly affected, marked by catheter dysfunction, stenosis/thrombosis, catheter related infection and hemorrhage. This later occurred while the patient is on dialysis session and away from their dialysis facilities as well [1,2]. Predisposing factors for hemorrhage included coagulation abnormalities, stenosis, local sepsis, repeated trauma, and hypertension. Grafts had four times tendency for thrombosis and six times for hemorrhage compared to fistulas and tunneled catheter. To avoid complications related to catheter use; manufacturers are making efforts to avoid microbial colonization and thus reducing the likelihood of clot formation on the catheter surface by developing either coated catheter or advocating specific lock solutions (antibiotic, trisodium citrate, recombinant tissue Plasminogen activator and heparin sodium). Early catheter-related complications occurred most often during the first 90 days of catheter placement and in some circumstances after 90 days or late complications [3]. These complications are classified as mechanical catheter-related complications (MCRCs), catheter-related bloodstream infections (CRBSIs) and non-mechanical noninfectious catheter related complications (NMNICRC).

Case report

This 85 year old man is under hemodialysis due to the evolution of nephro angiosclerosis for 8 years duration. His main medical history includes arterial hypertension, ischemic cardiomyopathy, and hemorrhagic central vascular accident with right sequels, prostatomegaly and monoclonal gammopathy of uncertain origin. Attempting creation of a permanent vascular access has failed and patient was dialyzed thru a central cuffed tunneled catheter that has been changed thrice during this period. Due to the long-term use of tunneled catheter, he developed a proximal stenosis mandating recurrent re-permeabilization by transcatheter angioplasty and finally the introduction of a stent. It seems that this proximal stenosis occurred on the top of a chronic fungal infection due to candida albicans. Finally, a tunneled cuffed catheter was inserted in the left internal vein, guided by ultrasound. Following this procedure and two weeks later, bulging appeared along the previous tunnel. Incision of the tumefaction confirmed his hematic nature and excluded any surinfection by culture and sensitivity of secreted material. His program of dialysis includes a three times four hours weekly dialysis. His dialyzer was a polysulfone membrane of 1.8 m² surface area, sterilized by gamma rays. His dry weight was fixed at 67.5 kg and being anuric. Anticoagulation of the extra corporeal circuit was assured by using standard unfractionated heparin with a loading dose of 5000 ui and 1000 ui hourly. He was dialyzed thru a cuffed tunneled catheter inserted in the left jugular vein allowing us to have a blood flow at 280 ml/min. Visual arterial and venous pressure, respectively, were within authorized limits. The catheter was locked with 2.4 and 2.3 ml heparin for venous and arterial branch respectively

according to the recommendation of the manufacturer (5ml = 25000 ui per vial). Clinical and biological data were consistent of dialysis patients. Initially, patient reported a right sciatic –like pain explored by plain radiography that was not showing significant abnormalities. The following appointment to his regular session, he was still having sustained pain and laboratory investigation, no including homeostasis profile did not alert any attention. In the nighttime he was brought by ambulance and was admitted with similar complain, having stable hemodynamic parameter, afebrile and normal electrocardiogram tracing. Blood chemistry was ordered and extracted thru peripheral circulation. It showed the following parameters: hemoglobin=13.5g/dl (13-17), hematocrit level 41.9%(40-54), Mean corpuscular volume = 92.3 fl (80-100) , plates=193giga/l (150-400) , Whole blood cells = 9giga/l (4-10) Prothrombin time= 61% (80-100) International normalized ratio(INR)= 1.43 Activated clothing time(ACT) = >180 seconds ratio patient/control > 6.21 ,fibrinogen level 3.6g/l (2.5-4) and Ddimeres = 4559ng/ml (68-449).sodium= 137 mmol/l , potassium = 4.5 mmol/l, chloride= 96 mmol/l , random blood sugar = 6.2 mmol/l , urea = 7.7 mmol/l , creatinine =427 umol/l and proteins = 86 g/l. C reactive protein = 11 mg/l (<5) Liver function test , thyroid stimulating hormone , albumin and procalcitonin were all within normal range. However NT-PRO BNP was at 5552 pg/ml (<300). He was admitted for observation at the short stay ward. In the early morning patient developed a sudden haematemesis and diffuse abdominal pain without guarding. An attempt to intubate the patient was followed by a bulky mass of blood leading to shock. Blood chemistry showed a sharp drop of his hemoglobin level at 6.6 g/dl and hematocrit =22.3% with INR at 2.45 and persistently a prolonged ACT at > 180 seconds after 12 hours from the end of dialysis. Troponin level was at 0.33 ug/l (<0.10) and blood dilution after the unsuccessful cardiopulmonary resuscitation. Early report did show negative lupus anticoagulant His current treatment included Clopidogrel 75 mg, celiprolol 100 mg, gabapentin 100 mg, hydroxyzin 25 mg, pentoprazol 40 mg, zopiclone 3.75 mg and Methoxy polyethylene glycol epoetine beta (MIRCERA) 75 ug monthly.

Discussion

Both tunneled and non-tunneled catheters are frequently used in patients with chronic renal failure under hemodialysis. However, central catheterization is subject for mechanical, infectious or non-mechanical non-infectious complications [4]. Such complications occurred according to the design, performance and patency of these catheters. The mostly used is either pure unfractionated heparin or citrated agent as Turolock and recombinant tissue Plasminogen activator [5-7]. Catheter locks containing heparin have been linked to an increased risk of hemorrhage and thrombocytopenia [8]. Citrate offers several clinical advantages over concentrated heparin: citrate lock avoids heparin-associated bleeding complications, improves reliability of international normalized ratio assays and provides an effective alternative for patients with suspected or confirmed heparin-induced thrombocytopenia. A disadvantage of citrate is mainly derangement of calcium homeostasis, metabolic alkalosis and is contra indicated in patient who has chronic liver disease. Tunneled catheters have decreased the rates of malfunction, infection, and thrombosis significantly when compared to temporary catheters, but predispose to more unwanted events observed in long-term stay [9]. Catheter related complications might occur during their insertion/utilization, the inter dialytic period or removal. However, incident related to their insertion are more common but ultrasound guided placement of catheter is well known to decrease these complication rate [10]. The presence of chest pain during an attempted removal of these catheters should raise the suspicion of catheter adhesion. Central tunneled cuffed venous catheters have an increasingly important role in the delivery of HD, either as interim vascular access or in patients with difficult vascular access. Long-term stay in place of these catheters (> 90 days) might predispose to dislocation, tethering, fracture and migrating distally into the vascular and cardiac chambers. Such incidents could induce arrhythmia, infection, pulmonary embolism, myocardial infarct and sudden death. Attempting forced introducing or removing could induce perforation of the superior vena cava leading to hydrothorax, pleural effusion, chemical mediastinitis, and right phrenic nerve. Our patient developed a budding hematoma two weeks later after the insertion of a dual tunneled catheter. Despite a favorable evolution, he developed a fatal outcome due to the spill out of pure heparin in the systemic circulation. Such complication have been reported independently of the lock solution nature, dose and clinical condition of the patient [11-16]. The initial complain was attributed to a probable consequence of degenerative changes or a compressive effect of retroperitoneal hematoma. The hallmark of overt anti coagulation due to unfractionated heparin was a persistently prolonged activated clothing time that sustained for more than 12 hours. We cannot exclude another episode of intra cerebral hemorrhage in the absence of radiologic investigations. Usually, unfractionated heparin is metabolized by the endothelium and the kidney clears solely one third of the administrated dose. In whatever is the condition, half-life of unfractionated heparin will never exceed 4hours in end stage renal failure. By opposite to unfractionated heparin, low molecular weight heparin is mainly cleared by renal route and has no specific antidote in case of occurrence of severe hemorrhage; that is why it is not recommended for use as lock. Clopidogrel contributed certainly to the occurrence of upper gastro intestinal bleeding during intubation attempt. To the best of our knowledge, few studies have focalized on the use of this agent in dialysis population. Further studies are needed to clarify the benefit/risk ratio whenever Clopidogrel is used with other anti platelet or anti coagulant agents. Low dose of Acetylsalicylate either prescribed for primary or secondary prevention has been associated with favorable outcome. Usually, it is concomitantly prescribed with Clopidogrel following repermeabilization of coronary arteries. This association might predispose to potential serious side effect that has to be weighted individually to minimize the risk of bleeding tendency. Furthermore, our patient was having prolonged activated clothing time evoking heparin leak to the systemic circulation and the sole predisposing agent was heparin that has to be neutralized by protamine sulfate. Unfortunately, prolonged ACT was not seen until the post mortem time. Maya et al showed that low heparin concentration lock solution do not decrease cumulative dialysis patency, but require a twofold increase in thrombolytic instillation to maintain long –term patency [17]. As in our case, Yevzlin, et al.[17]. showed that high concentrated heparin lock is associated with major bleeding while using tunneled hemodialysis catheter. The mechanisms of lock spillage from tunneled catheter remain controversial. The best practical point to avoid such complication should achieved by reducing long stay catheter. By opposite to previously mentioned, the prescription of non-vitamin K dependant oral anticoagulant in dialysis remains controversial [18].

Conclusion

Heparin leakage from dialysis catheter to the systemic circulation is a possible Complication that has to be kept in mind and mandating regular follow up of whole blood activated clotting time. Alarming hemorrhage tendency includes difficulties during catheter insertion, unexpected mechanical dysfunction or history of early bleeding and hematoma.

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