

## Case Report

## Converting a Catheter-Dependant Patient to Hemodialysis Reliable Outflow Graft (HeRO) is not an Heroic Approach

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### Abstract

We report a case of end stage renal failure under renal replacement therapy secondary to a rapid evolution of Good-Pasture syndrome into an irreversible phase. As a patient was having active infection, hemodialysis was considered as the appropriate option of life saving method. She was initially hemodialyzed through a central venous catheters taking in account the acute presentation, entertained by many comorbid conditions and failed creation of native arterial venous fistula. The tunneled catheters have been converted successively to HeRO graft then to arteriovenous femoral graft due to many catheter dysfonctions followed by catheter related blood stream infection. In case of unused HeRO graft, there is a great risk of metastatic infection of bridging piece of the graft mandating its early ablation as whole. Further randomized controlled trials are needed to confirm or to reject the hypothesis.

**Keywords:** Catheter; HeRO; Hemodialysis; Complication

## Introduction

Chronic renal disease is a growing condition leading to increase morbidity and mortality worldwide. Dialysis adequacy becomes a challenging option, beyond mathematical formulas to preserve the quality of life of these patients. This later is influenced by many factors dominated by the patency of a vascular access and dialysis prescription as a modifiable risk factor [1]. Many international guidelines are advocating arterial venous fistula as the hemodialysis access of choice, graft next and catheter use is last [2]). There is great discrepancy between countries in handling end stage renal failure which depend partially on the global budget, rather than the quality of life of these patients. Tunneled dialysis catheter (TDC) are associated with an increased incidence of bacteremia, less effective dialysis due to reduced blood flow rates and frequent malfunctions. Usages of tunneled catheters become reasonable in patients having a significant comorbidity with short life expectancy, those with advanced cardiac failure not candidate for peritoneal dialysis and in those with no more suitable vasculature. Approximately one third of patients using tunneled hemodialysis catheters during the first two years experiences central venous catheter (CVC) – related complication [3]. A new long term subcutaneous arterio venous graft, the hemodialysis reliable outflow graft (HeRO) was approved to be used in patient filling previous conditions. Practically, conventional approaches are the most preferred, follow by alternatives finally the salvage ones [4]. Tunneled dialysis catheters serve as a bridge to arterio venous fistula (AVF). The national kidney foundation dialysis outcomes quality initiative (NKF-KDOQI) recommends that less than 10 % of chronic maintenance hemodialysis patients can be maintained on catheters as their permanent dialysis access [5]. Complications of TDC are classified as mechanical and non-mechanical dominated by dysfunction and catheter related blood stream bacteremia. According to Dialysis outcome and practice patterns (DOPPS) data, 15-50 % of patients in Europe and more than 60 % of patients in USA start hemodialysis treatment with a catheter as primary access [6]. Although the prophylaxis of catheters dysfunction would be the complete avoidance of catheter use, a well-functioning catheter is essential in delivering an efficient dialysis

## Case Report

This 24-year-old hemodialysis female due to the evolvement of Good pasture syndrome to end stage renal failure. She is known to have congenital thyroid agenesis under hormonal replacement, overweight, recurrent renal colic and addiction to solvents and pooping. The diagnosis of rapidly progressive glomerulonephritis has been established by percutaneous kidney biopsy and patient was put under the program of renal replacement therapy initiated through a left uncuffed dual lumen. She reported the story of having been abandoned by her mother in the clinic of birth with a hard psycho social consequence. She deliberately pulled out one branch of her dual lumen catheter during hospitalization leading to external hemorrhage and anemia needing four red cell packs transfusion. Further dialysis sessions have been performed through the remaining branch using “Y” shape alternating blood flow pump. The patient was scheduled for left radial fistula creation witch thrombosed on the table of operation. Patient was transferred to our unit according to her wish as she was living nearby. According to her interrogatory, she confirmed the event of pulling the catheter as being not fully recovered from general anesthesia indicated during dental extraction complicated by high grade fever and herpetic infection. Patient was conscious, oriented and having profuse sweating and tachypnea tachycardia syndrome. She was under full dose steroids indicated for treating her original disease as plasma exchanges and immunosuppressive agents could not be administrated due to active infection. Clinical examination was unfruitful and laboratory data showed marked rise in inflammatory parameters dominated by a CRP at 460 mg/l (N<5) and procalcitonine level at 500 ng/ml (N<0.05). Blood cultures showed the growth of methicillin resistant staphylococcus aureus that was treated for three weeks without catheter removal. Urokinase 25000 UI/ml solutions have been used as lock solution to avoid cloth formation without catheter dysfunction neither further complication. One month later, patient underwent the insertion of Palindrome cuffed catheter (Covidem) in the right jugular vein. Subsequently, clearance improved substantially despite intermittent catheter dysfunction owing to the use heparin sodium as lock solution other days and the week end. Six weeks later another attempt to create a native vascular access in form of brachia cephalic fistula was followed by early stenosis and subsequent thrombosis. In order to exclude any derangement leading to thrombosis; patient underwent extensive checkup. She was found to have Methylenetetrahydrofolate reduction mutation (MTHFR) needing calcium folinate 50 mg every two weeks.

At this time, she described having a contraceptive implant (NEXPLANON) inserted deeply subcutaneously in the internal side of her right arm. Since then, patient was prescribed continuous oral anti vitamin k anticoagulant (Fluindione). After eighteen months under hemodialysis she gained 30 kg and becoming symptomatic with polypnea bradypnea syndrome evoking sleep obstructive syndrome that was confirmed by pulmonary function tests (plethysmography). She was put under nocturnal continuous positive airway pressure (CPAP) and advised to increase thyroid hormone replacement dosage. She started manifesting borderline personality dominated by alternating anorexia and bulimia nervosa and anaclitic state with dependence to her father who became the object of attachment. She was repeatedly requesting potent agents which allowing her to sleep deeply and for long time. Outer the counter medicine was the big challenge in dealing with the patient who was becoming overusing and addicted to a cocktail of narcotics, opioids, neuroleptics and tranquilizers. Patient developed many episodes of exit site infections and manifesting poor hygiene exacerbated by swimming in the lacks mandating the insertion of hemodialysis Reliable outflow (HeRO) graft as alternative access. HeRO was interposed between the right brachial artery and the right jugular vein under general anesthesia. At the meanwhile, a tunneled cuffed dual lumen catheter was inserted in the left jugular vein. Patient recovered well, however the following day we notice an asymmetrical swelling of her face, ejected eyes and headache. The diagnosis of superior vena cava syndrome was suggested, reinforced by a positive Pemberton's maneuver. The catheter was removed the following day and inserted on the right femoral vein. Symptoms related to superior vena syndrome disappeared completely. She has been dialyzed through HeRO for 9 months that was judged as overused presenting many areas of thrombosis on the top of stenosis with some focus of pseudo aneurysmal formation. A tunneled femoral catheter was the sole rescue to continue dialysis and peritoneal dialysis was considered as contraindicated due to severe obesity. Unfortunately, and despite a proper anticoagulation (heparin sodium 10000 UI bolus and 2000 UI hourly) the catheter was found to be thrombosed and solely Urokinase infusion over each lumen allowed us the catheter salvage. Eventually patient refused to continue renal replacement therapy and was requesting palliative care in agreement with her relative. After 10 days, she was brought by ambulance, presenting a typical septic shock, metastatic HeRO infection treated by the removal of foreign bodies and empirical broad spectrum antibiotic.



Thrombectomy of HeRO graft followed by local infection originating from distant Infected lesions of calciphylaxis

Her laboratory investigation was showing high level of urea nitrogen without significant serum electrolyte imbalance but constantly having high level of phosphate and severe secondary hyperparathyroidism with intact PTH at 460 ng/ml (N: 15-65). She was not taking water apart of energy drinks and refusing potassium resin exchangers (Kayexalate or Resikali) and Cholecalciferol. By this time; her dry weight was estimated at 147kg and becoming subject to superficial ulcer infections that were confirmed histologically to be calciphylaxis.



Bilateral Eruptions of Confirmed Calciphylaxis Under Local Application of Sodium Thiosulfate

#### **Bilateral Eruptions of Confirmed Calciphylaxis Under Local Application of Sodium Thiosulfate**

Similar aspect was noted on the biopsy of her right breast with negative anti AE1/AE3on immunohistochemistry that definitely ruled out the presence of carcinomatous infiltration



Breast involvement with calciphylaxis treated by local application of sodium thiosulfate

Such findings reassured the patient who agreed to start specific treatment with sodium thiosulfate (STS) administered by the end of daily dialysis. Patient didn't tolerate the product of STS and abandoned further administration. Fortunately, daily local application of STS was well tolerated and all lesions of calciphylaxies disappeared eventually.

She continued to be dialyzed through a tunneled cuffed femoral catheter awaiting the development of an arterio venous graft inserted between the left femoral axes. Nowadays, patient is doing well awaiting the conversion from graft to native fistula or femoro-basilic access.



Metastatic infection to unused HeRO

## Discussion

In treating end stage renal failure a vascular access represents the Achilles heel of dialysis [7]. This access should be created when creatinine clearance is below 25 ml/min /1.73m<sup>2</sup> according to DOPPS [8], K/DOQI [9], K/DIGO [10], EPBG [11, 12], Care [13] and USRDS [14] recommendations. Autogenous arteriovenous fistulae should be preferred over arterio venous graft and this later over catheters. Unfortunately, many dialysis patients exhaust options for permanent access sites or synthetic grafts and a permanent catheter is the only remaining vascular access. Such conditions are observed in elderly, massive obesity, prior intervention for vascular access, long term dialysis patients, those with history of radiotherapy, patient with poor cardiovascular diseases, amyloidosis, diabetic and those with connective tissue diseases. Our patient fulfilled many conditions mentioned above dominated by massive obesity, thrombophilia and predisposing hypercoagulable state. She was dialyzed through an uncuffed tunneled catheter well known to allow bacterial migration and therefore, predisposing to catheter related blood stream infection [15, 16, and 17]. In patient dialyzed through central venous catheter; bacteremia is the second leading of hemodialysis patient death and femoral catheter bacteremia rate are typically two times higher. Up to 87% of CVC developed dysfunction during the course of their use and 30% of dysfunction developed monthly [18,19]. Herein, the patient developed more dysfunction accounting for more than 33 times needing usage of Urokinase with successful result [20]. Our observation was in agreement with previous report mentioning dysfunction as the main complication in patient using CVC. She developed three episodes of bacteremia over a period of 43 months including one metastatic infection located at the HeRO graft and three episodes of exit site infection. The HeRO device is the new long-term permanent access as alternative solution for access-challenged and catheter dependent patients with low rate of infection [21,22,23,24,25]. If unused, the removal of the bridging device seems to reduce the rate of infection. Our patient developed metastatic infection to the HeRO

confirming this hypothesis. Accordingly, the rate of infection in patients with HeRO is not different from using cuffed tunneled catheter or arterio venous fistula. Moreover, at six months of its insertion; our patient developed three episodes of thrombosis, pseudo aneurysm and HeRO related infection preceded by deep tissue infection co existing with severe calciphylaxis. In the presence of MTHFR, anti-coagulation by using anti Vitamin K and high dose of folate, didn't prevent the development of thrombosis confirming previous reports that showed similar events [26, 27] but with improving quality of life [28]. Our patient was having many predisposing factors to the development of calciphylaxis and a state of chronic inflammation contributing in HeRO thrombosis and increasing the demand to overcome erythropoietin resistance [29]. Our case shares previous reports of the existing breast calciphylaxis that have to be differentiated from carcinomatous infiltration in the presence of tissular calcification on ultrasound [30]. Unfortunately, the patient didn't tolerate STS infusion and has accepted its application locally with excellent results after two months' treatment [32].

## Conclusion

In dialysis Era dealing with a high risky patient needs patience and a multidimensional collaboration. Hemodialysis reliable outflow graft (HeRO) has certain advantages and remained subject to unwanted events as any graft as whole.

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