Percutaneous Retrieval of Migrated Central Venous Catheters

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ABSTRACT

Migrated catheters should be removed as soon as possible, for several reasons. Once migrated, any intravascular catheter caries the risk of 71% major complications and is associated with a high mortality rate, between 24% and 60% . Cardiac arrhythmias or perforation threatens patients with cardiopulmonary localization of foreign objects. Seven cases were included in this study. Five patient were females and two males. The average age was 56 years. Six cases had migrated Port-A Catheter and one broken hemodialysis catheter (Mahurkar). The latter was broken at the hub and slept under the covering dressing. Retrieval procedures were accomplished through the right femoral vein access in all patients. In one patient who had the distal end embedded in the right hepatic vein, additional right internal jugular vein access was employed. A single loop snare succeeded in retrieving all catheters. All patients tolerated the procedure well without any procedure related complication.

Keywords*: migrated central venous catheter, displaced centrally inserted catheter, endovascular retrieval, percutaneous retrieval, percutaneous extraction.*

INTRODUCTION

The first removal of an intracardiac foreign body by a technique not requiring thoracotomy was described by Thomas et al. in 1964 [(1)]. One or more central venous catheters are placed in almost every patient in an intensive care unit. The number of pacemakers and defibrillators has also increased. Moreover, not less commonly a substantial proportion of patients on chemotherapy are candidate for insertion of Port-A Catheter owing to the thrombogenic nature inherent to infused chemotherapeutic, need for prolonged course, which frequently requires to be repeated. Merging that to the patient's convenience when use 'totally implantable central venous catheter', shores up the increasing frequency of their use. Catheter based hemodialysis is offered almost to every patient who undergo hemodialysis as temporizing measure until a suitable fistula or graft is mature for long term use or the kidney functions recover (acute tubular necrosis). These add to the increasing number of central venous catheter insertion and therefore their complications including migration. Migrated catheters should be removed as soon as possible, for several reasons. Once migrated, any intravascular catheter caries the risk of 71% major complications [(2)] and is associated with a high mortality rate, between 24% and 60%[(3)]. Cardiac arrhythmias or perforation threatens patients with cardiopulmonary localization of foreign objects[(4)]. The incidence of septic complications of migrated or lost intravascular objects has not been reported in the literature, but in well-positioned catheters, bacterial contamination was found in up to 52% [(5)] in the earlier literature and up to 28% in the recent literature[(6)]. Thus, the risk for septic complications with migrated catheter could be similar to this percentage.

The aim of the study was to present our experience in percutaneous retrieval of migrated central venous catheters, its technical aspects, difficulties and results.

PATIENTS & METHODS

Seven cases were included in this study. Five patients were females . The average age was 56 years. Six cases had migrated Port-A Catheter and one broken hemodialysis catheter (Mahurkar). The latter was broken at the hub and slept under the covering dressing. Fortunately, none showed evidence of infection (skin over the port or around the exit site of the Mahurkar was not angry nor discharging and leukocyte count was < 11,000/dl.).

All the six case of port-A catheter migration were discovered, in five cases through irrigation

resistance. The remaining case was incidentally discovered during routine chest radiograph. In four cases, the catheter dislodged off the port (at the junction between the catheter and port). In the remaining two cases, the catheter was broken half way between the port and distal catheter tip. All port-A catheter were inserted through the right subclavian vein and the used for chemotherapeutic infusion. The migrated Mahurkar catheter was inserted through the right internal jugular vein. The distal part of all migrated catheters (port-A catheter and Mahurkar) dwelled the right atrium and inferior vena cava except one port-A cath that was residing the right hepatic vein sprawling the way from there up to the right atrium where it formed a loop that posed great difficulty in grasping the free proximal tip, table.

Table: Migrated catheters.

Type of catheter	Number of cases	Site of insertion	Intention for insertion
Prort-A catheter	6	Right Subclavian vein	Chemotherapeutic infusion
Mahurkar catheter	1	Right internal jugular vein	Hemodialysis

Under local anesthesia and fluoroscopic control, retrieval procedures were accomplished through the right femoral vein access in all patients. In one patient who had the distal end embedded in the right hepatic vein, additional right internal jugular vein access was employed. A single loop (gooseneck 10 mm loop, ev3, INC.) succeeded in retrieving all catheters. This was aided by the use of 5F pigtail catheter in some cases where the targeted end was inaccessible to the snare loop. This situation was encountered when the catheter tip was impinged on the vein or embedded in its wall. The latter instance contraindicates the use of snare loop. All migrated Port-A Catheter were extracted (after being grasped and towed to the right femoral vein sheath) through the vein puncture and necessitated no adjunct surgical procedure. Being rigid and has tapering end (difficult to be grasped at its tip), the migrated hemodialysis catheter was extract through right femoral vein cutdown. There was no complication during procedure and all patients were discharged home the same day.

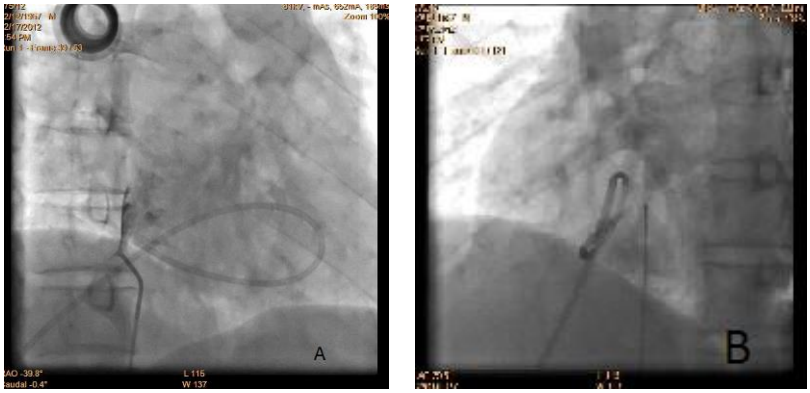

Fig. (1): Initial venogram: A/P view; A. LAO view distal end of the catheter dwells the right hepatic vein while its proximal end resided the right atrium after making a loop; B.

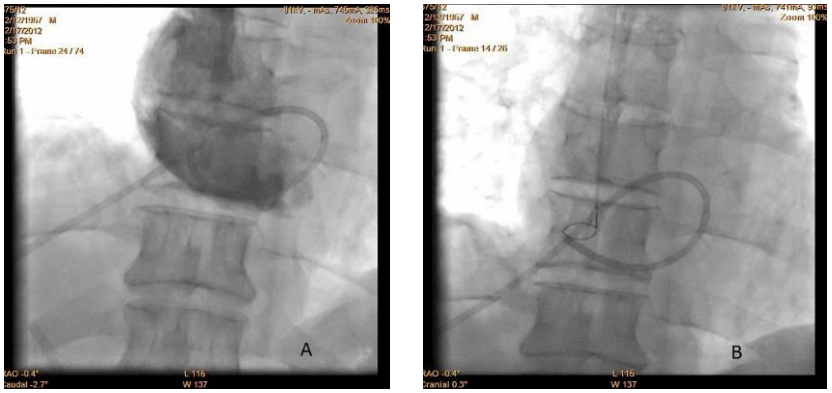

Fig (2): Utilizing the Rt IJV access to perform venography, note the biliary stent in place; A. failure to grasp the proximal end from above due to its angulation and impingement on the vein wall; B.

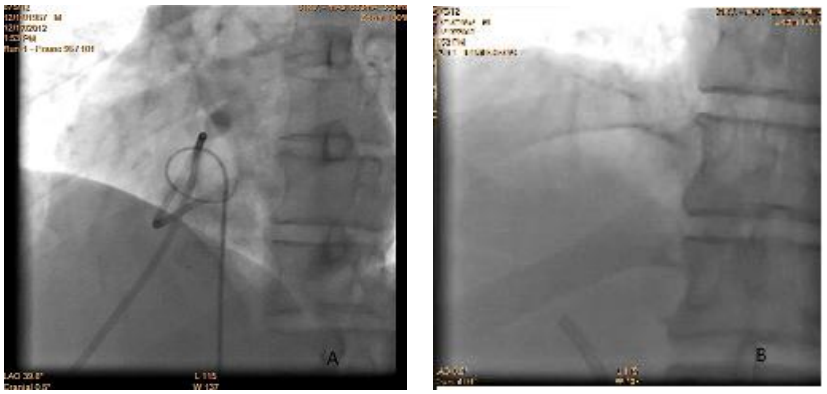

Fig. (3): A pigtail catheter is formed around the looped part to move the catheter a little; A. After extraction; B.

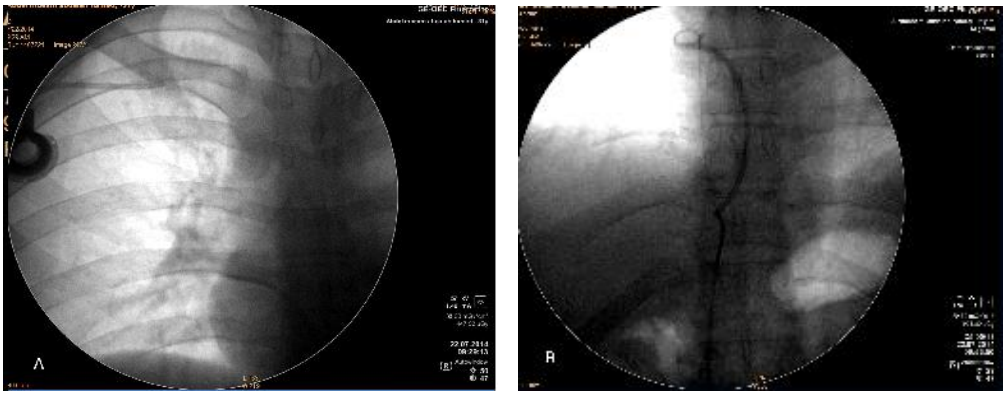

Fig. (4): Initial venography; A. Either end could not be grasped due to impingement on the venous wall; B.

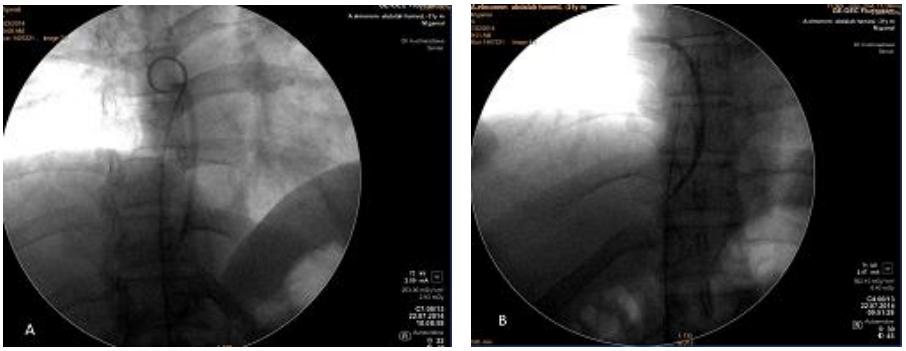

Fig. (5): A pigtail is used to rock the catheter off the vein; A. A loop snare was able to catch the catheter but about its middle; B.

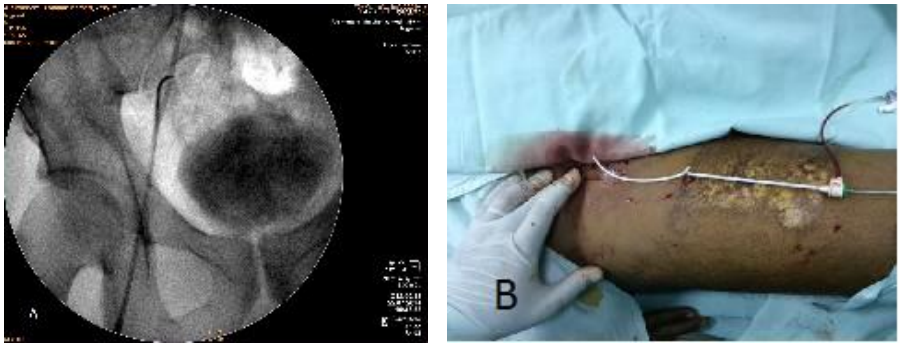

Fig. (6): The loop snare slightly released its grip, and towed gently to lie about the catheter tip; A. All were out (catheter, sheath and snare loop; B.

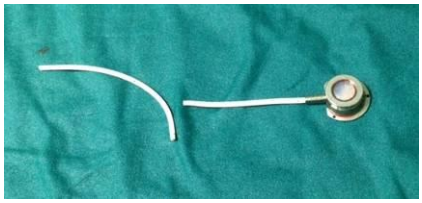

Fig. (7): Extirpated port-A catheter

Fig. (8): During retrieval of migrated Mahurkar: the left arrow; migrated Mahurkar, right arrow; guide wire passed the catheter to the right subclavian vein.

RESULTS

All patients tolerated the procedure. Duration of the procedure was ranging from 45-175 minutes (average; 71.4 minutes). The port-A catheter whose distal end was embedded into the right hepatic vein toke the longest duration (175 minutes). No procedure related complication and the end stage renal failure patient (migrated Mahurkar) was not in need of post-procedure hemodialysis and fitted in his hemodialysis scheduled the next day. All patients were discharged home on the same day.

DISCUSSION

The cause for catheter migration can be broadly attributed to inappropriate insertion technique, material defect, or patient factor **(7)**. Of these causes, the 'pinch off syndrome' (POS) represents the commonest factor behind catheter migration after being inserted through subclavian vein. As the catheter is compressed between, the clavicle and the first rib can with repeated movement of shoulder girdle fracture and eventually migrates. Hinke et al.**(8)** classified the POS into 4 grades; 0 = normal, 1= abrupt change In the course, 2= abrupt change in the course with luminal narrowing and 3 = catheter fracture. Eight in 112 cases of POS described by Mirza et al. (2004), 5.3 months were the average period between catheter insertion and occurrence of POS. **(9)** Due to the high proportion of POS (40.9%) occurring in migrated catheter which were inserted through subclavian access, many authors recommended the internal jugular vein access, when feasible, instead. Moreover, if the subclavian vein is to be used, the vein should be punctured at a point lateral to the midclavicular line.**(11)** In only two of our cases where the catheter broke about its middle, the Pinch off syndrome could be implicated.

The remaining four port-A catheters migration occurred due to disengagement of the port from the catheter. This might be due to material fatigue, bent at the junction between the port and the catheter or the effect of chemotherapeutic agent.**(11)**

Migrated venous catheters remain in 46% of cases in the venous system, in 35% go to reside the right side of the heart and 19% of instances reach the pulmonary artery. [7] Tsai et al. mentioned the most frequent site for migrated port-A catheter is located at the junction between the right atrium and inferior vena cava.**(12)** This was the situation in all our port-A catheter, except one whose distal end – for unknown reason- entered the right hepatic vein. Although foreign body in vein generally course towards the heart, heavy objects can fall against the stream of blood and under the influence of gravity. Cutler 1923,**(13)** called this movement retrograde migration" and was the first to say that it was not uncommon. Objects, which travel down the inferior vena cava generally, lodge in the internal iliac or femoral veins, and the radiologist-unless infection supervenes-provides the only indication of their movements. Once inside a vein sterile foreign bodies are influenced by forces, which are generally opposed. The blood stream tends to sweep them towards the heart; gravity often pulls in the other direction. Objects, which float rise upwards, and others sink. 'Migration' and 'retrograde migration' are to be expected. The weight, size, shape, and consistency of an object are also concerned. Our migrated Mahurkar catheter being heavy and rigid responded more to effect of gravity than to the blood stream. Its distal tip reached down the inferior vena cava below the diaphragm. While all migrated port-A catheters were extracted through the right femoral access and required no adjunct surgical procedure, the migrated hemodialysis catheter being rigid and has tapering end (difficult to grasp) was removed through right femoral vein cutdown. If it were insisted to retrieve the Mahurker through the vein puncture, the rigid catheter being grasped few centimeters above its tip, would lacerate the vein and could not pass through the subcutaneous tissue above.

Once catheter migration is diagnosed, it should be removed as early as it can be. Review of literature found no definite time for a foreign body in the venous circulation to spend safely without posing harm. Barrett 1950, stated that foreign body in the heart whether reaches there through penetration of chest wall or through the venous system can remain as it is for 6 to 8 week. **(14)** Whereas, Tateishi and Tomizawa, 2009 mentioned that it may be difficult to remove foreign body after 24 hours of its dislodgement. They added, it might difficult to ascertain when exactly a chronically inserted catheter is migrated. In contrary, Thanigaraj et al., 2000 reported a case

of catheter retrieval from the left pulmonary artery 11 year after its migration without adhesions. [15] Complications of modern retrieval techniques do not exceed 6%, in contrast to up to 71% incidence of major complications if the intravascular foreign body remains inside the circulation. Retrieval methods have evolved from double wire technique, in early days, to snare loop catheter, nitinol gooseneck snare, basket, and endovascular forceps. The latter is being evaluated. Loop snare catheter is flexible, can conform to curves but has weak grip. Nitinol goose-neck snare provides a stable shape inside the vessel due to its shape memory. Since it was first used in 1990, the nitinol gooseneck snare represented the tool of choice in retrieving intravascular foreign bodies for decades. [16] Sometimes, the snare loop finds difficulty encircling the end of a catheter. This situation frequently encountered whenever the targeted end impinges on the wall or if the loop size is smaller than the housing vein. This enigmatic event can be solved by the audacious use of a pigtail catheter. The catheter can be formed around the fragment, and gentle traction is exerted over the pigtail to move the whole fragment. Even a little movement is enough for the snare loop to be able to encircle the targeted end. Baskets have strong grip, and can catch a foreign body, which has no free edge, but being rigid can damage the vessel wall.[17]

CONCLUSION

Trans-catheter retrieval of foreign bodies is currently used in more than 90% of cases.[7] The success rate of this method mounts to 97.8%[18] Safe, effective, easily reproducible and perhaps less costly makes the endovascular retrieval of migrated catheter the treatment of choice.

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