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Original research article

PERCUTANEOUS REMOVAL OF EMBOLIZED GUIDE WIRE USING SELF-DEVISED IMPROVISED LOOP SNARE: A CASE SERIES

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Abstract

Background: In modern clinical practise, various central venous access devices, percutaneous diagnostic and intervention devices are being increasingly used. And with increasing use of these devices frequent complications are been encountered. One such complication is embolization of either catheter or the various devices used for insertion of these catheters. Though the incidence of such embolization is rare, but the complications associated with it are drastic and include vessel perforation, thrombosis, infection, arrhythmia, infection etc.

Aims and objectives: The aim of article is to demonstrate the method of removal of IFB using a self-devised snare devised from the commonly used cath lab hardware.

Materials and methods: For the construction of snare the following hardware's were required - One PTCA wire 0.014'' (ChoICE™ Extra Support by Boston scientific), JR guide 6F (French), semi compliant balloon 2x15 mm, an inflation device, Y connector and vascular Sheath 7F. The Judkins Right 6F guide catheter is taken and Y connector is attached. A 0.014" regular PTCA wire is introduced through the guide and 2x15 mm semi complaint balloon is loaded over it. The balloon is just positioned near the tip of catheter. The distal tip of wire is given a U shape and it's tip is parked under the balloon. Now the balloon is inflated at 8-10 atmospheric pressure and introduced in through the sheath. The terminal loop of the wire can be increased or decreased as per vessel size. Once the tip of embolized material is caught in the loop, wire is pulled back and the guide is pushed forward simultaneously. Finally, the loop is tightened and the whole assembly is pulled out.

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Conclusion: In our experience this self -devised snare can be made easily and is a cheap and easily available alternate to the high-cost snares. We had a very good success rate with no complications in all patients. We have removed only the embolized guide wire, not any other hardware so this self-devised snare might not be useful in all situations and some situations might need specialized hardware. The main strength of our snare is this being readily available, cheap and that it can be used in vessels of various sizes.

Keywords: Embolized guide wire, Loop snare, Percutaneous diagnostic, Intervention devices

Introduction

In modern clinical practise, various central venous access devices, percutaneous diagnostic and intervention devices are being increasingly used. And with increasing use of these devices frequent complications are been encountered. One such complication is embolization of either catheter or the various devices used for insertion of these catheters. Though the incidence of such embolization is rare, but the complications associated with it are drastic and include vessel perforation, thrombosis, infection, arrhythmia, infection etc. [1]. A mortality rate of 38% has been directly associated with embolized fragments and the intra-cardiac location being deemed as the most life-threatening [2]. The earliest and secure removal of these wires is of utmost necessity to minimize the complications. This removal can be done either through surgical or percutaneous method. Since the first nonsurgical retrieval of a foreign body in 1964, an increasing number of successful, nonsurgical percutaneous retrievals of embolized catheter fragments has been reported [3]. Percutaneous removal is becoming increasingly popular and is currently the method of choice deeming availability of the necessary expertise and equipment. There are a range of purpose-designed devices now available like Amplatz gooseneck snare (ev3), Trefoil En-Snare(Merit Medical), Dormia baskets, Alligator retrieval forceps (Cook Medical and ev3), Myocardial biopsy forceps (Cook) [4]. The loop snare is frequently the first choice of device used to attempt removal of an intravascular foreign body (IFB) [5, 6]. There are a various kinds of loop snares available in the market, but the cost factor remains the limitation with these regular commercial loop snares. It is very difficult to maintain stock of different size loop snares especially in low volume cath lab set-ups and with limited economic resources in a developing country like India. Another challenge is the limited exposure of most operators with the use of loop snares, as complications requiring their usage are very rare. The removal of the embolized material is usually an emergency procedure, so an immediate arrangement of an appropriate loop snare is usually a challenge. We came across a similar challenging situation which led us to devise our own snare from the commonly used hardware in our Cath lab set up, with the guidance from the available literature [7].

We present our experience with management of three patients, with embolized 0.035” central line guide wire, along with inputs on how to assemble the snare and the tips and tricks for the wire removal.

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Material and Methods

For the construction of snare the following hardware's were required - One PTCA wire 0.014'' (ChoICE™ Extra Support by Boston scientific), JR guide 6F (French), semi compliant balloon 2x15 mm, an inflation device, Y connector and vascular Sheath 7F.

The Judkins Right 6F guide catheter is taken and Y connector is attached. A 0.014" regular PTCA wire is introduced through the guide and 2x15 mm semi complaint balloon is loaded over it. The balloon is just positioned near the tip of catheter. The distal tip of wire is given a U shape and its tip is parked under the balloon. Now the balloon is inflated at 8-10 atmospheric pressure and introduced in through the sheath. The terminal loop of the wire can be increased or decreased as per vessel size. Once the tip of embolized material is caught in the loop, wire is pulled back and the guide is pushed forward simultaneously. Finally, the loop is tightened and the whole assembly is pulled out.

The puncture point was determined according to the position of the foreign body with aim to catch the softer J tip of the guide wire. Success was defined as successful removal of the intravascular foreign body with no serious complications, such as haemorrhage or tissue damage, during or after surgery.

Results and Observations

Total 8 cases are being presented to showcase the in-depth observations of undergoing IFB retrieval using self-devised snare.

Table 1: Details of cases undergoing IFB retrieval using self-devised snare

S. No.	Cr no.	Age/Sex	Wire location	Route Used	Outcome	Time
1.	44007	70/M	SVC -Left Femoral Vein	Right Subclavian Vein	Success	10 min
2.	62516	45	Innominate artery-Aortic Valve-descending Aorta	Right Femoral Artery	Success	25 min
3.	61951	58/F	Right SVC to Left Femoral vein	Left Femoral vein	Success	10 min
4.	27596	69/F	Right IJV to Right Femoral vein	Right Femoral vein	Success	7 min
5.	85174	52/M	Right Atrium to Right Femoral	Right Femoral vein	Success	<5 min
6.	97008	47/M	Right SVC to Right Femoral vein	Right Internal Jugular vein	Success	6 min
7.	19528	21/F	Right SVC to Left Femoral vein	Right Internal Jugular vein	Success	7 min
8.	101481	10/F	Right IJV to Right Ventricle	Right Femoral vein	Success	<5 min

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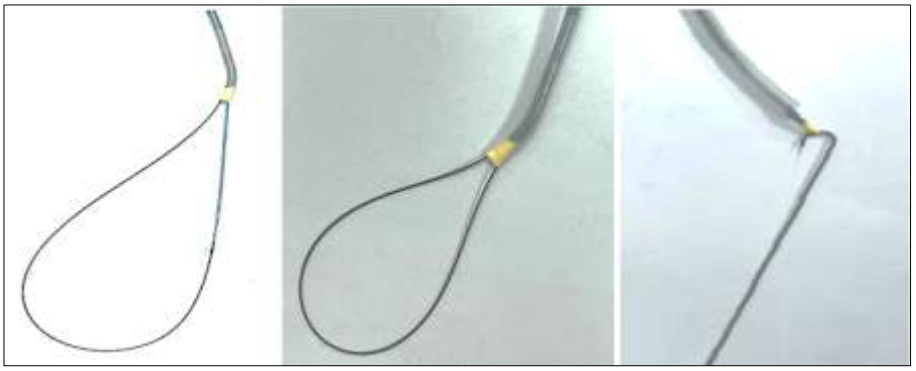
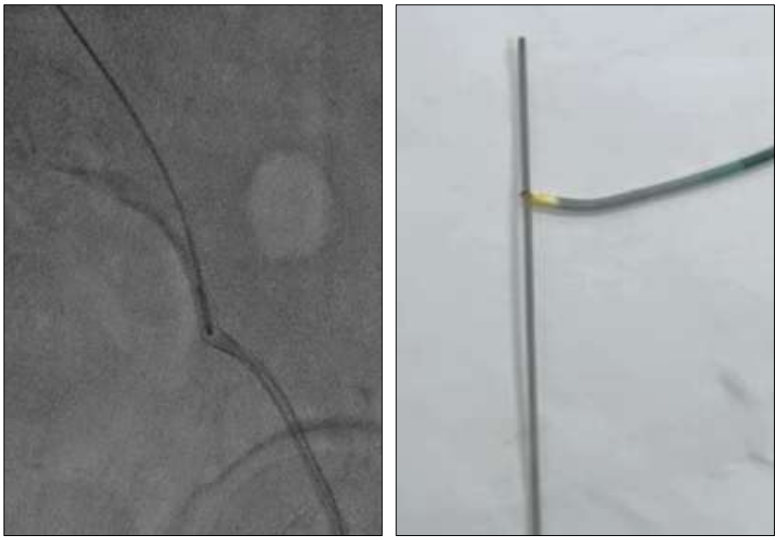


(a) (b) (c)

Fig 1a, b & c: Demonstration of various steps (*in vitro*) for making snare and mechanism of guide wire removal by holding it through J end

(a) (b)

Fig 2a, b: Showing *in-vitro* removal of guide wire by our self-devised snare



(a) (b)

Fig 3: a) Shows fluoroscopic image of removal of guide wire from left femoral route with our self-devised snare. b) Shows in ability of wire to fold on itself if it is caught at the other end

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Case 1

A 70 years old male was admitted to the ICU in view of decompensated heart failure. The resident on duty planned to insert a left femoral vein line, after considering the patient's body habitus and acute respiratory distress and the need of BiPAP support. Unfortunately, the guide wire was embolized while inserting central line and flushed after that in panic by the resident. The guide wire was still in situ. The patient was shifted to the cath lab. The wire position was confirmed on Fluoroscopy. Its J tip end was in SVC while the straight end was in the left femoral vein. The right subclavian access was taken with 7F sheath and our self-devised snare was used to remove the wire. Venogram was taken through both right subclavian vein and left femoral vein with no evidence of perforation or thrombus. The patient was shifted back to ICU for monitoring.

Case 2

A 45 years old male post-operative neurosurgery patient was planned for right subclavian central line. Cardiology referral was sought in view of the embolization of guide wire. Patient was shifted to the Cath Lab. The wire position was checked under fluoroscopy. Initially the wire extended from SVC to RA-RV-PA but on careful review it was surprising to see the wire in positioned from Innominate Artery =>Aortic Valve => Descending Aorta. This happened due to accidental puncture of subclavian artery instead of subclavian vein. The distal J tip was lying in Descending aorta. Once the position was confirmed in different views, then the removal of the wire was relatively easy. Right femoral access was taken and wire was removed easily with the self-devised snare. Aortogram was done to rule out vessel any wall damage or thrombus.

Case 3

A 58 years old female was admitted with cerebrovascular accident and poor Glasgow coma scale score. A central line insertion was planned through the right IJV. But unfortunately resulted in guide wire embolization. The patient was shifted to the cath lab. The wire position was checked under fluoroscopy. It was extending from right SVC to left femoral vein (J-tip). Retrieval from left femoral vein access was taken. The wire could easily be removed with the help of our self-devised snare. Final the venogram was done which showed no complications. Patient was shifted back to ICU.

Case 4

A 69 years old female was admitted for chronic kidney disease (CKD) in medicine ward and planned for haemodialysis (HD) through right IJV. So, on duty resident decided to insert double lumen central line (DLC) for HD but unfortunately landed up in embolization of guide wire while inserting DLC. The patient was shifted to the cath lab. The wire position was checked under fluoroscopy. It was extending from right internal jugular vein to right femoral vein (J-tip). The right femoral vein access was taken and guide wire retrieved. The wire could easily be removed with the help of our self-devised snare. Final the venogram was done which showed no complications. Patient was shifted back to medicine ward.

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Case 5

A 52 years old female was admitted in medicine ward with diagnosis of sepsis with septic shock. On the 3rd day it was planned for central line insertion through right IJV for better infusion of inotropes continuously. So, on duty resident decided to insert triple lumen central line but unfortunately they forgot to withdraw guide wire and as a result guide wire got embolized. The patient was shifted to the cath lab. The wire position was checked under fluoroscopy. It was extending from right atrium to right femoral vein (J-tip). The right femoral vein access was taken. The wire could easily be removed with the help of our self-devised snare. Final the venogram was done which showed no complications. Patient was shifted back to medicine ward.

Case 6

A 47 years old male patient admitted in ICU, PGIMS, Rohtak for Scrub Typhus with MODS. Patient was intubated and on ventilator. After few days his kidney function declined with raised Urea, Creatinine and decreased urine output. So, on duty senior resident of ICU decided to insert double lumen central line (DLC) for HD but unfortunately landed up in embolization of guide wire while inserting DLC. The patient was shifted to the Cath lab. The wire position was checked under fluoroscopy. It was extending from right superior vena cava (SVC) to right femoral vein. The Right Internal Jugular vein (IJV) access was taken. The wire could easily be removed with the help of our self-devised snare. Final the venogram was done which showed no complications. Procedure went uneventful. Patient was shifted back to medicine ward.

Case 7

A 21 year old female admitted in medicine ICU with sepsis with septic shock and septic AKI. On 3rd day she was planned for central line for continuous ionotropic support and further management. A central line insertion was planned through the right IJV. But unfortunately resulted in guide wire embolization. The patient was shifted to the cath lab. The wire position was checked under fluoroscopy. It was extending from left femoral vein to right SVC (J-tip).Retrieval from right internal Jugular vein access was taken. The wire could easily be removed with the help of our self-devised snare. Final the venogram was done which showed no complications. Patient was shifted back to ICU.

Case 8

A 10 years old female admitted in ICU with pneumonia leading to sepsis with septic shock. On 2nd day central line insertion was planned for better management. While inserting central line unfortunately resident landed up with embolization of guide wire. Patient was shifted to cath lab. The wire position was checked under fluoroscopy. It was extending from right IJV to right ventricle. Retrieval from right femoral vein access was taken. The wire could easily be removed with the help of our self-devised snare. Final the venogram was done which showed no complications. Patient was shifted back to ICU.

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Discussion

Percutaneous retrieval of intravascular foreign bodies is considered a gold standard treatment because it is a minimally invasive, relatively simple, safe procedure, with low complication rates compared to conventional surgical treatment. Hence, commercially available snares have become the standard for intraluminal foreign-body retrieval [8, 9].

Primary prevention of embolization of IFB should be the aim. Approaches to this end should include adequate training of staff who are manipulating the intravascular devices, as inappropriate device handling is the commonest cause of subsequent device failure and embolization. The best management is usually to obtain timely and urgent retrieval of a lost IFB. The risks and benefits should be judiciously balanced, and multidisciplinary team and peer discussion is advisable. Once the decision has been made to attempt retrieval via an endovascular approach, it is essential to adequately plan the procedure. Percutaneous access sites should be carefully considered, and access sheaths should be of appropriate size. It may not be always appropriate or possible to retrieve a lost IFB by the endovascular approach and an open surgical retrieval may be required in approximately 6–10% of cases [10-12].

Mallmann, *et al*. showed almost similar experience with a self-made snare with 4 m long 0.018" wire. They had 100% success with their snare [7]. But the mentioned wire is not easily available in our labs, and we used the coronary PTCA wire with the same success rate. They also highlighted the point that it is quite difficult to maintain a stock of different required snares. The fact that they had not used any commercial snare for the last 10 years for IFB retrieval, seems promising for future use of our self-devised snare.

Conclusion

In our experience this self -devised snare can be made easily and is a cheap and easily available alternate to the high-cost snares. We had a very good success rate with no complications in all patients. We have removed only the embolized guide wire, not any other hardware so this self-devised snare might not be useful in all situations and some situations might need specialized hardware. The main strength of our snare is this being readily available, cheap and that it can be used in vessels of various sizes.

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Conflict of interest: None.

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