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CASE REPORT

# Retrieval of Dislodged Central Venous Pressure Catheters

## Early experience with three case presentations

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# استرجاع الجزء المنفصل من قساطر الضغط الوريدية المركزية

## الخبرة الأولية مع تقرير لثلاث حالات

حفيظ الهادى، منصور سلام

**الملخص:** تستخدم قساطر الضغط الوريدية المركزية بكثرة فى الممارسة الطبية السريرية. نادرا ما ينفصل جزء من هذه القسطرة. وفى حالة فشل استرجاع هذا الجزء المنفصل بواسطة القسطرة القلبية عن طريق الجلد . فان جراحة القلب المفتوح تكون ضرورية لاسترجاع هذا الجزء المكسور لتجنب حدوث مضاعفات محتملة. هذا التقرير يصف خبرتنا الأولية في مستشفى جامعة السلطان قابوس باسترجاع الجزء المكسور من قساطر الضغط الوريدية المركزية عن طريق ثلاث طرق مختلفة: الأولى، عن طريق القسطرة القلبية باستخدام الشراك (الفخ). والثانية عن طريق جراحة الصدر فقط . أما الثالثة فتكون عن طريق جراحة القلب المفتوح أثناء عمل توصيلات للشرايين التاجية. نود أن نذكر هنا بامكانية استرجاع الأجزاء المنفصلة من قساطر الضغط الوريدية المركزية التي تستقر في الجهة اليمنى من القلب أو الشريان الرئوي عن طريق القسطرة القلبية باستخدام الشراك.

**مفتاح الكلمات:** قساطر الضغط الوريدية المركزية . انفصال، القسطرة القلبية، الشراك، أشعة الصدر، الشريان الرئوي، تَخْطيطُ صَدَى القَلْب،تَنْظيرٌ تَألُّقِيّ، تقرير حالة.

**ABSTRACT:** Central venous catheters (CVP) are frequently used in clinical practice. Occasionally, catheters may become dislodged. If percutaneous retrieval fails, then cardiothoracic surgery is necessary to retrieve the fractured catheter and avoid potential complications. This report describes early experiences of three different modes of broken catheter retrieval: the first by use of a snare catheter; the second by surgery and the third during bypass surgery. We conclude that broken fragments of catheters that lodge in the right side of the heart or pulmonary circulation can be retrieved most of the time percutaneously by snare catheters.

***Keywords:*** Central Venous Pressure (CVP); Dislodgement, percutaneous; Snare catheter; Chest X-Ray, pulmonary; 2D echocardiography; Fluoroscopy; Case report.

Central venous pressure (CVP) catheters are frequently used in clinical practice to monitor and guide further management of sick patients in coronary care units (CCUs) or intensive care units (ICUs). This is essential to balance fluid and drug requirements. Breakage of the catheters with the intravascular fragment migrating centrally as a foreign body embolus has been reported and is associated with potentially serious complications.[1-3] Fortunately this is usually a rare incidence. [4] Most often, the intravascular fragments become lodged within the right side of the heart where they may induce sepsis, thrombosis, perforation, or endocarditis.[4-5] In other instances, the intravascular fragment lodges more distally within the main pulmonary artery or one of its branches carrying the risk of pulmonary infarction.[5] Many intravascular techniques have been developed to retrieve fractured catheters such as intravascular forceps and basket retrievals; however, the most commonly used device is the intravascular snare.[6-7] Snares and baskets have the ability to grasp the catheter fragment firmly and securely allowing it to be pulled out percutaneously through the access site. Failure of such intravascular techniques to retrieve the fracture catheters results in surgical interventions to avoid the potential complications.[7] This report describes our early experience in this rare complication of catheter dislodgement and the different modes of their restoration.

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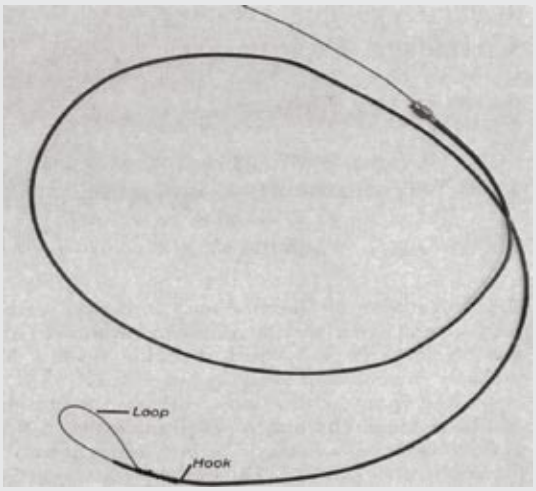


**Figure 1:** Shows snare catheter, which is the most common technique used to retrieve broken catheter fragments

## Case One

A male patient, 45 years old, was admitted with symptoms of heart failure to the CCU for the purpose of close haemodynamic monitoring. A central venous pressure (CVP) catheter was inserted via the right subclavian vein. After haemodynamic improvement, an attempt to remove the CVP catheter was done. However, the hub totally separated from the shaft of the catheter and migrated to the right ventricle as proved by urgent chest X-ray. Within one hour, the patient was shifted to the catheterisation laboratory. Fluoroscopy proved the fast migration of the fractured catheter into the main shaft of right pulmonary artery. The patients' right common femoral vein was accessed and a 6F 13cm long sheath was inserted. A 6F right Judkin's guiding catheter was advanced over a 0.035 inch guide wire to the right pulmonary artery. Then the guide wire was withdrawn. A 'noose neck Nitinol snare retrieval catheter (Microvena, Minnesota) [Figure 1] was introduced through the right Judkin's catheter. The snare was manipulated to the distal end of the dislodged catheter. After three attempts, the snare successfully caught the dislodged catheter fragment. The snare together with the secured catheter fragment was pulled back to the guiding catheter then to the level of femoral sheath. The vascular sheath, guiding catheter and the snared catheter fragment were then withdrawn as a unit out through the skin of the right groin and haemostasis was achieved manually. The retrieved fragment catheter was 9 cm long. Fluoroscopic examination of the inferior vena cava, heart and pulmonary arteries revealed no residual catheter fragments. The entire procedure was accomplished successfully in 25 minutes.

**Figure 2:** Shows standard 6F pigtail catheter, which is used sometimes to dislodge deeply impacted or entrapped fragments of broken catheters.

## Case Two

A female patient, 55 years old and a known diabetic with hypertension and chronic renal failure, was on regular haemodialysis. She was referred from a secondary hospital with a history of a right subclavian CVP catheter dislodged 6 hours previously. A chest X-ray confirmed that the dislodged catheter had impacted in the left pulmonary artery. Immediately, the patient was transferred to the catheterisation laboratory. Initial fluoroscopic imaging with small amounts of contrast showed that the fractured catheter was deeply impacted in the subpulmonic branches of the left pulmonary artery. Using the same technique described above, many attempts were made to snare the fractured catheter, none of them successful. A 6F pigtail catheter was also used to attempt to free the catheter from its impacted position without success [Figure 2]. After approximately two hours, all attempts to free the broken fragment had failed. The guiding catheter was withdrawn followed by the snare catheter and then the vascular sheath; haemostasis was achieved manually. After explaining the risks of an impacted fractured catheter and the risks of surgical removal through thoracotomy, the patient and family agreed to an attempt to retrieve it surgically. This was accomplished successfully with no complications. The surgical report confirmed that the fractured catheter, which was 13 cm long, was deeply impacted in the small branches of the left pulmonary artery and so it was theoretically very difficult to retrieve it with a percutaneous snare.

**Figure 3:** There was no obvious foreign body that could be identified with any certainty on this routine chest X-ray.

## Case Three

A male patient, 62 years old, was a known hypertensive, diabetic, dyslipidaemic and a heavy smoker. He was referred from a district general hospital for coronary angiography after an attack of acute myocardial infarction complicated by left ventricular failure one month prior to his admission in our hospital. The patient gave a history suggestive of CVP catheter insertion through the right jugular vein for a few days during admission in the district hospital. He was asymptomatic at rest and was haemodynamically and clinically stable, but had mild effort-induced chest pain and shortness of breath. Surprisingly, a routine chest X-ray did not reveal the broken catheter [Figure 3]. The terminal catheter position was confirmed by 2D echocardiography which showed a radio-opaque indwelling catheter tip protruding into the posterior aspect of the right atrium (RA) [Figure 4]. Coronary angiography fluoroscopic imaging clearly showed a long catheter that moved with each heart beat with its superior end originating from the superior vena cava and inferior edge ends in the RA [Figure 5].

During coronary angiography, we noticed the 'unusual' frequent catheter thrombosis that required a generous 7000 units of intravenous heparin and catheter exchange. Coronary angiography revealed extensive multiple vessel coronary artery diseases (CAD) requiring bypass surgery. It was decided to retrieve the catheter fragment surgically for the following reasons: 1) the catheter has been dislodged for more than a month and could be adherent to the posterior aspect of the RA; 2) the possibility of significant thrombus formation around the catheter could not be ruled out, which would make it difficult and hazardous to snare; 3) the patient was asymptomatic, and 4) he anyway required emergency coronary artery bypass surgery (CABG) during the index admission. During the bypass surgery, the surgeon retrieved the broken catheter through a small incision in the right atrium. The catheter, which was 12 cm long, was surprisingly not adherent to the myocardial tissue and was retrieved successfully and intact [Figures 5 & 6].

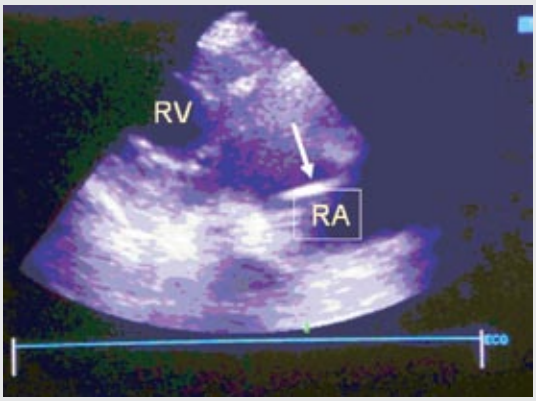


**Figure 4:** This is a modified echocardiographic view showing the radio-opaque catheter tip protruding into the posterior aspect of the right atrium. The arrow points to the tip of the catheter fragment.

## Discussion

Many techniques have been developed to retrieve intravascular fragments from fractured central venous catheters. The most commonly used techniques are the use of an intravascular snare to capture and retrieve the loose catheter fragment [Figure 1]. This minimally invasive technique is feasible when at least one free end of a fractured catheter is accessible. In some cases, snare removal of a foreign body may be extremely difficult, especially when both ends are fixed or entrapped and thus impossible to grasp. In such instances, one may attempt to release one end of the impacted catheter by using another catheter with a bent tip e.g. a pigtail catheter [Figure 2]. If, however, both ends of the dislodged catheter are adherent to the vessel wall or are fixed inside a thrombus, then technically successful retrieval may not be possible

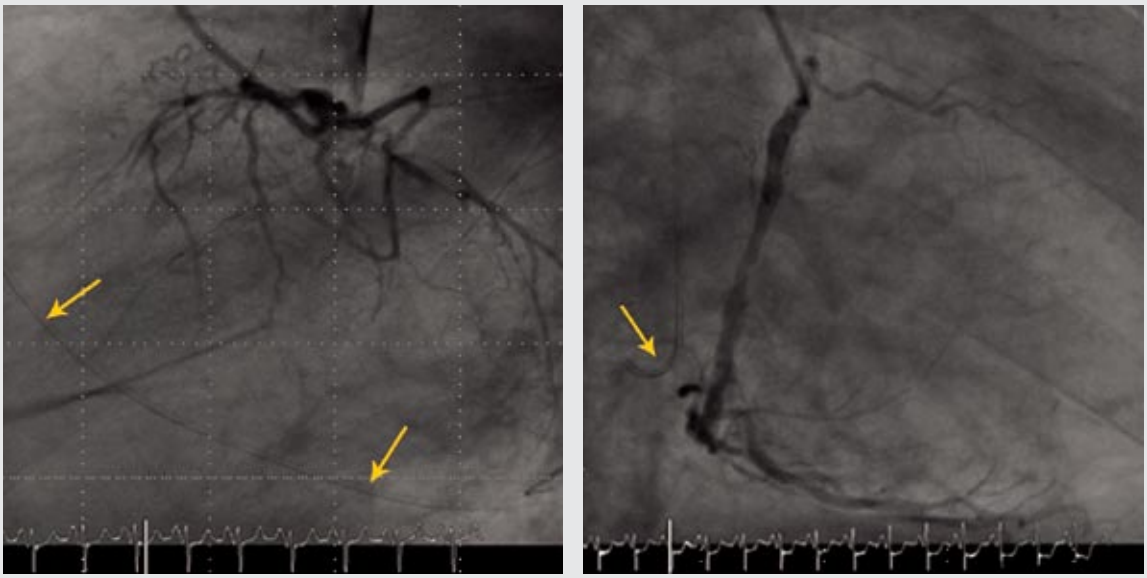

**Figure 5:** The position of the broken catheter is pointed out with an arrow in these two different angiographic view.

and the alternative safer option is surgical removal.

The broken catheter of the first patient had been notified immediately within one hour and the intravascular retrieval attempt was carried out successfully. The time factor seems to be of paramount importance. However, as shown in the second and third cases, it is not the only factor. The size of the broken catheter and the distance it can migrate distally, i.e. become impacted, can also have an important influence. The second patient represented a challenge despite the relatively short time (6 hours) after the incident. The many intravascular attempts failed to retrieve the damaged catheter. Unfortunately, major surgery thoracotomy had to be undertaken to remove the catheter. During surgery, the broken catheter was found to be deeply impacted into the branches of the left pulmonary artery. In the third patient, the dislodged catheter was discovered accidentally. He was lucky enough, in the sense that he had not suffered major complications such as thrombotic embolism or serious infection. He also had another indication for a thoracotomy which was the planned CABG due to his extensive multi-vessel coronary artery disease (CAD). Owing to the long duration of the dislodgement (one month), there was some concern that the fragment could have caused significant in-situ thrombosis or might be quite brittle and subject to additional breakage when tension was applied to the snare. Consequently, to avoid such complications and as the patient was planned for open heart surgery anyway, a direct visual removal of the impacted catheter was seen as the right option.

**Figure 6:** Shows a picture of the fractured CVP catheter recovered after surgery.

## Conclusion

Broken CVP lines are fortunately a rare incidence; however, their occurrence is associated with significant morbidity and mortality. All intravascular CVP catheters should be removed gently and the terminal end inspected carefully to avoid missing dislodged fragments. If identified, such complications should be notified immediately. Foreign bodies that break and lodge accidentally in the right side of the heart or in the pulmonary vasculature can be retrieved through percutaneous approaches. If these methods fail, then surgical removal via thoracotomy is the alternative option. The time lapse from catheter dislodgement to retrieval is of paramount importance to avoid

adhesions or thrombus formation and the occurrence of distal migration or deep impaction. Our cases show that when broken catheters are identified early, percutaneous or surgical retrieval is a feasible option.

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