

# Accidental Microcoil Migration into Right Atrium during Portal Vein Embolisation: A Case Report

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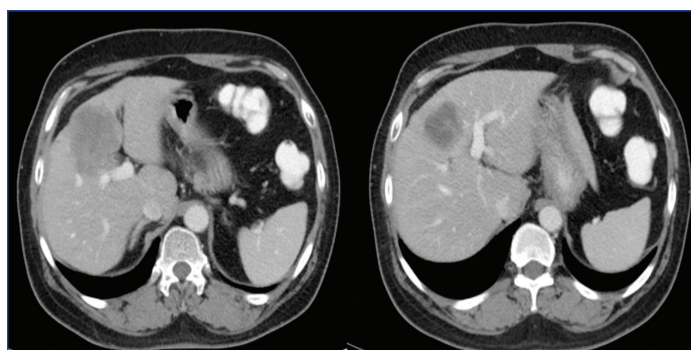
## ABSTRACT

With the advancement of technology in the field of medicine, minimally invasive vascular procedures are widely utilised for therapeutic effects. Embolisation is a minimally invasive approach to occlude a vessel for therapeutic benefit. However, these procedures are associated with a small percentage of complications, one of which is the migration of the embolising agent. Migration refers to the movement of the embolisation agent (mostly a coil) from the original placement site to an unwanted location. A 59-year-old male presented with complaints of abdominal pain lasting 2-3 months. A Contrast-enhanced Computed Tomography (CECT) scan of the abdomen revealed an ill-defined infiltrative lesion arising from the neck and body of the gallbladder. Curative surgery was planned in the form of an extended right hepatectomy; however, the Future Liver Remnant (FLR) calculated was not optimal (19%). The patient was therefore referred for preoperative Portal Vein Embolisation (PVE). During the procedure, there was an accidental microcoil migration to the right heart post-PVE, which was managed by minimally invasive techniques. The importance of multimodality imaging techniques used to identify the location and multidisciplinary approaches to aid management has also been highlighted.

**Keywords:** Curative surgery, Embolising agent, Future liver remnant, Right heart

## CASE REPORT

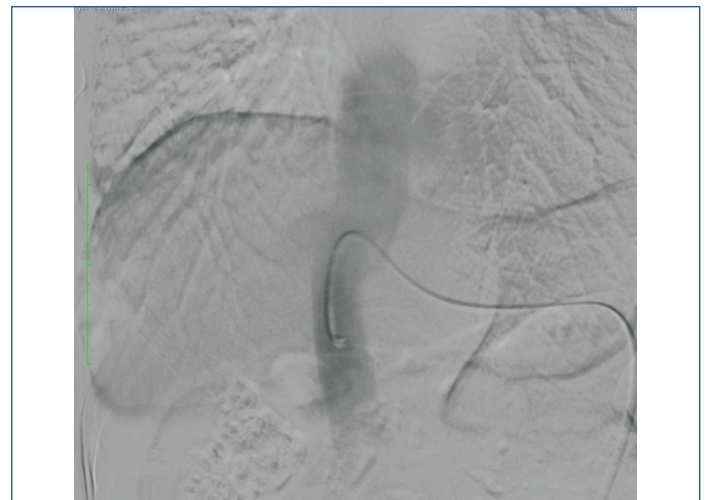
A 59-year-old male presented with complaints of abdominal pain persisting for 2-3 months, unresponsive to routine medical management. A CECT scan of the abdomen revealed an ill-defined infiltrative lesion approximately sized 5.0×4.3×4.6 cm, arising from the neck and body of the gallbladder with direct invasion into the right lobe of the liver, predominantly segments IVa and IVb [Table/Fig-1]. On the post-contrast scan, there was heterogeneous enhancement with a central necrotic component within the lesion. A Positron Emission Tomography (PET) scan showed no evidence of metastatic disease elsewhere in the body. An ultrasound-guided biopsy from the lesion revealed moderately differentiated adenocarcinoma of the gallbladder. Curative surgery was planned in the form of an extended right hepatectomy; however, the calculated Future Liver Remnant (FLR) was not optimal (19%). Consequently, the patient was referred for preoperative PVE.



**[Table/Fig-1]:** Axial CECT image showing the lesion arising from the neck and body of the gallbladder with direct invasion into the right lobe of the liver, predominantly segments IVa and IVb.

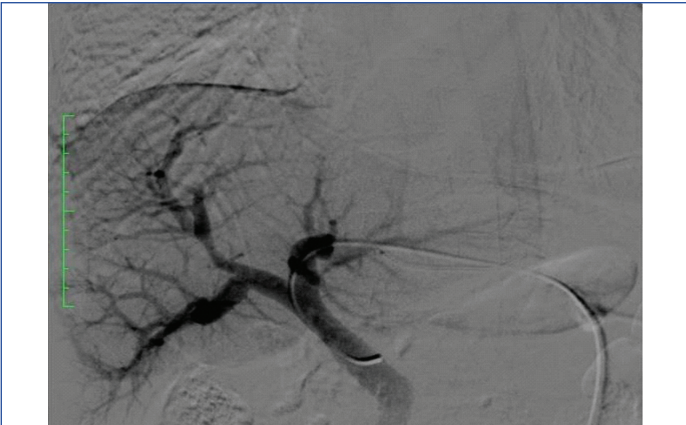
During the PVE procedure, under local anaesthesia, an ultrasound-guided percutaneous puncture of the left portal vein was attempted using a 21G Chiba needle (Cook Medical). However, accidental entry into the left hepatic vein occurred, which was recognised after checking the venogram and revealed filling of the left hepatic vein, Inferior Vena Cava (IVC), and contrast entering into the right atrium [Table/Fig-2]. This access sheath was kept in situ with a slow

infusion of heparinised saline connected to prevent thrombosis. The plan was to remove this sheath after the final PVE procedure with tract embolisation using micro coils.

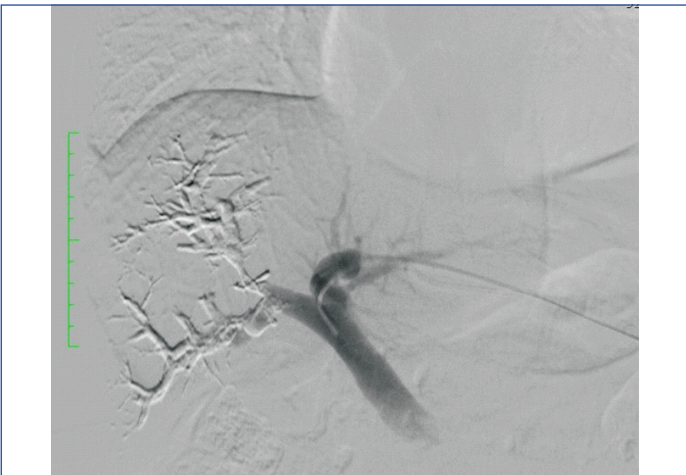


**[Table/Fig-2]:** Digital Subtraction Angiography (DSA) venogram from access sheath showing contrast opacification of the IVC and right atrium suggestive of accidental entry through the left hepatic vein.

This was followed by a repeat ultrasound-guided puncture of the left portal vein radical using a 21G Chiba needle through which a guide wire was passed and access was gained through the introduction of a 5F vascular sheath for further procedure [Table/Fig-3]. Using a combination of a 4F Cobra (C1) catheter and Terumo guide wire, the right portal vein was accessed, confirmed by selective venograms. Using a coaxial microcatheter (2.70F Progreat, Terumo), selective embolisation of the anterior and posterior branches of the right portal vein was performed using n-Butyl Cyanoacrylate (n-BCA) mixed with Lipiodol in a 1:5 proportion (16.67%). Post-embolisation check venogram revealed non filling of the right portal vein branch and its anterior and posterior divisions. However, the left portal vein and its branches were patent with the diversion of the main portal vein blood flow to the left side, suggesting a successful procedure [Table/Fig-4].

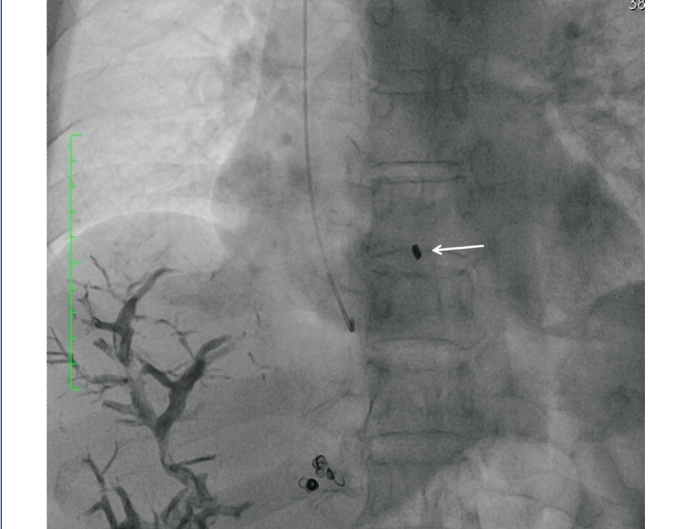


**[Table/Fig-3]:** Pre-embolisation DSA venogram through access sheath showing the catheter tip in the main portal vein and contrast opacification of the right and left portal venous branches inside the liver.



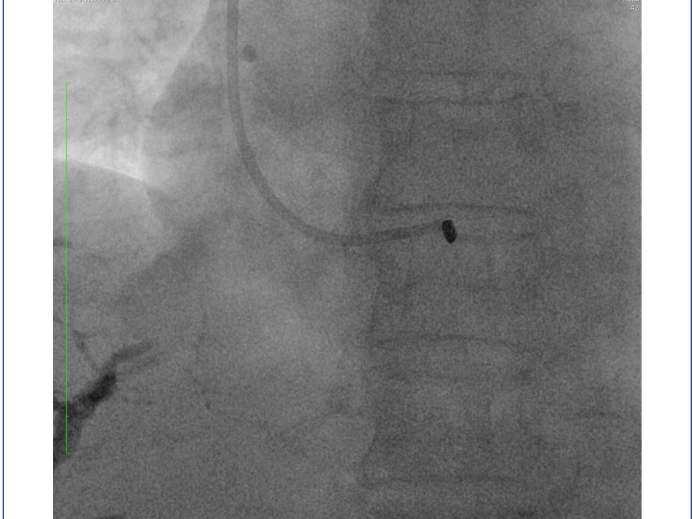
**[Table/Fig-4]:** Post-embolisation DSA venogram through the access sheath showing non opacification of the right portal venous branches with n-butyl cyano-acrylate cast in situ. The left portal vein and its branches are patent.

Ultrasound and fluoroscopy-guided microcoil embolisation of the left portal vein access hepatic tract was successfully done to prevent bleeding. However, during similar tract embolisation of the left hepatic vein access tract, there was a sudden migration of the microcoil (Cook Nester microcoil 18-7-4) into the IVC and right atrium [Table/Fig-5]. The microcoil was initially seen to be freely moving inside the right atrium on fluoroscopy. However, after some time, it became static. Through immediate right internal jugular venous access, multiple attempts were made to retrieve the microcoil using a snare, however, they were unsuccessful [Table/Fig-6]. After consultation with a cardiologist, a bedside transesophageal echo was performed,

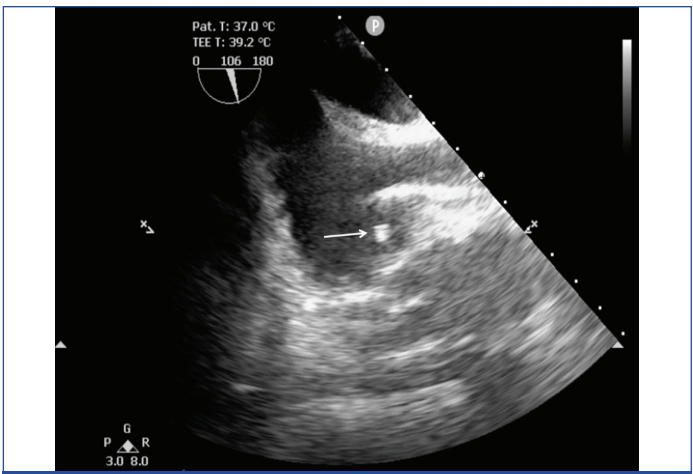


**[Table/Fig-5]:** Fluoroscopy image showing the migrated microcoil in right atrium (White Arrow).

which confirmed the position of the microcoil inside the right atrial appendage [Table/Fig-7]. The patient had no new complaints related to the microcoil migration, and he was haemodynamically stable. After a thorough discussion with the cardiologist and the patient's relatives about this incident and future possibilities, it was decided not to further intervene for microcoil retrieval due to the serious risk of right atrial appendage perforation and cardiac tamponade. The patient was started on Tablet Aspirin 75 mg OD for three months to prevent the development of micro-thrombi over the coil and was counseled for close follow-up. No complications related to microcoil migration were observed on follow-up for six months.



**[Table/Fig-6]:** Fluoroscopy image showing the catheter tip placed close to the migrated microcoil during percutaneous retrieval process through right internal jugular venous access.



**[Table/Fig-7]:** Immediate transesophageal echocardiography revealing the location of the migrated microcoil in right atrial appendage (White arrow).

**DISCUSSION**

Portal Vein Embolisation (PVE) is a commonly performed procedure that increases the Future Liver Remnant (FLR) prior to resection [1]. The complications post-PVE can be categorised into puncture-related, which include vascular injury, bilioma formation, abscess formation, and embolisation-related, which include migration of the embolisation agent, liver parenchymal infarction, non-target embolisation, and complete portal vein thrombosis, portal hypertension [2]. The present case is unique because there was no migration of the n-BCA used for PVE, but the microcoil used for embolising the liver parenchymal tract had migrated to the right heart. Schechter MA et al., in their review of literature of 19 case series and 115 case reports, with respect to retrieving a fractured medical device, malpositioned coil of migrated IVC filter, found that only 20 intravascular foreign bodies were due to coil migration [3].

In cases with varicocele coil embolisation, Fu J and Hsia D reported a case with coil migration to the left pulmonary artery with a

resultant small distant infarct [4]. Due to the high risk of retrieval, the case was managed conservatively. In a similarly treated case, Chomyn JJ et al., described successful percutaneous retrieval of a migrated coil to the right lower lobe pulmonary artery [5]. After the literature review, Wang X et al., recommended the early removal of intracardiac foreign bodies. The potential complications included infections, thrombosis, and further distal embolisations [6]. Fisher RG and Ferreyron R found that most fatal complications involved foreign objects migrated to the cardiac chambers in cases of catheter embolisations [7].

According to recent reports, intracardiac foreign bodies that are clean, smooth, and embedded within the myocardium can be left in situ due to less risk of life-threatening issues [8-10]. Karia N et al., described a case in which the removal of the migrated coil, post-varicocele embolisation, was necessary as it was in close proximity to the tricuspid valve. Surgical extraction of the coil was performed via a median sternotomy using a full cardiopulmonary bypass [11]. Percutaneous retrieval of the migrated coil from the left atrium post-pulmonary arteriovenous malformation Embolisation was described by Lu T and Qanadii SD [12]. The success rate of percutaneous coil retrieval was approximately 50% as per Gulati S and Singh AK [13]. Kyaw H et al., described a case of coil embolisation to the right side of the heart after elective hypogastric vein embolisation requiring open-heart surgery [14].

The percutaneous approach is the safest and most justified to remove intracardiac foreign bodies. However, in difficult cases when open removal becomes necessary, the associated risk of sternotomy and cardiopulmonary bypass must be weighed against possible complications with a conservative approach [11].

## CONCLUSION(S)

Minimally invasive procedures demand a high level of operator experience and skill because the options available for the management of procedure-related complications are fewer. In the present case, the microcoil was intended to be used for embolisation

of the access tract; however, it accidentally became lodged into the hepatic vein and migrated through the IVC into the right heart with the blood flow. All prompt required management procedures were considered, but they were not successful, and hence, a conservative approach was preferred considering the high risk of open surgery. The procedure steps and possible minor/major complications must be discussed prior to prevent any major mishap.

## REFERENCES

- [1] May BJ, Madoff DC. Portal vein embolisation: Rationale, technique, and current application. *Semin Intervent Radiol.* 2012;29(2):81-89. Doi: 10.1055/s-0032-1312568. PMID: 23729977; PMCID: PMC3444878.
- [2] Yeom YK, Shin JH. Complications of portal vein embolisation: Evaluation on cross-sectional imaging. *Korean J Radiol.* 2015;16(5):1079-85. Doi: 10.3348/kjr.2015.16.5.1079. Epub 2015 Aug 21. PMID: 26357502; PMCID: PMC4559779.
- [3] Schechter MA, O'Brien PJ, Cox MW. Retrieval of iatrogenic intravascular foreign bodies. *J Vasc Surg.* 2013;57(1):276-81.
- [4] Fu J, Hsia D. Embolisation coil migration: An unusual cause of pulmonary embolism. *Chest.* 2015;148:997A.
- [5] Chomyn JJ, Craven WM, Groves BM, Durham JD. Percutaneous removal of a Gianturco coil from the pulmonary artery with use of flexible intravascular forceps. *J Vasc Interv Radiol.* 1991;2(1):105-06.
- [6] Wang X, Zhao X, Du D, Xiang X. Management of metallic foreign bodies in the heart. *J Card Surg.* 2012;27(6):704-06.
- [7] Fisher RG, Ferreyro R. Evaluation of current techniques for nonsurgical removal of intravascular iatrogenic foreign bodies. *AJR Am J Roentgenol.* 1978;130(3):541-48.
- [8] LeMaire SA, Wall MJ Jr, Mattox KL. Needle embolus causing cardiac puncture and chronic constrictive pericarditis. *Ann Thorac Surg.* 1998;65(6):1786-87.
- [9] Symbas PN, Symbas PJ. Missiles in the cardiovascular system. *Chest Surg Clin N Am.* 1997;7(2):343-56.
- [10] Datta G, Sarkar A, Mukherjee D. A foreign body in the heart. *Arch Cardiovasc Dis.* 2011;104(12):684-85.
- [11] Karia N, Balmforth D, Lall K, Gupta S, Bhattacharyya S. Migration of a varicocele coil to the right heart. *JACC Case Rep.* 2020;2(15):2312-17. Doi: 10.1016/j.jaccas.2020.07.035. PMID: 34317162; PMCID: PMC8304537.
- [12] Lu TL, Qanadii SD. Percutaneous retrieval of a migrated coil in the left atrium. *Radiol Case Rep.* 2015;5(4):335. Doi: 10.2484/rcr.v5i4.335.
- [13] Gulati S, Singh AK. Coil migration to pulmonary vasculature: Case report and review. *SM J Radiol.* 2015;1(1):1001.
- [14] Kyaw H, Park WJ, Rodriguez CA, Maleicka G, Reddy R, Kesanakurthy S. Coil embolisation to the right-side of the heart after elective hypogastric vein embolisation requiring open-heart surgery. *Cath Lab Digest.* 2018;26(9).

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