

# Intra-operative Decision Making for Needle Embolism After Intravenous Drug Use

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## INTRODUCTION

Nearly 1 million people have reported intravenous drug use (IVDU) in the past year, with a record-high mortality of over 70,000 deaths in 2018 according to the Centers for Disease Control and Prevention (CDC). While there is a myriad of health impacts associated with IVDU, needle breakage has been reported in as high as 20% of subjects. When a needle breaks, it can remain embedded in the soft tissues of the local region, however, there is a rare chance of systemic embolization if the fragment escapes into the vascular system. Only 12 cases of needle fragment embolization to the heart have been reported from 1988 to 2019, leaving time-critical decision-making up to the experience of the surgeon with limited available literature. Our case describes a fragmented hypodermic needle confirmed on preoperative imaging, which was unable to be located during operative exploration. Intraoperative x-ray imaging was performed to guide further exploration, or if embolization had occurred, to locate the fragments' new position. After failure to identify the fragment during exploration and with imaging, the procedure was aborted and formal postoperative cat (CT) scans were performed, which confirmed embolization of the fragment to the heart. Ultimately, the patient required a median sternotomy with cardiac bypass to successfully retrieve the fragment. In conclusion, repeat imaging of the neck while in the operating room, but prior to incision, may confirm embolization of the fragment and expedite the evaluation by cardiothoracic surgery, potentially eliminating an exploration of the original injection site.

## Pre-operative Imaging

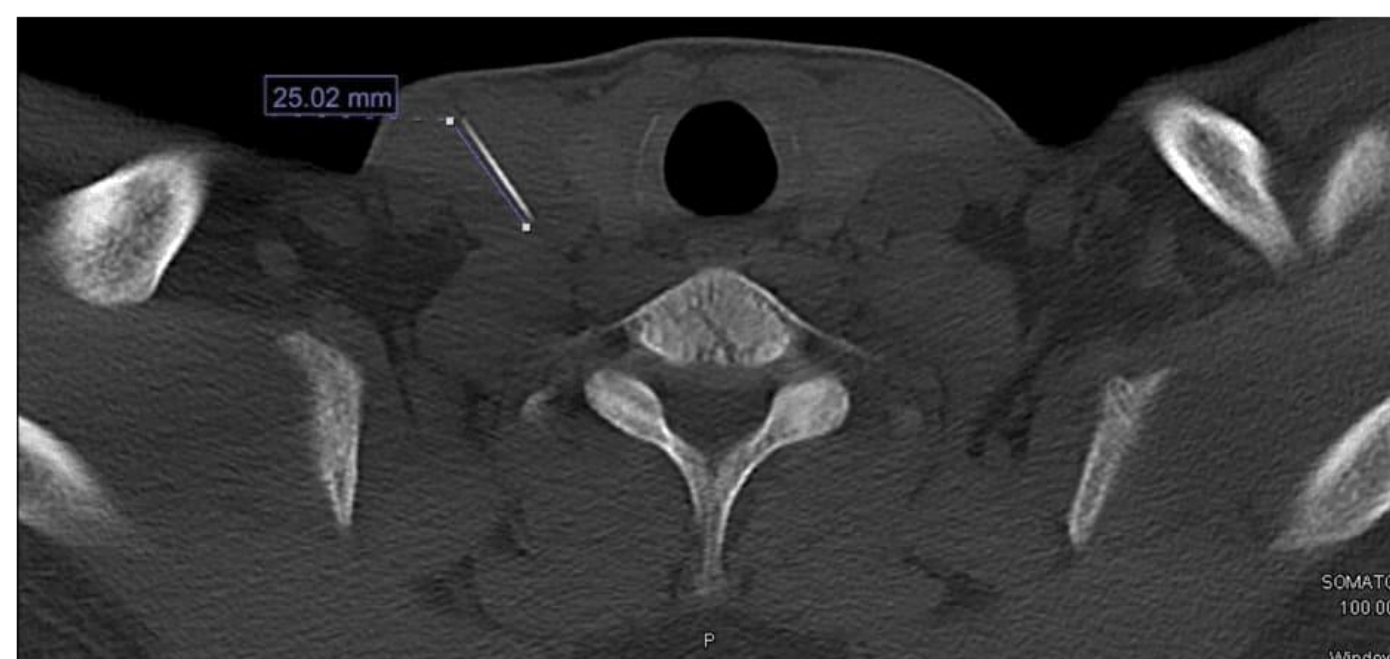


Figure 1. Preoperative CT imaging of needle fragment located in the right neck region.

## CASE DESCRIPTION

A 32-year-old man with a history of intravenous drug abuse, most recently at 3 AM on the day of admission, reported using a 3-cm-long, 25-gauge needle to inject heroin into his right internal jugular vein. Upon withdrawing the syringe after injection, the patient noticed the needle was not present and was retained in his neck. He presented to the emergency room where a CT scan of the chest demonstrated a radiopaque object at the injection site, tracking medial to the right internal jugular vein (Figure 1). The patient was taken to the operating room by the vascular surgery team for attempted removal of the needle. Unfortunately, despite an aggressive exploration, no needle was found. Intraoperative x-ray imaging was used to guide exploration, and a TEE at that time was inconclusive. Post-operatively, additional imaging was obtained that demonstrated the foreign object located in the heart (Figure 2).

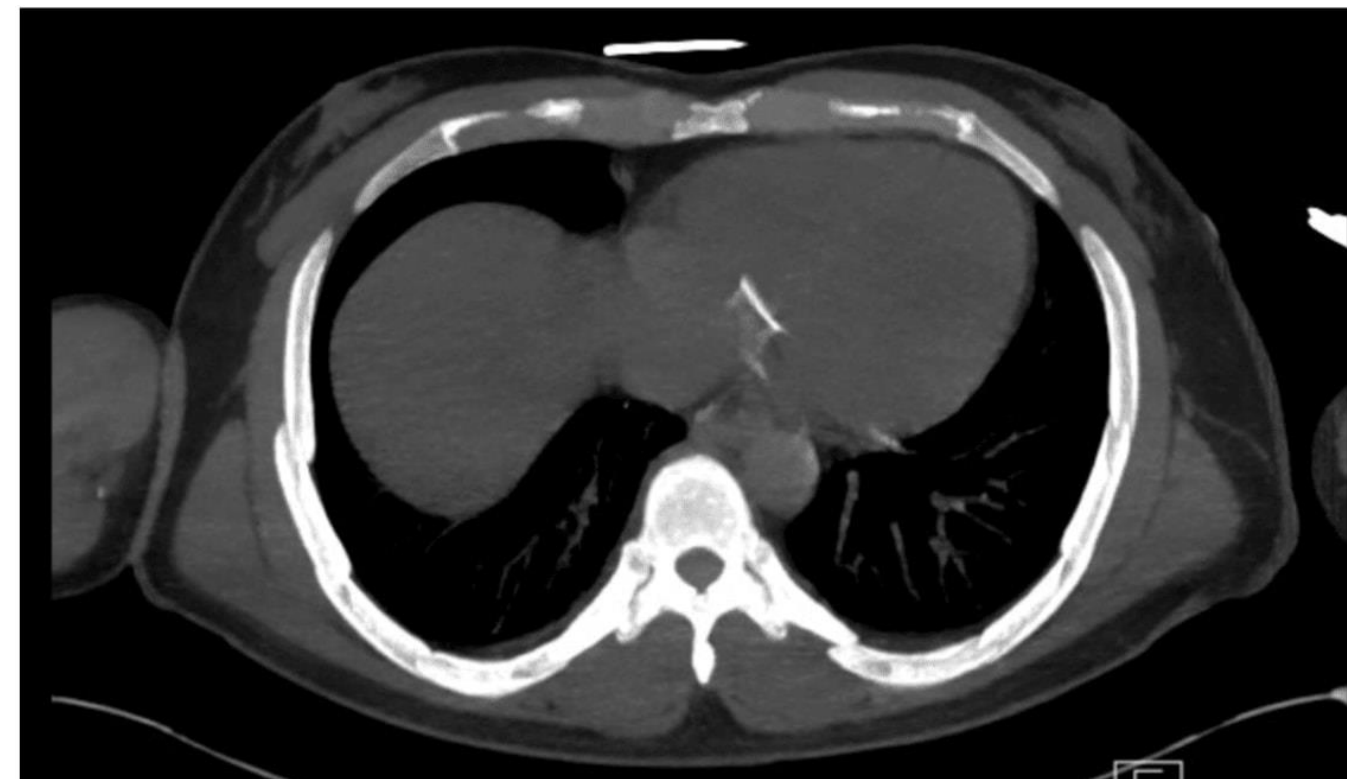


Figure 2. Post-neck exploration CT imaging of needle fragment now located in the heart after embolization.

At this time, cardiothoracic surgery was consulted. After a review of the CT scan of the chest and intraoperative transesophageal echocardiogram, which confirmed the needle in the heart, exploration, and removal of the needle was initiated. The needle fragment was specifically identified in the right atrium within the septal leaflet of the tricuspid valve. There was no injury to the leaflet and no resulting valvular pathology. After a median sternotomy, the patient was placed on cardiopulmonary bypass with bicaval cannulation.

## CASE CONTINUED

The right atrium was opened, and the needle was clearly seen below the septal leaflet of the tricuspid valve (Figure 3, left). The needle was carefully removed with care to prevent injury to the tricuspid valve (Figure 3, right). The right atrium was closed, and the patient was taken off the cardiopulmonary bypass machine. He recovered postoperatively, was subsequently discharged home on postoperative day number 4, and has since returned to the clinic and is doing well.

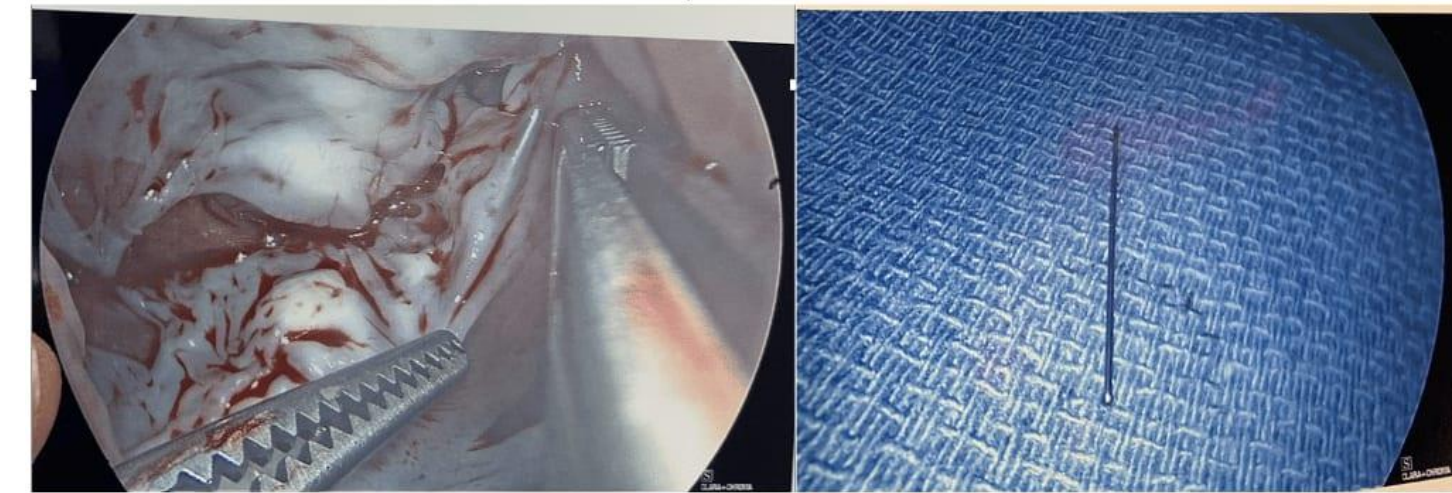


Figure 3. Intraoperative images of the needle fragment retrieval under the tricuspid valve leaflet (left), and the extracted needle fragment after removal from the body (right).

## DISCUSSION

This case report reviews a patient who had a 3-cm needle dislodged into his venous system and implanted into his right atrium. A migrating foreign body in the heart is a unique presentation to the emergency room. Although there have been reports of patients having objects in their hearts, this case has several unique aspects. First, this patient injected himself with the needle that migrated into his right atrium, in contrast to most presentations where patients are victims of trauma or iatrogenic events. Second, the patient was taken to the operating room twice with two different surgical services, vascular and cardiothoracic surgery, for attempted needle removal. Third, a needle being dislodged is not very common in contrast to the more common objects although it has been reported. For example, inferior vena cava (IVC) filters or vascular stents are more common to migrate in comparison to needles.

## DESCRIPTION CONTINUED

Traditionally, patients who have migration of their IVC filters are usually symptomatic (12 of 14 cases), and may occur a long time after the insertion of the filter - in one patient four years following the procedure in recent literature. It has contributed to the cause of cardiorespiratory arrest in three out of 14 patients and was associated with arrhythmias and death in two out of 14 patients, leading to the majority of death (50%) in the reported 104 patients. Moreover, larger devices than catheters and migrated stents can cause symptoms during the first year after placement. The larger foreign object can cause cardiac injury including aorto-right atrial fistulas, pericardial effusions, and valvular injuries. These findings of migrating objects contributing to injury of the heart should be a lesson to not only physicians who perform procedures but also medical doctors who do not perform procedures.

## CONCLUSION

The case report highlights the dangers of dislodged and migrating objects in the body. A 3-cm needle ultimately led to two surgical procedures required for successful extraction. In addition, the diagnostic studies identifying the foreign body were critical in assisting with surgical removal. A blind surgical exploration without the use of focused imaging would be very difficult. Finally, migrating foreign bodies, although rare, can lead to serious consequences. The prompt removal of these objects is warranted for the safety of the patients.