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## Transjugular biopsy case report of inferior vena cava hepatocellular carcinoma with intracardiac extension



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### ABSTRACT

**BACKGROUND:** Diagnosis of hepatocellular carcinoma (HCC) can be established with near certainty by correlating radiological imaging with clinical presentation. However, in the absence of diagnostic certainty, biopsy of liver tissue is mandatory for optimal management. We present our management of a patient with advanced liver disease who presented with an IVC mass extending into the right atrium, with co-existing liver lesions not meeting criteria for an imaging diagnosis of HCC.

**CASE PRESENTATION:** A 62-year-old male with Child-Pugh C liver cirrhosis presented with decompensated liver failure. Multiple imaging modalities demonstrated an inferior vena cava (IVC) mass extending into the right atrium with co-existing liver lesions not meeting radiological criteria for an imaging diagnosis of HCC. There was no contiguous evidence of HCC in the liver, yet there was extensive tumour burden in the IVC representing a separate metastatic lesion without any indication of direct tumour spread. Under fluoroscopic and angiographic guidance, a biopsy catheter was advanced through the right atrium into the IVC. Histology from the biopsy demonstrated fragments of malignant tumour with features consistent with moderately differentiated HCC without thrombus. Given the poor prognosis associated with metastatic HCC with IVC and intracardiac involvement, a multidisciplinary decision was made with the patient's family for palliation care.

**CONCLUSION:** Transjugular biopsy of IVC masses can be performed effectively, in an awake patient, without the need for sedation or anaesthesia. Where multiple imaging modalities fail to confirm a diagnosis for liver or IVC pathology, transluminal biopsy can assist with definitive diagnosis and treatment planning.

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## 1. Background

Important predictors of mortality in patients with cirrhotic liver disease include severity of liver disease as reflected by the Model End Stage Liver Disease (MELD) score, patient age, and comorbidities determined, by the American Society of Anesthesiologists physical status classification [1,2]. Despite advances in modern anaesthesia and surgical techniques, surgery for patients with advanced cirrhosis is associated with significant morbidity

and mortality [3]. Hepatocellular carcinoma (HCC) is a common complication of liver cirrhosis and the most common form of liver malignancy; it is the third leading cause of cancer-related death worldwide [4]. HCC preferentially metastasizes to the lungs, intra-abdominal lymph nodes and bone, however invasion of vascular structures including the portal system, inferior vena cava (IVC) and right atrium are well described however associated with extremely poor prognosis [5–7]. In many cases the diagnosis of HCC can be established with near certain accuracy using imaging characteristics and knowledge of background cirrhosis. However, in the absence of these, determining histopathology is crucial in planning for further optimum management. Open, laparoscopic or transcutaneous liver biopsy are often considered for diagnostic purposes in this setting, however these carry inherent risks in the presence of advanced liver disease and co-existing frailty. We describe our management strategies in a patient with advanced liver disease who presented with an IVC mass extending into the right atrium with co-existing liver lesions not meeting criteria for an imaging diagnosis of HCC. To avoid complications associated with general

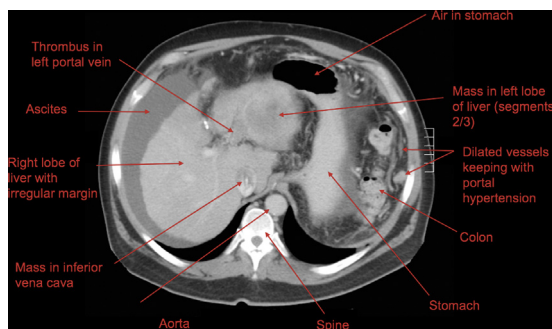
**Abbreviations:** CARE, case report guidelines; CT, computed tomography; HCC, hepatocellular carcinoma; IVC, inferior vena cava; MELD, Model for End-Stage Liver Disease.

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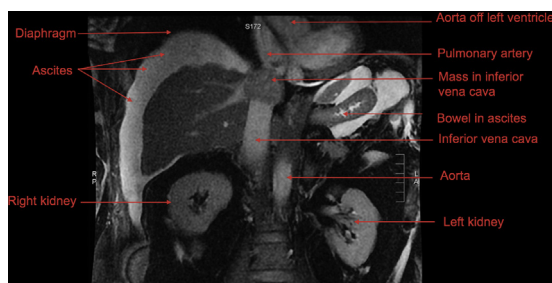


**Fig. 1.** Axial post-contrast CT scan shows left lobe mass, inferior vena cava filling defect and left portal vein thrombus.

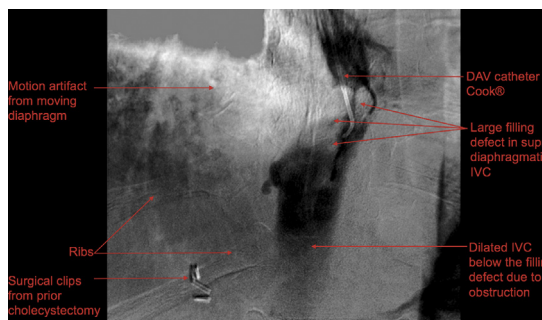
anaesthesia, sedation or transcutaneous biopsy, a minimally invasive diagnostic transjugular biopsy was successfully performed. This was paramount in determining subsequent management in this high-risk surgical candidate.

**2. Case presentation**

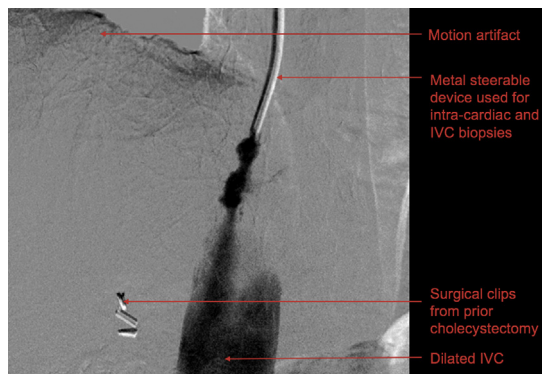
A 62-year-old Caucasian male presented with abdominal distension on a background of Child Pugh C liver cirrhosis secondary to alcoholic liver disease, complicated by acute decompensation with ascites, severe portal hypertension and encephalopathy. The patient had an Eastern Cooperative Oncology Group (ECOG) performance status score of 4 (completely disabled with severe limitations in self-care and confined to bed or chair) and a Model for End-Stage Liver Disease (MELD) score of 24. Computed tomography (CT) demonstrated a diffuse irregular 7 cm soft tissue mass in the left lobe of the liver thought to be consistent with a HCC (Fig. 1). In addition, there was a large IVC mass of unknown aetiology. Whilst HCC was considered as differential diagnosis for both lesions, the diagnosis could not be confirmed on imaging alone. Of note, there was no contiguous mass with the liver to account for the extensive IVC mass seen, suggesting an independent pathological process. Liver magnetic resonance imaging (MRI) confirmed the liver mass but did not meet diagnostic criteria for HCC. Extensive filling defects were seen within the IVC extending into the right atrium suggestive of thrombus (Fig. 2). The left portal vein demonstrated similar filling defects. The heterogeneous signal abnormalities seen on CT were attributed to potential dysplastic nodules. Due to the significant risks associated with an invasive open or percutaneous diagnostic surgical procedures requiring general anaesthesia or sedation, biopsies of the IVC mass were obtained using a transjugular approach. After local anaesthesia infiltration of the skin of the neck, and the absence of sedative medications, the right internal jugular vein was punctured under ultrasound guidance. After successful guide-wire dilatation, a Labs 200 19-gauge liver biopsy catheter was advanced through the right atrium and into the IVC



**Fig. 2.** Coronal T2-weighted magnetic resonance imaging showing mass in the inferior vena cava.



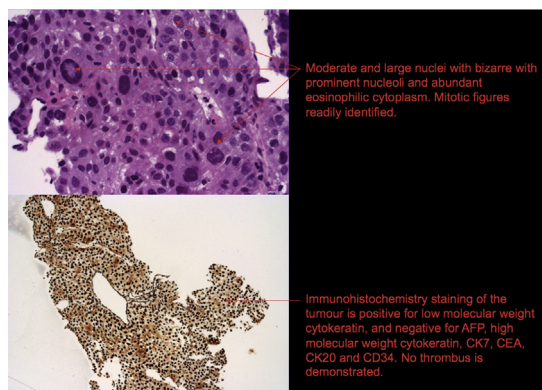
**Fig. 3.** Angiogram of injection of contrast into the inferior vena cava demonstrating soft tissue mass. Filling defect of the inferior vena cava is also shown.



**Fig. 4.** Angiogram of inferior vena cava with contrast intruding into the mass at the site of biopsy.

and several core biopsies were collected (Cook Medical Inc., Bloomington, Illinois, USA) under fluoroscopic and angiographic guidance (Figs. 3 and 4). There were no complications.

Histology demonstrated fragments of malignant tumour with features consistent with moderately differentiated hepatocellular carcinoma confirmed by immunoperoxidase staining (Fig. 5). Immunohistochemistry showed the tumour to be positive for low molecular weight cytokeratin, and negative for alpha-fetoprotein, high molecular weight cytokeratin, cytokeratin 7 and 20, carcinoembryonic antigen, and the glycosylated transmembrane protein CD34. No thrombus was seen. Given the poor prognosis associated with metastatic HCC with IVC and intracardiac involvement, on the background history of end stage decompensated liver disease, a multidisciplinary decision was made, together with the patient’s family, for palliation, and the patient died eight days later.



**Fig. 5.** Histopathology of the inferior vena cava hepatocellular carcinoma.

### 3. Discussion

We report a case where minimally invasive diagnostic transjugular biopsy was performed in a patient with end stage liver disease, where more invasive procedures, general anaesthesia, and sedation were considered prohibitive. Whilst intraluminal transvenous biopsy was first performed in 1964, the transjugular approach for biopsy of IVC lesions is infrequent [8–15]. In the case described, we chose a minimally invasive method to obtain a tissue diagnosis of the IVC mass due to the patient's advanced liver disease and poor functional status. Whilst percutaneous CT guided biopsy has been previously described for sampling such lesions, some form of sedation is generally required, which itself carries an inherent risk of exacerbating hepatic encephalopathy [16–18].

Compared to percutaneous or open chest sampling of mediastinal tissue, the transvenous method for biopsy acquisition offers multiple advantages. Firstly, the procedure is minimally invasive and can be used in critically ill patients, or in those with significant comorbidities that would make operative or percutaneous biopsy difficult. Transluminal biopsy can also be achieved in those who have contraindications to more traditional methods, such as in bleeding diatheses. Secondly, significant complications such as pneumothorax, major vascular injury and air embolism that can occur during percutaneous biopsy are minimized [19]. The risk of these complications would likely be reduced due to the targeted course of the biopsy needle through the preformed lumen of the jugular vein. Moreover, there is a theoretically lower risk of tumour seeding, as the biopsy sample is not withdrawn through several layers of tissues. In the event of greater accuracy being required, intravascular ultrasound can be concomitantly employed.

This method of transvenous sampling is not limited to the vascular system. Intracardiac neoplasms have been biopsied in this way with a variety of imaging-guidance including transoesophageal echocardiography, fluoroscopy and intracardiac echocardiography [20–32]. Renal biopsies have also been performed safely on a large series of patients using the internal jugular vein, as have hepatic biopsies [33,34]. In most cases of IVC HCC, a contiguous mass extending from the liver into the IVC would be seen as a tumour thrombus [35,36]. Our case is unique in that multiple imaging modalities demonstrated no contiguous evidence of HCC in the liver, yet there was extensive tumour burden in the IVC representing a separate metastatic lesion without any indication of direct tumour spread. This created diagnostic uncertainty that was clarified using transluminal biopsy, thus negating the need for further invasive techniques.

In summary, transjugular biopsy of intracardiac or IVC masses can be performed effectively, in an awake patient, without the need for sedation or anaesthesia. This technique should be considered in patients with IVC masses extending into the right atrium who are deemed to be high-risk surgical candidates and where diagnosis is uncertain. As described in this case, this technique was paramount in confirming the diagnosis, which allowed appropriate management strategies. This report was written following the CARE guidelines for clinical case reporting [37,38].

### Conflict of interest

Nil conflicts declared by each author.

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### Ethical approval

Austin Health Research Ethics committee has approved this report being submitted for publication. Written informed consent has been obtained by the patient's next of kin and is available upon request from the corresponding author.

### Consent

Written and informed consent for publication, including all de-identified images have been provided by the patient's next of kin.

### Authors' contribution

A/Prof Laurence Weinberg: responsible for study concept, data collection, data interpretation, collation of all images and writing of the paper. He is the corresponding author.

Dr Manfred Spanger was the interventional radiologist who performed all the interventional radiology procedures. He was responsible for next of kin consent, collection and interpretation of all radiological images, data interpretation and writing of the paper.

Drs Diana Abu-ssaydeh, Jason Wang, and Clarence Wong assisted with the literature review, data collection and interpretation, and writing of the paper.

All authors were involved in drafting the article. All authors have read the final manuscript and approved it for submission.

### Guarantor

A/Prof Laurence Weinberg is the Guarantor.

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### Availability of data and material

All original radiological images are available from the corresponding author.

### Acknowledgement

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