

ULTRASOUND BASED ASSESMENT OF THE VARIATIONS OF INTERNAL JUGULAR VEIN ANATOMY IN RELATION TO THE COMMON CAROTID ARTERY

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Introduction

Internal Jugular Vein (IJV) catheterization has an important role in the management of critically ill patients and as central vascular access for patients requiring hemodialysis. IJV catheterization using the anatomical landmarks as guidance is still used in various settings, with a complication rate of upto 14%. The major causes for increased risks of complications are the anatomical variations in the size and position of the IJV.

Methodology

The ultrasound images of all persons undergoing ultrasound guided central venous catheterization between 2014-2015 were recorded and analysed. The anatomic relation of the IJV in relation to the Common Carotid Artery (CCA) was identified and recorded as medial, anterior, anterolateral, lateral, or posterior. The diameters of both the IJV and CA were measured, and their distances from the skin and each other were measured at the end-expiratory phase. The IJVs were divided into adequate sized (>7 mm diameter) and small sized (≤ 7 mm) groups.

Results

51 patients participated in the study out of which 54 IJVs were analyzed. Of these, 11.1% were done due to patient preference, while 88.9% were due to complications of anatomical landmark guided catheterizations. The mean diameter of the IJV was 10.45mm, (2.8mm-23.2mm). The mean diameter of the IJVs on right and left side was 10.95mm and 8.44mm respectively. The mean distance from the skin to IJV was 10.89mm. The IJV was located anterolateral to the CCA in 50% of patients (n=27), while in 24.07% (n=13) each it was Anterior or Lateral, and in 1.85% (n=1) of subjects it was seen in the Antero-Medial position. Small sized IJV (<7mm diameter) was seen in 48.1% of the patients. 45.5% of the left sided IJVs were anterior to the CCA, while 36.4% were anterolateral. While on the right side, 20.9% were anterior and 51.2% were anterolateral to the CCA, and 1 (1.85%) was anteromedial to the CCA. In summary, on the right side 23.2% had a dangerous position of IJV, while on the left side 45.5% had a dangerous position.

Discussion

IJV is usually located antero-laterally to the CCA, but if it deviates from the normal, then the attempts to cannulate the IJV may be unsuccessful and result in higher rates of complications. It was shown IJV access is obtained 50% of the time while advancing the needle and 50% while withdrawing the needle. Therefore, an anterior position of IJV is associated with 50% chance of arterial puncture, provided the vein is located. In our study, 23.25% of the right side and 45.45% of the left side IJVs had anatomical variation, with a total of 25.92% IJVs. In patients with small sized IJVs, cannulation might be difficult by the landmark-guided technique. The patients with small sized IJVs, and/or anterior or medial positioned IJVs have high risk for developing complications and are referred as dangerous positions. In our study, the anterior position of IJV was seen in 24.07%, while antero-medial position was seen in 1.85%. The normal size and location of IJV was seen in only 61.1% of patients. Also, the diameters of the IJV and the CCA were 2mm less in our study compared with other studies.

Conclusion

In conclusion, we support that in about one-quarter of uremic patients, the external-landmark technique for cannulation of IJV is not reliable. Hence complication rates may be high with external technique. It is advisable to apply ultrasound guidance routinely to reduce the complications and increase the rates of successful cannulation of the IJV.

Position	Percent	No
Lateral	24.07	13
Anterolateral	50	27
Anterior	24.07	13
Anteromedial	1.85	1

Fig 1: Frequency of IJV positions

	Right	Left
Total	100%	100%
Lateral	25.6%	18.2%
Anterolateral	51.2%	36.4%
Anterior	20.9%	45.5%
Anteromedial	2.3%	0.0%

Fig 2: IJV position on each side

Position	≤ 7 mm	> 7 mm	Total
Anterior	45.5%	20.9%	25.9%
Anterolateral	18.2%	53.5%	46.3%
Anteromedial	9.1%	2.3%	3.7%
Lateral	27.3%	23.3%	24.1%

Fig 3: IJV diameter based on position

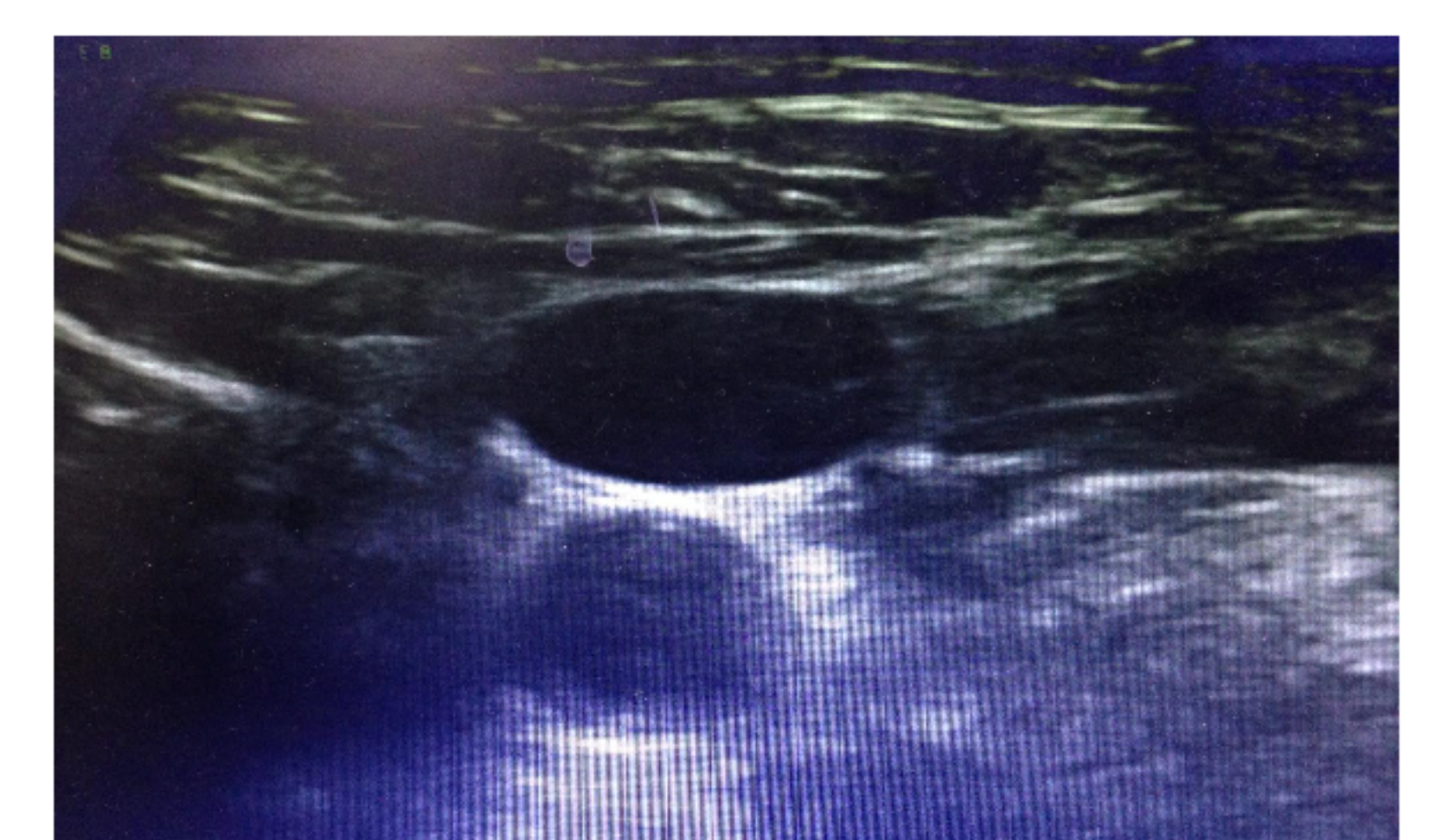


Fig 4: Anterior located IJV



Fig 5: Anterolateral located IJV

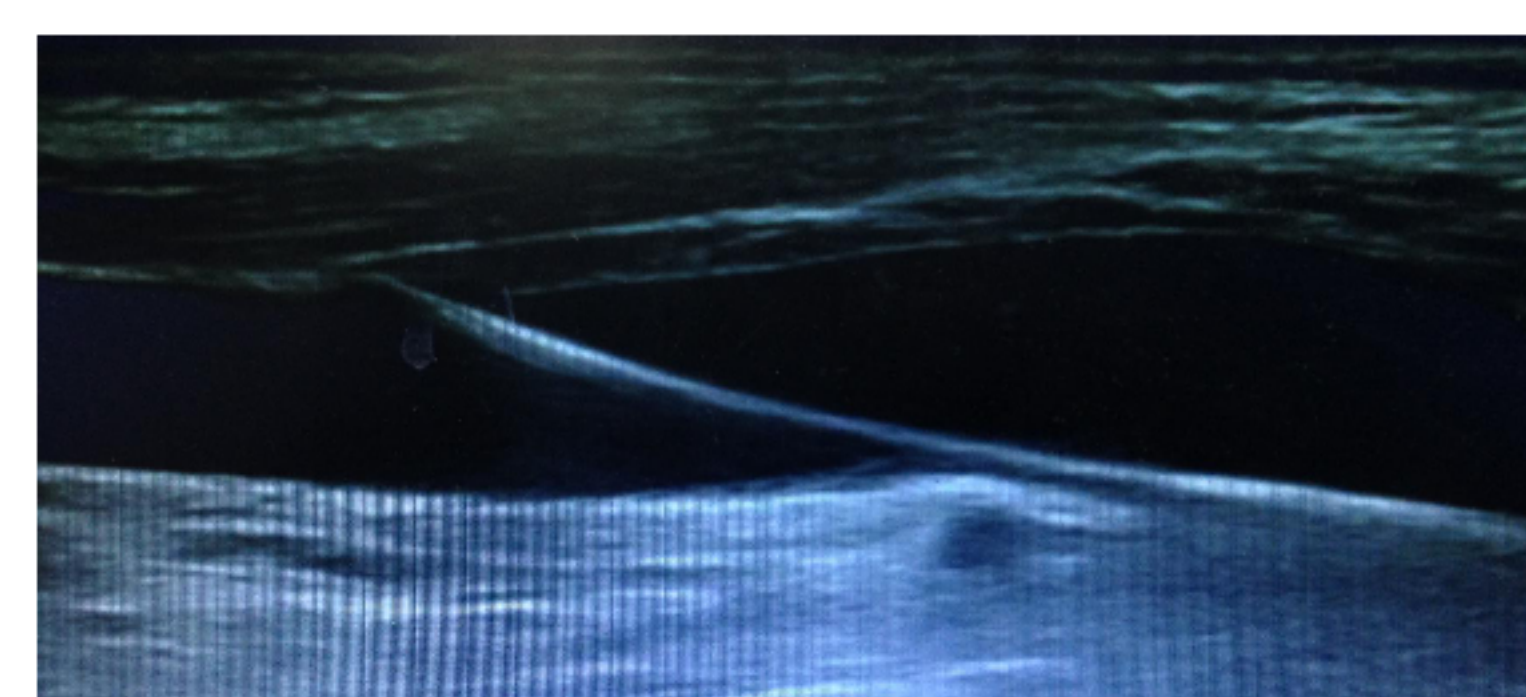


Fig 6: Hemodialysis catheter insertion into IJV

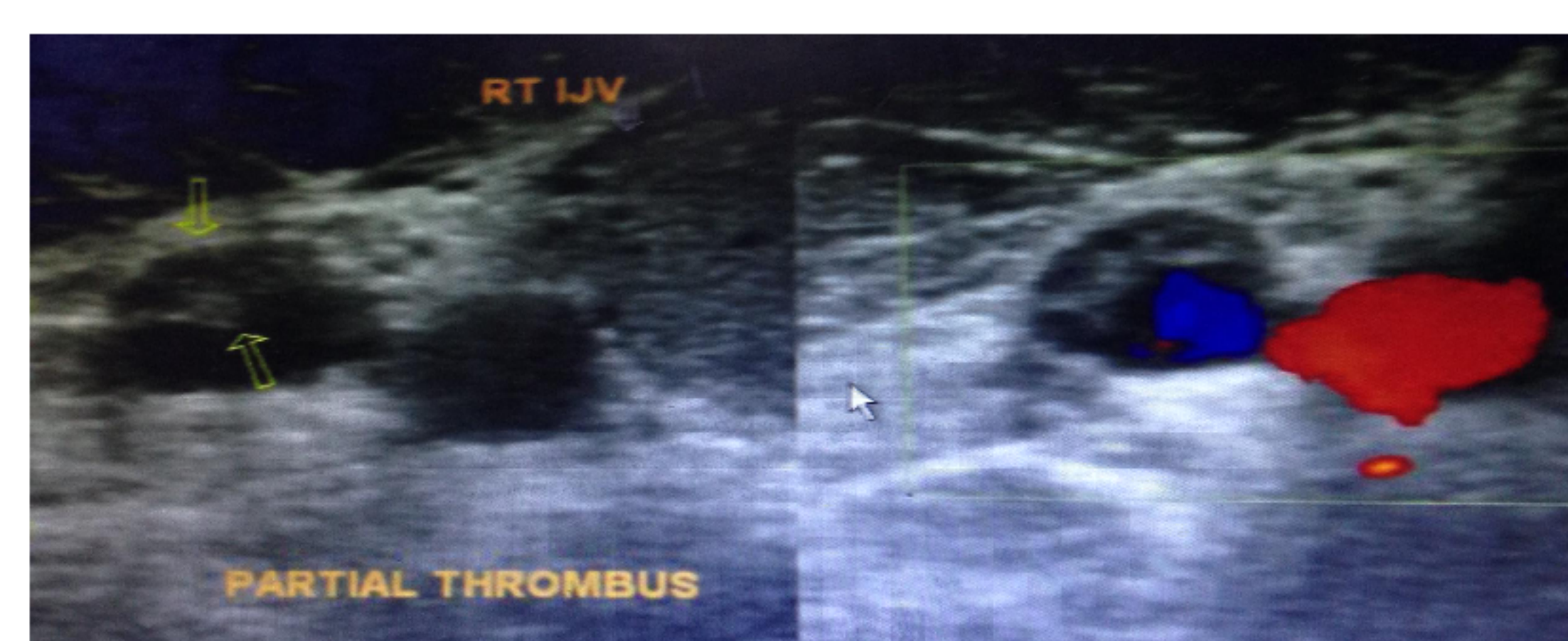


Fig 6: Laterally located right IJV with partial thrombosis

