

## **Bilateral Haemothorax Complicating Internal Jugular Catheter Placement as Access for Haemodialysis: A Case Report and Review of the Literature.**

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### **Abstract.**

Double-lumen catheters inserted into the internal jugular vein are increasingly being used as vascular access for haemodialysis in Nigeria. We report here a case of bilateral haemothorax following placement of a double-lumen catheter in the internal jugular vein, a rare but potentially fatal complication. The patient was on admission on account of acute kidney injury and had developed a right lower limb deep vein thrombosis following repeated cannulation of the femoral vein for dialysis access. He developed right-sided chest pain and worsening dyspnoea 12 hours after a double lumen was inserted into his right internal jugular vein. A chest x-ray revealed bilateral pleural effusion which was found to be haemorrhagic on thoracocentesis. He responded well to bilateral, closed-tube thoracostomy drainage and transfusion with blood and fresh frozen plasma.

### **Introduction**

Placement of double-lumen catheters in the internal jugular vein is increasingly being used as vascular access for haemodialysis in Nigeria in preference to the long established practice of repeated femoral vein cannulation.<sup>1,2</sup> Major mechanical complications of this procedure though rare, have been well documented in the literature.<sup>3</sup> We report here a case of bilateral

haemothorax following placement of a double-lumen catheter in the internal jugular vein, a rare but potentially fatal complication that is said to be more commonly seen after subclavian vein cannulation

### **Case Report**

Mr A.O, a 44 year old clergyman was referred to our hospital on account of a week's history of fever, jaundice, and passage of dark coloured urine and a two-day history of reduction in urinary output. He had been on admission for three days at a private hospital where he was being treated for sepsis before he was referred to us on account of having made only about 20mls of urine in the preceding 24hours. At presentation, he was acutely ill-looking, febrile (axillary temperature of 39<sup>o</sup>C), pale, icteric and had bilateral pitting pedal oedema. His abdomen was distended but there were no palpably enlarged organs. He had ascites demonstrable by shifting dullness. His respiratory rate was 20 cycles per minutes with vesicular breath sounds bilaterally and no added sounds.

His pulse rate was 92 beats per minute and blood pressure was 140/80mmHg. His jugular venous pulse was not elevated and the first and second heart sounds only were heard.

He was conscious and well oriented in time, place and person with no obvious focal neurologic deficits. However, there was demonstrable asterixis.

The results of laboratory investigations carried out on admission and during the period of hospital stay are as shown in table 1.

An assessment of intravascular haemolysis secondary to severe sepsis and complicated by acute kidney injury was made. The focus of the

sepsis was not immediately obvious and microbial cultures of both blood and urine were negative probably because he had been on antibiotics prior to being referred. He was admitted, commenced on intravenous Levofloxacin 500mg stat, then 250mg daily and intravenous metronidazole, 500mg 12-hourly. His total fluid intake in 24hours was restricted to one litre plus previous day's urine output and a low salt diet was prescribed.

**Table 1. Results of the Patient's Laboratory Investigations**

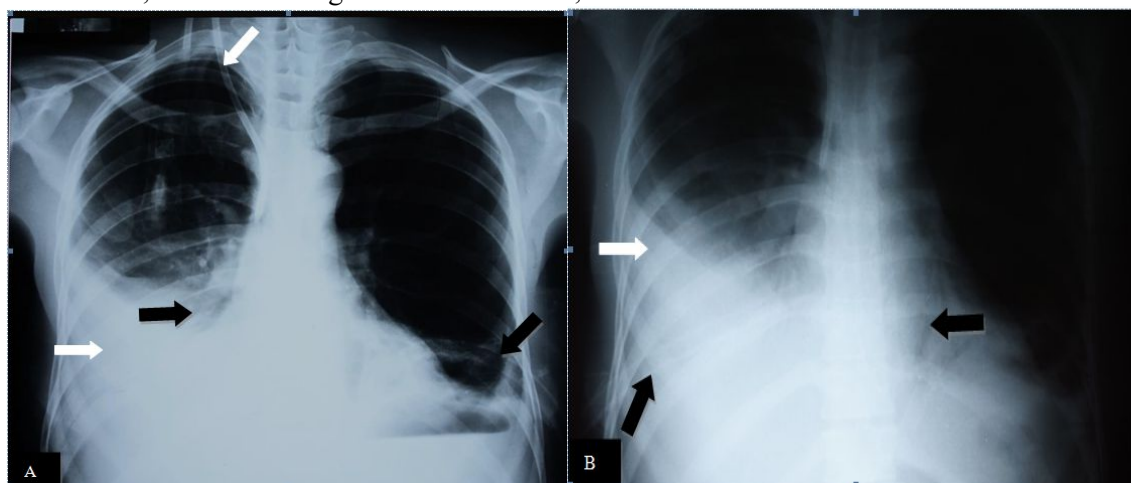
LABORATORY VARIABLE	REFERENCE RANGE	Day 1	DAY 5	DAY 17	DAY 21	DAY 39	DAY 49
Haematocrit (%)	40-54	25	31	16	26.6	28	33.9
WCC ( $\times 10^9/L$ )	4-11	19	12.5	19.04	10.2	10.1	9.07
Differential Count							
Neutrophils (%)	40-70	76	84.9	96.9	84%	59.9	57.6
Lymphocytes (%)	20-45	17	9.1	1.7	11	30.9	33.1
Monocytes (%)	4-10	6	4.4	1.4	4	7.7	8.2
Eosinophils (%)	1-6	1	1.4		1	1.0	0.8
Basophils (%)	0-3		0.2			0.5	0.3
Platelet Count ( $\times 10^9/L$ )	150-400	208	602	398	241	634	418
ESR(mm/Hr)	0-20					100	>100
Sodium (mmol/L)	135-145	118	137.3	121	146	129	124
Potassium (mmol/L)	3.5-5.0	3.7	4.7	6.0	4.9	4.1	3.9
Chloride (mmol/L)	98-106	83	86.7	91	98	99	99
Bicarbonate (mmol/L)	22-28	16	24	9	23	19	32
Urea (mmol/L)	1.5 – 6.5	54	46.3	43.8	39	12	4.6
Creatinine ( $\mu\text{mol/L}$ )	53-115	1728	1355	1600	651.2	163	70
AST (U/L)	0-12	45		63			
ALT (U/L)	0-12	32		3			
ALP (U/L)	39-117	52		61			
GGT (U/L)	11-58			43			
Total Bilirubin ( $\mu\text{mol/L}$ )	0-17			21			

Conjugated Bilirubin ( $\mu\text{mol/L}$ )	0-4			8			
Total Protein (g/L)	60-75	67	65.4				
Albumin(g/L)	35-50	33	35				
INR	1.0-1.3	1.03	1.05	1.64			

WCC = White Cell Count; ESR = Erythrocyte Sedimentation Rate; AST = Aspartate transaminase; ALT = Alanine transaminase; ALP = Alkaline phosphatase; GGT = Gamma Glutaryl transaminase; INR = International Normalised Ratio.

He was also commenced on alternate-day haemodialysis (HD) which was carried out initially via intermittent femoral vein cannulation, with two single lumen catheters;

one inserted in each femoral vein. The catheters were removed immediately after each session of dialysis.



**Fig 1.** Postero-anterior chest Radiograph (A) and close up view (B) of the patient who developed bilateral pleural effusion following placement of a double-lumen catheter in the internal jugular vein. Note pleural effusion (horizontal white arrow) with bibasilar consolidation (horizontal black arrows) with air bronchogram. Bilateral chest tubes (oblique black arrows) as well as the right internal jugular catheter (oblique white arrow) are also noted.

On the seventh day of admission, after having had three sessions of HD, he was noticed to have developed differential left lower limb swelling. A subsequent doppler ultrasound scan confirmed a deep venous thrombosis in the left common femoral and superficial femoral veins. As a result of this finding, he was commenced on subcutaneous Enoxaparin 60mg 12-hourly. On the 10<sup>th</sup> day of admission, when the patient was due for a fourth session of haemodialysis, a 12F

gauge, 20cm double-lumen catheter was inserted into the right internal jugular vein using the landmark technique.<sup>4</sup> The procedure was successful after three attempts and the position of the catheter in the SVC was confirmed by a chest x-ray. The patient subsequently had a session of haemodialysis using the catheter. About 12 hours after insertion of the catheter, he complained of right-sided chest pain, and developed progressively worsening dyspnoea.

Examination of the chest revealed signs of pleural effusion bilaterally with stony dull percussion notes and absent breath sounds in the middle and lower lung zones. A chest X-ray showed pleural effusions in both lower and middle lung fields bilaterally and a diagnostic thoracentesis yielded haemorrhagic fluid. Also, his haematocrit had dropped to 16% from a pre-catheter insertion value of 22%.

After taking into consideration the risk of bleeding due to the patient being on therapeutic anticoagulation, a decision was taken to initially “manage conservatively” with transfusions and closed tube drainage of the pleural space and to offer delayed thoracotomy only if significant bleeding continued despite “conservative management”. The Enoxaparin was immediately withheld and the patient transfused with two units of fresh frozen plasma (with the aim of counteracting any bleeding tendency caused by the Enoxaparin) before subsequently having bilateral closed-tube thoracostomy drainage of the haemothorax. Figure 1 are chest X-rays of the patient showing the pleural effusion as well as the internal jugular catheter and bilateral chest tubes inserted. He was transfused with a total of six units of whole blood over the following 48 hours. The patient responded well to this with stabilisation of his clinical signs and a progressive reduction in the effusions. He had a further three sessions of HD before recovery of renal function. He became dialysis independent by day 25 post admission after which the internal jugular catheter was removed. He however remained on admission for an additional 25 days because the right chest tube continued to drain small but significant volumes of blood stained effluent. The left thoracostomy tube was removed 12 days after its insertion having drained 780ml of bloody effluent while the right thoracostomy tube was removed 26 days after its insertion having drained 1,725ml of bloody effluent.

The patient was discharged after 50 days on admission in a stable state and is being followed up on outpatient basis. His kidney function had returned to normal.

## Discussion

Although ultrasound guidance has been shown in many series to improve success rates and

decrease complications, cannulation of the internal jugular vein using the landmark technique generally remains a safe procedure in the hands of experienced clinicians with success rates exceeding 88%, and minor complications occurring in about 10% of cases.<sup>5</sup> We recently reported our experience with placement of temporary catheters in the internal jugular vein as access for dialysis over a two year period with no episodes of major mechanical complications.<sup>6</sup> Despite these, the risk of complications has been shown to increase in the presence of certain patient-related factors such as obesity, neck deformity, respiratory distress and use of anti-coagulants and anti-platelets drugs.<sup>3</sup> The patient reported here had been on therapeutic doses of Enoxaparin on account of having developed a left lower limb deep vein thrombosis.

Haemothorax complicating cannulation of the internal jugular vein is rare, and is believed to occur in less than 0.5% of patients. In fact, it occurs more commonly following cannulation of the subclavian vein.<sup>3</sup> It may occur during or immediately after placement of the catheter and usually arises from damage to a large vein or arterial puncture. It is most commonly unilateral; the hydrothorax occurring on the side of the cannulated internal jugular vein.<sup>7-10</sup> The first case of bilateral pleural effusion following internal jugular vein cannulation was reported by Carvell and Pearce<sup>11</sup> in 1976. Since then, a few other reports of this life-threatening complication have appeared in the literature. In the case reported by Carvell and Pearce, the pleural effusion on the right was thought to be due to perforation of the superior vena cava and pleura by the catheter with a possible communication in the midline thought to account for passage of pleural fluid to the left side. Sheep et al,<sup>12</sup> reported a case of bilateral effusions associated with cardiac tamponade that ultimately proved fatal and was also thought to be caused by superior vena cava perforation. Galbis et al,<sup>13</sup> reported a case in which the bilateral haemothorax that occurred following internal jugular vein cannulation only became obvious 60 hours after catheter placement suggesting a possibility that presentation of this complication may be delayed.

One major reason often cited for the higher rates of mechanical complications following the

landmark technique of internal jugular vein cannulation is the frequent but underestimated occurrence of anatomic variations in the position and size of the internal jugular vein. Denys and Uretsky<sup>14</sup> in an ultrasound study of 200 adults found that 8.5% had aberrant internal jugular veins. 3% of the individuals had small fixed internal jugular veins, the right internal jugular vein was absent in 2.5%, the internal jugular vein was located medial to carotid in 2%, and more than 1cm lateral to carotid in 1%. Lin et al<sup>15</sup> in a study of 104 consecutively presenting uraemic patients in Taiwan found a total of 27 patients (26.0%) who had internal jugular vein anatomical variations that might contribute to difficulty in internal jugular vein cannulation using the landmark technique. Variations of the right and left internal jugular veins were noted in 19 (18.3%) and 17 (16.4%) uraemic patients respectively, while nine patients (8.7%) had bilateral variations.

In the case reported, we were of the opinion that the primary reason for the post-insertion bleeding was a combination of multiple attempts at cannulation and the use of therapeutic anticoagulation in the patient. The use of anticoagulation also informed the decision to delay exploratory surgery. The patient subsequently responded to conservative management. It would seem that use of ultrasound guidance in carrying out the procedure may have prevented this complication by ensuring that the vessel is visualised before attempts at cannulation were made and thus reducing the number of attempts made before successful cannulation. This would have led to reduced morbidity, duration of hospital stay and ultimately cost of care to the patient. The American College of Surgeons recommends ultrasound guidance for all internal jugular vein cannulation.<sup>16</sup> This may be difficult to attain in resource-limited settings because of the limited availability and competing needs for the use of ultrasonography. However, it may be possible to identify those patients at increased risk of post-insertion complications such as the patient reported and to deploy ultrasound guidance in these situations.

#### **Conclusion/Message**

Cannulation of the internal jugular vein using the landmark technique generally remains a safe

procedure in the hands of experienced clinicians. Despite this, life-threatening complications do occur and physicians need to be aware of this. Several patient factors are associated with an increased risk of complications of the procedure and patients should be evaluated for the presence of any of these factors. Whenever any of these factors are present, ultrasound guidance is preferable to the landmark technique to reduce complication rates.

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