

A rare case of pulseless ventricular tachycardia during central venous catheter insertion

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Abstract:

Hypokalaemia is a common occurrence in ICU around 40% of the patients were found to have Hypokalaemia between day 1 and day 4 of admission¹, Though central venous catheter insertion is a common procedure with insertion rates in ICU (49%) or theatres (42%)², is associated with complications which include premature atrial and ventricular contractions(pneumo/hemothorax, vessel/nerve injuries)the incidence of life-threatening ventricular arrhythmias is less than 1%³ We report a patient with severe hypokalaemia with quadriplegia who developed pulseless ventricular tachycardia while inserting central venous catheter through the right subclavian vein by landmark technique. Patient was successfully resuscitated as per the ACLS July 2020 guidelines. this case report reminds the clinician to be careful during central venous catheter insertion in critically ill ICU patients with adequate resuscitation equipment and a code blue team on standby to prevent catastrophe in what seems to be a benign day-to-day procedure.

Keywords: Central venous catheter, Pulseless ventricular tachycardia, Severe Hypokalemia

Introduction:

Central venous catheter (CVC) insertion was performed in 1929, and was initially performed by radiologists under fluoroscopic guidance, however establishment of CVC in critically ill patients, is now a routine procedure/standard of care both for monitoring and therapeutic purposes. Inserting CVC in Critically ill patients who are already on pressor/inotropic support for shock having electrolyte imbalances, dehydration and sepsis, which can invite some serious complications like cardiac dysrhythmias, pneumothorax, vessel/nerve injuries, thromboembolism and infection⁴. Strict attention to insertion technique and the depth of guidewire insertion can reduce the risk of dire complications like pulseless VT/VF, cardiac arrest and even death. So, clinicians must remain aware and be prepared for a probable life-threatening cardiac situation while inserting CVC, especially in critically ill patients. Here we report a case of pulseless ventricular tachycardia (VT) during placement of a CVC in an awake patient in ICU.

Case report:

A 42Y/Female, Housewife presented to our unit with history of sudden onset of weakness of both lower limbs associated with inability to put weight along with ascending numbness, the patient had a history of trivial fall ~15 days back. on presentation, initial examination revealed absent knee reflexes but ankle reflexes were preserved the only significant findings on presentation was quadriplegia with Medical Research Council muscle power grade (out of 5) was 3 distally, 4 proximally in the arms and 3 distally, 3 proximally in the legs. Baseline parameters were as follows: Pulse –82/min regularly regular, normovolemic and no radio-radial or radio-femoral delay, blood pressure – 122/88 mm of Hg in right arm in sitting position & Glasgow coma scale score – E4V5M6 (15/15). All routine investigations including electrocardiogram were within normal limits except for the extremely low serum potassium level (1.9 mmol/L). A differential diagnosis of Guillain barre syndrome/ transverse myelitis/ Hypokalaemic periodic paralysis was made, as the diagnosis was suspected to be having hypokalaemic periodic paralysis the treatment of which is potassium replacement at rates of 40-60 mEq/hour. Due to the high potassium requirement, there was a need for CVC insertion & after due consent, In supine position Local anaesthesia was administered using 2% lignocaine, after an intensivist with > 12 years experience tried inserting CVC (7Fr/16cm /tri channel) through the right subclavian vein using landmark technique under hemodynamic monitoring. While introducing guidewire patient complained of uneasiness and while she was

trying to communicate she developed sudden onset uprolling of eyeballs and there were irregular waves which were of varying morphology and amplitude (no P Wave, QRS complex or T wave) seen on ECG monitor & On palpation of carotid for pulse, it was not palpable and immediately CPR was started according to AHA ACLS July 2020 guidelines, ROSC was achieved after 30 seconds of CPR. After stabilisation of cardiac status patient was observed for fifteen minutes, post which 12 lead ECG was done and found to be Normal Sinus Rhythm.

Discussion:

Despite the benefits of central venous lines to patients and clinicians, more than 15% of patients will have catheter-related complications.⁴ Benign cardiac dysrhythmias resulting from guide wire or catheter tip in the atrium or the ventricle during the cannulation procedure is usually transient⁵ with an incidence of 41% for atrial dysrhythmia and 25% for ventricular ectopy has been reported⁶ & the incidence of life-threatening ventricular arrhythmias is less than 1%.³ However this incidence can further be compounded in critically ill patients with hypokalaemia (prevalence of 40% between days 1 & 4 of ICU admission). While arrhythmias during CVC insertion have widely been attributed to mechanical irritation of the endocardium by the catheter tip, some patients may be at higher risk for arrhythmia than others. Over-insertion of the guidewire during CVC placement is a major risk factor for the initiation of dysrhythmias.⁷ However Operator, Age of patient, type of catheter and brand of catheter insertion were not found to be significant variables that correlated with the occurrence of ventricular ectopics during the CVC insertion. It was found that even moderate hypokalemia (2.5–3.0 mmol/L) can be highly arrhythmogenic in normal hearts. In isolated rabbit and rat hearts, it was found that modestly reducing K⁺ to 2.7 mmol/L resulted in spontaneous EADs, polymorphic VT, and VF in approximately over 50% of hearts studied, whereas severe hypokalemia (2.0 mmol/L) caused VF in 100%.⁸ The reduction in repolarization reserve by hypokalemia has classically been attributed to direct suppression of K⁺ channel conductances, but recent evidence indicates that indirect effects of hypokalemia leading to activation of late Na⁺ and Ca²⁺ currents play a key role as well.⁹ Together, these 2 factors are synergistic in reducing repolarization reserve sufficiently to induce EADs and EAD-mediated arrhythmias, including Torsades de pointes, polymorphic VT, and VF.⁸ Arrhythmia results from guide wire contact with the right atrium, most frequently this results in premature atrial and ventricular contraction.^{6,10} However, if the atrioventricular node is in contact with guide wire or tip of CVC for a significant amount of time supraventricular tachyarrhythmias can result and lead to fatal arrhythmia and arrest.¹⁰ Arrhythmia originating in critically ill ICU patients have multivariate aetiology which includes structural causes and Variable causes.¹¹ Out of which our patient developed dysrhythmia by mechanical stimulation of myocardium by guide wire and sustained by severe hypokalaemia, leading to an episode of pulseless VT. Dysrhythmias and its grave consequences during central venous catheter insertion can be reduced if not totally eliminated, by anticipating and preparing for a probable life-threatening cardiac situation before going for CVC placement. Using an ECG monitor along with the experience of operator for early recognition of such an event and its prompt management following standard protocol is crucial to reduce morbidity and mortality.

Take Home Message –

Although the CVCs catheter insertion is considered a small procedure but since it has life-threatening complications like cardiac arrhythmias especially in critically ill ICU patients it seems to be crucial that this procedure be performed with anticipation and preparation for a probable life-threatening cardiac situation in order to reduce morbidity & mortality

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CONSENT –

Routine Procedure was performed for the patient and written & Verbal consents were taken from the carer in their native language.

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