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JLB: a flexible and effective device in critical patients. Review of clinical cases

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Abstract

JLB catheter (Deltamed Inc) is an alternative way to manage difficult venous access; it is placed under US-guidance in large bore veins, with an easy-sterile approach. Internal jugular vein (IJV) is the first choice for cannulation, followed by subclavian or deep upper-arm veins. The catheter is available in different lengths and gauges, it allows high flow rates and can be left in place up to 30 days.

From June 2015 to March 2017, JLB has been positioned in 409 patients: in 354 as primary access in IJV, brachial or subclavian vein; in 55 cases JLB became an introducing line for the Seldinger guidewire and further CVC positioning. All clinical cases were reviewed selecting those with greater clinical relevance.

We report 8 cases in which JLB resulted determinant for the patient treatment:

- a 16 years old obese girl born with perinatal distress,
- a 78 years old obese woman with hemorrhagic shock caused by gastrointestinal bleeding,
- a 40 years old man with severe hypokalemia,
- a 30 years old man with severe sepsis,
- a 40 years old man with Becker's muscular dystrophy and severe sepsis,
- a 40 years old man with multiple myeloma who had to carry out cycles of chemotherapy,
- a 76 years old man with CMV pancolitis and myelofibrosis who needed parenteral nutrition, antiviral therapy and frequent blood and platelets transfusion.

Moreover, it has been useful in elderly patients who needed to carry out palliative care for seniority or cancer lasting up to 30 days .

In our experience the JLB catheter is safe, easy to place, quick and cost – effective. It is a valid solution either in unstable patients requiring an

immediate access in emergency and stable patients with difficult venous access, in which invasive devices can be considered an over-treatment.

Introduction

Vascular access is a cornerstone in the treatment of critically ill patients in ED, OR or ICU. In many conditions, obtaining a venous line is difficult due to anatomic variability, medical history or patient's critical condition (Difficult IntraVenous Access = DIVA).

When facing a DIVA, alternatives include cannulation of external jugular vein (EJV), deep limb veins (such as brachial or cephalic vein, either with standard device or MIDLINE / PICC lines), classic CVC placement or, recently and limited to unstable patients, intraosseous access. All these solutions need expertise, they are prone to serious adverse events and time-consuming. Moreover, CVC placement could be futile in many patients who don't need invasive monitoring.

We designed a new catheter (JLB®, Deltamed Inc.), that can be placed under US-guidance bedside, first choosing internal jugular vein (IJV), obtaining an easy and rapid (mean procedure time < 4 min) solution for difficult venous access.

Material and methods

JLB is an over-the-needle catheter indicated for cannulation of medium and large bore veins in patients with DIVA. Compared to standard peripheral devices, it is longer and more echogenic. Internal Jugular Vein (IJV) is the first-choice site of cannulation, followed by deep upper arm veins (brachial, cephalic) and subclavian vein.

Using a high frequency (10–15 Mhz) linear probe, the physician first explores the supine patient on both neck sides, assessing for the best IJV for cannulation, according to caliber, depth and patient's neck anatomy. If both neck veins are not feasible, deep upper-arm veins are the second choice, followed by subclavian.

Awaken patients often benefit from subcutaneous 2% Lidocaine before cannulation attempt. Mild procedural sedation with IV Midazolam is reasonable in non-compliant patients.

Chlorhexidine ensures skin disinfection as well as ultrasound conduction. The catheter-over-needle device is plugged on a 10 cc syringe and introduced with 45° angle caudad. This first phase is entirely US-guided, allowing the visualization of the catheter along its course, hence the insertion depth. Vein cannulation is assumed as the needle tip is visualized inside the vessel, and confirmed by direct blood aspiration in the syringe. In the second phase the physician gets rid of the probe and proceeds sliding down the catheter into the vessel, holding the syringe with the other hand. Once the catheter is entirely inside, the infusion line is promptly plugged to avoid air embolism. Correct positioning is furtherly confirmed by blood reflux test; the device is then fixed using simple patches, steri-strips or stitches, depending on physician's choice and patient's clinical conditions. Chest US is immediately performed to rule out iatrogenic PNX. It is also used if early or late local complications (eg. haematomas) are suspected.

Catheter length (60, 70, 80mm) and caliber (14, 16, 17, 18 Gauge) is chosen considering patient morphotype, neck characteristics, vessel depth (estimated during US first look) and patient's needs in terms of hydration and IV therapy.

We led a multi-center observational retrospective study including three EM units, two ICUs and one Internal Medicine ward from June 2015 to March 2017. JLB cannulation was performed in 409 patients, among which the main indication was the absence of any other peripheral venous access (DIVA). In a subset of patients JLB was positioned by the anesthesiologist in the operating room as first venous access, enabling rapid fluid resuscitation and patient stabilization; in a second phase, the catheter itself (regardless of its gauge) acted as introducer for the Seldinger guidewire for further CVC positioning.

Patients were >5 y old, with PLTs > 50.000 and normal coagulation profile (PT and APTT).

Our study enlightened the safety of JLB, recording only two minor complications (on minor arrhythmia, one soft tissue haematoma) and no major complication (considered as: PNX, catheter related infections or thrombosis, arterial cannulation, major arrhythmias, life-threatening haematomas).

A review of all these cases pointed out those with major clinical relevance.

Discussion

We report 8 cases in which JLB played a determinant role in patient treatment. In two of these cases, aware of altered coagulation state (PLT <50.000, abnormal INR), JLB has been used in state of necessity for life-threatening conditions. No complications occurred, and more invasive and risky procedures (eg. CVC) were so avoided.

JLB enables an easier management of patients with unfavourable anatomy. For example it has been rapidly placed in two obese patients: a 16 years old girl born with perinatal distress and a 78 years old woman with hemorrhagic shock caused by gastrointestinal bleeding. The latter arrived at the ED with BP 80/60 mmHg, INR 22,5 and Hb 5,5 g/dL. JLB permitted prompt administration of plasma factors and blood transfusions, leading to clinical stabilization.

The use of JLB has also been effective in neoplastic patients, usually characterized by poor peripheral venous pool and immunocompromised state. JLB has been used for intravenous correction of a severe hypokalemia (1,2 meq) in a 40 years old man with malignancy. Our device also allowed a 40 years old man with multiple myeloma to carry out cycles of chemotherapy. In both cases no procedural or infective complications were observed.

Sepsis or septic shock are frequent presentations in the emergency medicine setting. JLB has revealed to be useful in the management of these conditions, complicated (a 40 years old man with Becker's muscular dystrophy; a 76 years old man with CMV pancolitis and myelofibrosis complicated by candidemia) or not (30 years old man with severe sepsis) by comorbidities. JLB represented a quick, rapid and life-saving solution in the patient affected by CMV pancolitis and myelofibrosis, with peripheral venous pool depletion and need of periodic blood and platelets transfusion (Hb 6,6 g/dL, Platelets 5000/mm³, INR 1,42). Although the severe piastrinopenia and the altered INR, no procedural bleedings or long-term haematomas occurred.

Moreover, JLB has been useful in elderly patients who needed to carry out palliative care for seniority or cancer. The device lasted up to 30 days, avoiding any overtreatment in these fragile critically ill patients.

JLB still cannot replace CVC in patients who need invasive hemodynamic monitoring (CVP measurement, ScvO₂, et.).

Conclusion

From our review JLB® appears to be safe, cost and time-convenient and easy to place at patient's bed. It could represent a valid solution both in critical and stable patients with DIVA, in which classical alternatives can be too much invasive.

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