Using the external jugular vein collapsibility index as an indicator for reestablishment of normovolemia in a hypotensive dog - a case report

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Introduction

The correct use of fluid therapy ensures the maintenance of patients’ fluid balance in several ways: by restoring the sensitive and insensitive losses of fluids and electrolytes, promoting venolic expansion of dehydrated and/or hypovolemic patients, maintaining and/or restoring acid-base balance, and providing electrolytes and buffer solutions. It is one of the pillars in the therapy of critical patients, as in cases of sepsis, septic shock and trauma.

Considering the possible complications that fluid overload and the positive water balance can bring to critical patients (Kelm et al., 2015), several methods have been proposed to evaluate the real need for volume resuscitation, its quantity, time of administration and monitoring.

Researches have been proposed using the internal jugular vein to evaluate the hemodynamic status in human patients (Bilgili et al., 2017; Guarracino et al., 2014; Unluer & Kara, 2013). The location outside the abdominal cavity, the possibility of being evaluated in several recumbencies and the ease of localization through ultrasonography make the external jugular vein (EJV) (of larger diameter than the internal jugular vein in dogs) a possible alternative to evaluate the hemodynamic status in veterinary patients.

Objectives

The objective of this case report was to describe the variability of the EJV diameter and collapsibility index (CI) pre and post fluids resuscitation in a dog.

Case presentation

A 13-year-old neutered female Chihuahua with hypoadrenocorticism, treated with fludrocortisone for the last two years was presented with weakness, vomiting and anorexia. The dog was off the medication for one week.

On the primary survey the dog presented pale mucous, moderate dehydrated (6-7%), 60bpm of heart rate (HR), 240mm of respiratory rate (RR), temperature of 36.5°C, weak peripheral pulses, systolic blood pressure (SBP) 90mmHg and lactate 4mmol/L.

With the dog in right lateral recumbency, using a linear probe (10 MHz), the EJV was measured during the respiratory cycle. All the exams were performed in B mode. Once the external jugular vein was identified (figure 1), the position was adjusted so that the sectional image was as circular as possible. The EJV CI was calculated following the formula:

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\text{Collapsibility Index} = \frac{\text{Maximum diameter of EJV} - \text{Minimum diameter of EJV}}{\text{Maximum diameter of EJV}}
\]

The patient evaluated was awake, so it was not possible to have a full control of their respiratory cycle. Given that the dog had no cardiac or respiratory diseases that could alter the central venous pressure, we assume that the maximum diameter of the jugular vein corresponded to the expiration, and the minimum diameter to the inspiration (figure 2).

New/Unique Information

EJV measurements using ultrasound was easy and swiftly performed, it was not stressful to the patient and did not require any invasive approach.

Using the EJV diameter and CI variation to estimate the hypovolemic condition contributed to an adequate rapid volume replacement during an emergency approach in a dog. The successful EJV CI targeted reestablishment of normovolemia is reflected in a controlled fluid administration that allowed a reduction of the CI from 17% to 3% in just 40 minutes.

Figure 1 – Echocardiography visualization of the EJV (upper blue circle), external artery (red circle) and internal jugular vein (purple blue circle)

Figure 2 – Conceptual representation of the external jugular vein collapse index. The D exp consists in the expiratory diameter, the D imp in the inspiratory diameter and the D collapse in the collapse of the jugular vein during the respiratory cycle.

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References


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