Jugular Venous Pressure (JVP)

Definition:
- The jugular venous pressure (JVP) reflects pressure in the right atrium (central venous pressure); the venous pressure is estimated to be the vertical distance between the top of the blood column (highest point of oscillation) and the right atrium.

Anatomy:
- Right and left internal jugular veins
  - Largest paired neck veins draining the head and neck
  - Originate from the dural venous sinuses
  - Exit the skull via the jugular foramen
  - Descend through the neck alongside the internal carotid arteries
  - Joins the subclavian veins at the base of the neck
  - Located posterior and superior to the medial fourth of the clavicle, running cephalad until it passes under the sternocleidomastoid muscle
  - Not directly visible, identifiable only via pulsations transmitted to the surface of the neck
  - Right internal jugular vein
    - Communicates directly with the right atrium via the superior vena cava
- Right and left external jugular veins
  - Drain superficial scalp and face structures
  - As they descend through the lateral neck the pass diagonally over the top of the sternocleidomastoid muscles
  - Empty into the subclavian veins
- Sternal angle of Louis
  - The bony ridge adjacent to the second rib where the manubrium joins the body of the sternum
  - Remains roughly 5 cm above the right atrium regardless of the patients position

Physiology:
- Pressure changes from right atrial filling, contraction, and emptying cause fluctuations in the JVP and its waveforms that are visible to the examiner

Indications:
- Routine cardiac examination in the evaluation of:
  - Constrictive pericarditis
  - Heart failure
  - Pericardial tamponade
  - Pulmonary hypertension
  - Superior vena cava obstruction
  - Tricuspid stenosis
- To determine the central venous pressure

Technique:
1. Begin with the patient relaxing comfortably in bed, head on a pillow (to relax the sternocleidomastoid muscles), view of neck and chest should be unobstructed (if possible), and the head of the bed elevated 30°– 45°
2. Turn the patient's head slightly away from the side you are inspecting and extend the chin (ensure the sternocleidomastoid muscles are still relaxed)
3. Use tangential light to identify the external jugular veins and then the internal jugular vein pulsations (lower half of the neck)

   a. If jugular venous pulsations cannot be seen, lower/raise the head of the bed until observed
4. Take care to distinguish internal jugular pulsations from the carotid artery pulsations
   a. Observe the pulsations in the right side of the neck while timing the carotid artery pulse on the left side of the neck with the examiners right third finger
5. Observe if both the left and right jugular veins distend at approximately the same degree of elevation during the same phase of respiration
6. Observe for the fluttering waves in inspiration and expiration (this identifies the top of the venous column)
   a. In order to find the top of the column, the head of the bed may need to raised and lowered several times
   b. Avoid exaggerated breathing or breath holding because it distorts the normal mean venous pressure
7. Focus on the right internal jugular vein
   a. Look for pulsations in the suprasternal notch
8. Identify the highest point of pulsation
   a. Extend a long rectangular card/ruler horizontally from this point and a centimeter ruler vertically from the sternal angle (make an exact right angle)
   b. Measure the vertical distance (in centimeters) above the sternal angle where the horizontal card crosses the ruler
   c. Add to this distance 4 cm (the distance from the sternal angle to the center of the right atrium)

Results:

- Normal:
  - JVP is 6 to 8 cm above the right atrium
- Abnormal/elevated:
  - JVP is > 9 cm above the right atrium (> 4 cm above the sternal angle)

Interpretation:

- JVP falls in hypovolemia
- JVP rises with:
  - Constrictive pericarditis
  - Pericardial compression/tamponade
  - Pulmonary hypertension
  - Right/left heart failure
  - Superior vena cava obstruction
  - Tricuspid stenosis

Pearls:

- The jugular veins/pulsations are difficult to detect in children < 12 years of age
- Consider the patient's volume status
  - Hypovolemic patients may need to lie flat before you can observe neck veins
  - Increased JVP (or volume-overload) you may need to elevate the head of the bed 60°–90°
- In patients with obstructive lung disease, venous pressure may appear elevated on expiration only and the veins collapse during inspiration (dose not indicate heart failure)
- To determine if jugular venous distention is due to pressure from below or are simply prominent, use the method of "stripping" the vein
  - Place our adjacent forefingers over a distended segment of the external jugular vein
  - Strip the vein of its blood by moving your fingers apart while maintaining firm pressure on the vein (the vein should be flat as you maintain pressure on it)

- To test for “filling from below” (from the heart back up into the veins), release only the finger closest to the heart (keep the other finger in its place)
- If the central venous pressure is high enough, the vein will fill in a retrograde fashion (“from below”)

References:

Bickley LS et al. Bates’ Guide to Physical Examination and History Taking. 11th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2013;361-5.

Marieb EN, Hoehn K. Anatomy & Physiology. 3rd ed. San Fransisco, CA: Pearson Benjamin Cummings. 2008;668-71.

Orient, JM. Sapira’s Art and Science of Bedside Diagnosis. 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2010;398-403.

Walker HK et al. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Boston: Butterworths; 1990. Chapter 19.