Morphological Variations of the Internal Jugular Venous Valve

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Abstract

The internal jugular vein is a popular route for central venous catheter placement. The internal jugular veins are also important venous vessels for returning blood from the brain. The internal jugular vein valves are the only venous valves between the heart and the brain and incompetence may result in retrograde cerebral venous flow during coughing and other precipitating activities. We investigated 60 cadavers from legal autopsies to observe the morphological variations of the internal jugular venous valve.

The position of the internal jugular venous valve in situ varied among the subjects, ranging from being directly posterior to the clavicle to a position 3 cm further inferior and 2.5 cm further superior. Valves were present bilaterally in 58 (96.7%) subjects and unilaterally in 2 (3.3%) subjects. Bicuspid valves were present in 72.0% of the valves we examined. As the internal jugular vein is increasingly being used for vascular access, knowledge about and evaluation of these valves may be useful in clinical practice to avoid damage during percutaneous procedures.

Keywords: Internal jugular venous valve; Morphological variation; Autopsy

Introduction

Internal jugular vein (IJV) catheterization is commonly used to obtain central venous access for hemodynamic monitoring, long-term administration of fluids, antibiotics, total parenteral nutrition, chemotherapeutic drugs, and hemodialysis [1,2]. The anterior jugular venous system, with its interconnections to the subclavian and deep jugular veins, provides a collateral venous network across the midline of the neck area. This area is especially important in the unilateral occlusion of the innominate vein. Harvey’s drawings of peripheral venous valves are well known; however, he and his teacher were aware of the presence of venous valves in the IJV [3]. In fact, in 1628 Harvey wrote that “the edges of the valves in the jugular veins hang downwards, and are so contrived that they prevent blood from rising upwards”[4]. The IJV valve is the only protective vessel valve between the heart and the brain [5]. Jugular venous valves are clinically important as an incompetent valve may be associated with increased intracranial pressure [6].

The medical literature contains many reports and discussions concerning the presence and clinical significance of competent jugular venous valves. Nevertheless, many physicians remain unaware of the presence of the IJV. We investigated the autopsy data of IJV valves from 60 individuals.

Results

A total of 118 valves were examined which were bilaterally present in 58 (96.7%) subjects (Figure 1-3). The female subjects 2 (3.3%)
In anatomical studies, aplasia is reportedly present in as many as 16% of non-selected patients but in these studies valve competence was not assessed [12]. In humans approximately 90% of internal jugular veins have a valve [13,14].

In a preclinical study, Imai et al. [9] reported that competent IJV valves became incompetent after being punctured with a 14-gauge needle. As the IJV valve may be situated slightly above the clavicle at the base of the neck, Imai et al. raised the concern that the valve may be injured in clinical situations when the IJV is cannulated at the lower neck for the insertion of a central venous catheter [8,9]. In our study valves were bilaterally present in 96.7% of the subjects but the clinical importance of such an abnormality is not yet clear. Venous back pressure due to incompetence or absence of the IJV valves may give rise to transient blood flow disturbances in the brain. Incompetence of these valves may be associated with respiratory brain syndrome [6,11,15,16]. Positive end-expiratory pressures for long periods of time may induce incompetence of the IJV valves with subsequent cerebral venous back flow which would contribute to the venous engorgement noted in patients undergoing this form of treatment. The presence and competence of the IJV valves may prevent respiratory brain syndrome. However, a thrombus may easily develop from venous congestion and blood coagulation resulting from IJV catheterization.

Conclusion

Internal jugular venous valves were present bilaterally in 96.7% subjects. The position of valves was noted relative to the clavicle and 53.4% valves were directly posterior to the clavicle. Bicuspid valves were present in 72.0% of the valves we examined.

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References


