Central Venous Access Via External Jugular Vein

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Background

Central venous catheterization, or central line placement, was first described in 1929 by Werner Forssman, a surgical intern who catheterized his own heart through his cephalic vein. This bold procedure later earned him the 1956 Nobel Prize and has had a significant impact in the practice of and delivery of modern medicine to both stable and critical patients.

Central venous access has had a great impact on improving longevity and quality of life. Renal replacement therapy, percutaneous coronary interventions, total parenteral nutrition, and cancer chemotherapy are extreme examples of such advancements. In the areas of acute care medicine, early goal-directed therapy for sepsis and therapeutic hypothermia represent some of the newest advances inherently dependent on central vascular access.

As central vascular access becomes more common and increasingly recognized as a standard requirement in many treatment regimens, the difficulty of obtaining it also grows. Previous attempts or placement of central venous catheters can make further attempts difficult or even preclude its use in the same vascular territory. In addition, modern self-destructive behaviors, such as intravenous (IV) drug abuse, have developed a whole new disease state that has forced medical providers to adapt and take a more innovative approach to vascular access.

Indications

The indications for external jugular vein (EJV) central venous access are generally the same as those for all other routes. Although the list below is all-inclusive, not all of these indications are considered prudent or possible in each individual patient (eg, a dialysis catheter may be too large for the caliber of the vessel in some patients).

General indications include the following:

- Total parental nutrition
- Long-term antibiotic treatment
- Hemodialysis
- Hemoperfusion
- Hemodynamic monitoring
- Medication administration

Specific indications include the following:

- Conversion of an (already) indwelling peripheral IV catheter
- Critically ill patients in whom a serious immediate procedural complication may prove fatal [1]

Contraindications

Because this procedure is relatively devoid of immediate serious complications, it has very few contraindications. Most arise out of diminished neck mobility, which impairs the practitioner's ability to perform the procedure.[2] The presence of a tracheostomy tube has been listed as a contraindication to internal jugular vein (IJV) cannulation because of the risk of catheter-related infections due to proximity; however, this does not appear to be worrisome with external jugular cannulations.[3]

Absolute contraindications include the following:

- Overlying skin or soft tissue infection
- External jugular thrombophlebitis
- Ipsilateral thrombosis of the EJV or the subclavian vein

Relative contraindications include the following:

- Nonvisible or palpable EJV
- Known or suspected cervical spine injury
- Diminished neck mobility (Morbus Bechterew, cervical syndrome)
- Ipsilateral clavicle fracture
- Neck mass or other anatomical distortion
- Cervical hematoma
- Lemierre syndrome

Technical Considerations

Best practices

The following technical points should be kept in mind:

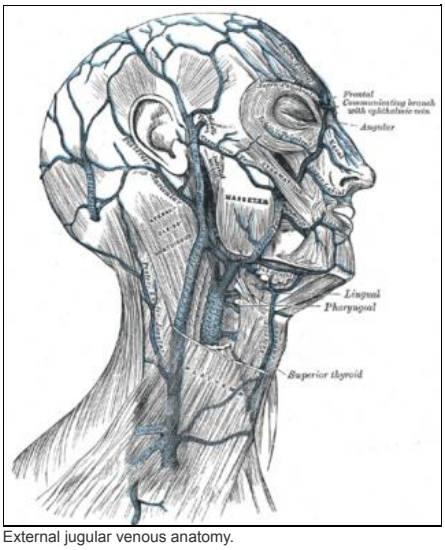
- Introducing the wire through a catheter, rather than a needle, may enhance

success and is therefore recommended [4]

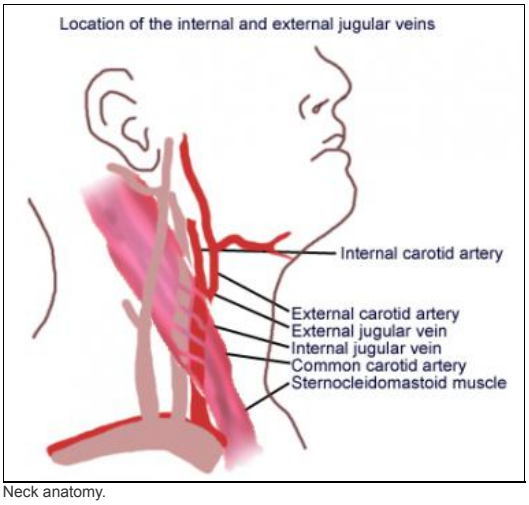
- The Valsalva maneuver is critical for improving success rates [5] ; the more distended (and thus visible and prominent) the vein is, the easier both initial cannulation and guide wire insertion will be [1]
- The Trendelenburg position helps engorge the vein and thus facilitates catheterization
- A stethoscope may also be positioned above the clavicle to occlude the vein [5]
- If the wire will not pass the level of the clavicle, withdrawing it a few millimeters and rotating 90-180° before reinsertion may help. Some advocate passing the catheter over the wire at this point, with good success rates of reaching the central circulation. [6]
- A head tilt to the opposite side and shoulder manipulation may improve success rates [7]
- The use of ultrasonography has not shown any benefit in the success or safety of this procedure to date [8]
- Intra-arterial electrocardiography may diminish the malpositioning rate and improve the chances of achieving proper catheter depth on the first pass [9]

P rocedural planning

The EJV is formed primarily by the confluence of the retromandibular and posterior auricular veins near the angle of the mandible (see the first image below). It remains superficial in the neck, loosely fixed in the subcutaneous tissues, traversing the sternocleidomastoid (SCM) obliquely just deep to the platysma (see the second image below).



External jugular venous anatomy.



Neck anatomy.

As the EJV nears the clavicle, just lateral to the insertion of the lateral head of the SCM, it pierces the deep fascia and receives other tributaries just prior to emptying into the subclavian vein lateral to the termination of the IJV.

The EJV generally has two bicuspid valves, one at the junction of the subclavian and the other approximately 4 cm upstream.[10, 1] In about 4% of patients, the terminal end is a venous plexus instead of a single channel.[1] If the vein is not visible, its route can be estimated by extending the line of the deltopectoral groove into the neck.[11]

Important anatomic considerations in relation to this procedure vary with each individual. The loosely adherent nature of this superficial vein can make the initial venipuncture difficult. Passage of a guide wire, stiff introducer, or catheter can be troublesome and even impossible at times. Postulated reasons include valves, venous plexus and angulation inherent in its passage through the cervical fascia as

well as the perpendicular termination into the subclavian vein.[5, 1, 4, 7, 9]

Finally, the caliber of the EJV is thought to be inversely proportional to that of the IJV, which can pose a size limitation of the proposed intravascular implement in certain patients.[9]

C omplication prevention

One of the greatest benefits of this procedure is the relative lack of serious immediate complications. Reported complications include the following:

- Hematoma formation
- Mild persistent oozing of blood from the puncture site
- Catheter impingement on its introducer, probably due to acute angles
- Vein wall entrapment between wire and needle, most likely associated with the in-out wire maneuver frequently required for wire passage beyond the valves
- Catheter malfunction from kinking that can occur as a result of the circuitous route to the central circulation

Delayed complications tend to mirror those of other access sites, which include infection, thrombosis, and catheter malfunction.

When deciding on a site for vascular access, many things must be considered. Of primary concern is minimizing risks while maximizing patient benefit and comfort. The choice of route depends on patient historical and demographic factors, plan of care, device of use, provider experience and known success and complications rates of the desired technique.

The IJV, the subclavian vein, and the femoral vein are the typical sites for central line placement, each with its own risks and benefits. Another viable option for access is through the EJV. Use of the EJV for central venous access has been akin to the swing of a pendulum. Although it is not considered a universal favorite, it has certainly gained a following and has proved to be safe and reliable in appropriately selected populations.

Anatomic factors and variability may lead to difficult or even failed catheterization. Numerous individuals do not have a palpable or visible EJV. Also, the presence of an acute angle between the EJV and the subclavian vein, the presence of valves, and constriction of the EJV as it penetrates the fascial layers can contribute to a difficult catheterization. Because the EJV is superficial to the IJV and the carotid artery, make sure to enter the skin at a shallow angle of approximately 10-25°.

Subcutaneous infiltration with anesthetic should be used at anticipated site of catheter and suture placement to prevent pain and movement. This can be done after initial venipuncture if the wire through catheter method is used.

Use of ultrasonography may be a useful intervention in those without a visible or palpable EJV; however, Mitre et al showed no significant difference in EJV catheterization with ultrasonography versus using surface anatomy.[8]

In a prospective, observational human study, Kato et al found that computed tomography venography (CT-V) was useful for preoperative anatomic estimation of the cervical venous plexus.[12] They suggested that the EJV approach with CT-V guidance is worth considering as the initial method when central venous cannulation must be performed under less than optimal conditions.

Despite an impressive safety profile, EJV cannulation has a lower predictability of success and a higher malposition rate.[5] After three unsuccessful attempts, another site should be considered.

Outcomes

In 1974, Blitt described the technique with the use of a J-tipped wire guide with a success rate of 96% and no complications.[4] In subsequent studies, technical success rates have ranged from 73% to 88%.[13] Advantages to using the EJV include its superficial position and its distance from vital structures, which decrease the risk of major complications such as pneumothorax.

Periprocedural Care

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References

1. Byth PL. Evaluation of the technique of central venous catheterisation via the external jugular vein using the J-wire. *Anaesth Intensive Care*. 1985 May. 13(2):131-3. [Medline].
2. Uvelin A, Kolak R, Putnik D. External jugular cannulation is irreplaceable in many situations. *Resuscitation*. 2010 Jun. 81(6):773; author reply 774. [Medline].
3. Cho SK, Shin SW, Do YS, Park KB, Choo SW, Choo IW. Use of the right external jugular vein as the preferred access site when the right internal jugular vein is not usable. *J Vasc Interv Radiol*. 2006 May. 17(5):823-9. [Medline].
4. Blitt CD, Wright WA, Petty WC, Webster TA. Central venous catheterization via the external jugular vein. A technique employing the J-WIRE. *JAMA*. 1974 Aug 12. 229(7):817-8. [Medline].
5. Dailey RH. External jugular vein cannulation and its use for CVP monitoring. *J Emerg Med*. 1988 Mar-Apr. 6(2):133-5. [Medline].
6. Segura-Vasi AM, Suelto MD, Boudreaux AM. External jugular vein cannulation for central venous access. *Anesth Analg*. 1999 Mar. 88(3):692-3. [Medline].
7. Sparks CJ, McSkimming I, George L. Shoulder manipulation to facilitate central vein catheterization from the external jugular vein. *Anaesth Intensive Care*. 1991 Nov. 19(4):567-8. [Medline].
8. Mitre CI, Golea A, Acalovschi I, Mocan T, Caea AM, Ruta C, et al. Ultrasound-guided external jugular vein cannulation for central venous access by inexperienced trainees. *Eur J Anaesthesiol*. 2010 Mar. 27(3):300-3. [Medline].
9. Karaaslan D, Altinisik U, Peker TT, Nayir E, Ozmen S. External jugular vein catheterization using 'intra-atrial electrocardiogram'. *Yonsei Med J*. 2009 Apr 30. 50(2):222-6. [Medline]. [Full Text].
10. Nishihara J, Takeuchi Y, Miyake M, Nagahata S. Distribution and morphology of valves in the human external jugular vein: indications for utilization in microvascular anastomosis. *J Oral Maxillofac Surg*. 1996 Jul. 54(7):879-82. [Medline].
11. Jaroch M, Steiger E. Rapid identification of the external jugular vein. *Cleve Clin J Med*. 1990 Jan-Feb. 57(1):95-6. [Medline].
12. Kato K, Taniguchi M, Iwasaki Y, Sasahara K, Nagase A, Onodera K, et al. Central venous access via external jugular vein with CT-venography using a multidetector helical 16-section CT. *J Invest Surg*. 2014 Jun. 27(3):176-82. [Medline].
13. Chakravarthy M, Krishnamoorthy J, Nallam S, Kolur N, Faris A, Reddy K, et al. External jugular venous route for central venous access: our experience in 563 surgical patients. *J Anesth Clin Res*. 2011. 2(6):1-5. [Full Text].