

## Femoral Versus Jugular Central Venous Line Placement: Which Is Better?

Parienti JJ, Thirion M, Mégarbane B, et al; Members of the Cathedia Study Group. Femoral vs jugular venous catheterization and risk of nosocomial events in adults requiring acute renal replacement therapy: a randomized controlled trial. *JAMA* 2008;299:2413–22.

### Study Overview

**Objective.** To compare the rates of nosocomial complications with femoral or jugular vein catheterization.

**Design.** Prospective, blinded, randomized, multicenter, parallel-group trial.

**Setting and participants.** Critically ill patients aged  $\geq 18$  years requiring catheter insertion for renal replacement therapy were enrolled from a network of 9 tertiary care university medical centers and 3 general hospitals in France between May 2004 and May 2007 (the Cathedia Study). Only patients with first venous catheterization and no contraindications for either femoral or jugular access were considered. Patients were excluded if they were morbidly obese (body mass index [BMI],  $> 45 \text{ kg/m}^2$ ), had a coagulopathy, a local skin infection, volume overload precluding Trendelenburg positioning, chronic renal failure with an arteriovenous fistula, a thoracic life-threatening condition, or only 1 available site for catheterization (femoral or jugular).

**Intervention.** Participants were randomized to femoral or internal jugular vein catheterization by operators skilled in the insertion of both. Full sterile precautions were used, and physicians inserted all catheters using the Seldinger technique. If insertion was unsuccessful, physicians switched to the contralateral side (if possible) and also switched from one site to the other site. Decisions to remove the catheters were made by the treating physician. Follow-up was until death or discharge from the intensive care unit.

**Main outcome measures.** Time to colonization on removal of jugular or femoral catheters (reported as per 1000 catheter-days); rates of catheter-tip colonization, defined as cultures with  $\geq 10$  colony-forming units/mL from the catheter tip; and rates of catheter-related bloodstream infection, defined as colonization plus  $\geq 1$  peripheral blood culture yielding the same species within 48 hours of catheter removal.

**Main results.** Characteristics of patients who received femoral or jugular catheterization were similar. There were no

differences in rates of catheter-related infection between femoral and jugular catheterization groups (incidence per 1000 catheter-days, 1.5 vs. 2.3;  $P = 0.42$ ). Risk of catheter-tip colonization was not statistically significant between the femoral and jugular catheterization groups (hazard ratio, 0.85 [95% confidence interval {CI}, 0.62–1.16];  $P = 0.31$ ). For patients with higher ( $> 28.4 \text{ kg/m}^2$ ) versus lower BMI, there was a statistically significantly higher rate of catheter-tip colonization in the femoral versus jugular catheterization group (incidence per 1000 catheter-days, 50.9 vs. 24.5;  $P < 0.001$ ). There were no significant differences in the rate of thrombosis formation in the femoral catheterization group as compared with the jugular catheterization group (10.5% vs. 22.7%;  $P = 0.16$ ). Jugular catheters took longer to insert, had more failures, and required more crossover insertion to the other side. The rate of hematoma formation was greater for the jugular versus femoral catheterization group (3.6% vs. 1.1%;  $P = 0.03$ ).

**Conclusion.** For patients who are not obese or have lower BMI ( $\leq 28.4 \text{ kg/m}^2$ ), jugular venous catheterization does not appear to reduce the risk of infection when compared with femoral catheterization. Jugular access may increase the risk of hematoma formation.

### Commentary

Central line placement by femoral, subclavian, or jugular catheterization is often performed on patients requiring critical care or when emergent access is necessary or unobtainable by peripheral venous catheters. More than 5 million central venous catheters are inserted every year in the United States, with over 15% leading to complications varying from infection to thrombosis to mechanical complications [1]. Femoral venous catheterization is more rapidly performed and generally has been reserved as an emergency procedure for gaining vascular access. Concern about the risks of infection and/or thrombosis has led to recommendations that femoral central line access be avoided, with a preference of placement in either internal jugular or subclavian veins [2]. The literature has demonstrated mixed outcomes when comparing rates of complications for femoral versus jugular

access. Most of these studies, however, were only observational in nature.

The study by Parienti et al demonstrates that there is no difference in rates of infection between femoral and jugular catheterization. An increased risk of infection with femoral placement was only observed in patients with a BMI greater than 28.4 kg/m<sup>2</sup>. Interestingly, patients with a low BMI (< 24.2 kg/m<sup>2</sup>) were at increased risk of infection with jugular catheter placement. The study also found that when compared with femoral placement, patients with jugular access had a significantly increased rate of hematoma formation. Jugular catheters took longer to insert (mean [SD] time in minutes, 15.0 vs. 13.3) and had more failures necessitating a crossover attempt (on the other side) when compared with the femoral group.

It is interesting to note that a similar study by Merrer et al [3], which compared femoral with subclavian venous catheterization in critically ill patients, found that femoral access was associated with higher incidence of infection versus subclavian access (incidence per 1000 catheter-days, 20 vs. 3.7;  $P < 0.001$ ) and was associated with a greater risk of thrombotic complications (odds ratio, 14.42 [95% CI, 3.33–62.57];  $P < 0.001$ ). However, the Merrer et al study did not compare risks of complications between femoral and jugular access or evaluate the ease and speed of subclavian versus femoral catheter insertion.

Reducing complications associated with catheter insertion will continue to depend on the need for central venous access, patient characteristics, insertion technique, operator experience, and catheter maintenance [1]. Ultimately, clinicians often choose the site of catheter insertion based on their preference and level of comfort. These studies by Parienti et al and Merrer et al [3] may assist with evidence-based deci-

sion making when choosing between femoral, jugular, and subclavian placement. The results of these studies imply that femoral access may be quicker and easier to obtain than jugular access without increasing the risk of infection or thrombosis formation; however, femoral access was associated with risks for both of these complications when compared with subclavian access.

### Applications for Clinical Practice

Because no increased incidence of nosocomial infection was seen in a population already at increased risk (ie, critically ill patients requiring renal replacement therapy) [4], these findings may be applicable to all critically ill patients. Use of femoral catheters does not increase the risk of nosocomial complications when compared with jugular catheters. Femoral catheters may be suitable for patients requiring quick and easy vascular access by central venous catheterization.

—Review by Ulla Hwang, MD, MPH

### References

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