

A Sound Method for Axillary Vein Access

Martin van Zyl¹ and Abhishek Deshmukh¹

¹Mayo Clinic

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Abstract

Ultrasound guided venous access Is important to minimize pneumothorax and unnecessary incisions in patients undergoing device implant.

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Martin van Zyl, MB ChB, Abhishek J Deshmukh, MBBS

Department of Cardiovascular Medicine, Mayo Clinic, Rochester, MN

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Corresponding Author: Abhishek J Deshmukh

Department of Cardiovascular Medicine

Mayo Clinic 200 First Street SW Rochester, MN, 55901 Tel: 507-266-3089, Fax: 507-255-1051 E-mail address: deshmukh.abhishek@mayo.edu

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Ultrasound (US)-guided vascular access has become the standard-of-care for intravascular procedures at many institutions. This trend is owed to reduced vascular access site complications, increased first-pass success, and reduced access time [1]. Nevertheless, the adoption of US in cardiac electronic device implantation has lagged—likely bound by inertia rather than a technical challenge.

The Agency of Healthcare Research and Quality (AHRQ) has developed a set of administrative-data-based Patient Safety Indicators (PSIs) to identify in-hospital patient safety events [2]. Conferring excess morbidity, length of stay, and health care cost, iatrogenic pneumothorax is identified as a PSI and occurs in approximately 1-2% of device implantations [3, 4]. Operator experience, safe technique, and ultrasound use during central venous access can prevent iatrogenic pneumothorax [5]. Thus, in an utopic world , *a pneumothorax is seldom forgivable, rarely excusable, and always unacceptable.*

Reducing access-related vascular complications has also become especially important in an era where uninterrupted periprocedural systemic anticoagulation has become the default for most patients [6]. There

is also a widespread push towards reducing the use of fluoroscopy and intravenous contrast when possible. Conventional methods including anatomic, fluoroscopy, and contrast venography guided venous access are often still taught as the standard. These approaches remain popular, perhaps due to operators' reluctance to adopt a new technique in the absence of a randomized trial to support a substantial benefit.

Chandler et al. [7] present their retrospective experience of US-guided access for transvenous device implantation from a single center. This study's results are significant, showing a 95% success rate with US guidance regardless of laterality. Compared to an age- and sex-matched cohort undergoing conventional axillary/subclavian vein access by operators at the same institution, the US's use was associated with reduced fluoroscopy times and similar median procedure times. A small number of complications were reported in both arms, and there were three pneumothoraces in the conventional arm as opposed to 0 in the US arm.

A notable observation in this study was avoiding an unnecessary skin incision in two patients where US before incision revealed a need to convert to the contralateral side. This highlights the benefit of US-guided access before skin incision that has not been apparent from many prior publications. Although the authors mention that some operators may be hesitant to perform percutaneous needle puncture out of concern for increased infection brought about by the introduction of skin flora into the pocket, an association has not been reported in the existing literature, and the US arm of this study did not report any device infections.

A significant limitation to note in the current study and several others [8-12] is the reliance on data gathered from one or two operators with experience in ultrasound-guided axillary vein access. It does not account for the learning curve, which would be encountered by new adopters. Studies have shown that operators can reduce implant time after trying in 15-25 patients [9,12], but prospective data are needed to show how inexperience might influence outcomes.

The current study utilized a wireless US system with a wide probe, which made placing the probe inside a small incision impractical. Therefore, the primary reason for failure was vessel depth beyond the reach of a percutaneously inserted 4F micropuncture needle, and body habitus likely played a role in these patients. Using longer micropuncture needles or smaller wired probes inside a sterile sheath within the pocket following incision, the operator could further expand eligibility for US-guided access. This latter approach may not avoid unnecessary incisions, but the other benefits, including reduced fluoroscopy and contrast utilization, should remain.

This study otherwise adds to prior observational data suggesting that when compared to fluoroscopy-based axillary/subclavian vein access techniques, US guidance is safe and successful in >90% of patients with a trend towards reduced fluoroscopy use and no impact on total implant time [8-10].

Although several studies have suggested a little-to-no downside to using the US for access, observational data limitations make it challenging to conclude the US's superiority over conventional methods for complications such as pneumothorax or hematoma. A prospective randomized study powered to detect differences in these outcomes would ultimately put this question to rest. However, the question remains if it is possible or even needed?

Furthermore, the current study emphasizes another potential benefit of initial percutaneous US imaging in avoiding unnecessary skin incision. With the wide availability of ultrasound and a trend towards reduced fluoroscopy times, even a small absolute risk reduction would drive a widespread practice change

Vascular access techniques such as the "blind stick" are frowned upon in many interventional specialties. If not already in place, we anticipate that ultrasound will become standard equipment in most cardiac device labs. When more sophisticated methods are safer and widely available, clutching to the convention may not be wise even in the absence of a clinical trial. US-guided vascular access is a skill that the device implanter should have in the armamentarium.

"Change is the law of life, and those who look only to the past or present are certain to miss the future. "

John F. Kennedy

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