Traditional Seldinger Technique: A Disparity Between Reality and Belief

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Abstract: The first and foremost step in any vascular intervention or diagnostic procedure is gaining access in a safe manner. Currently, the technique being followed is a modification of what is described as the traditional Seldinger technique. Looking into the literature, many articles describe the traditional Seldinger technique as a double-wall puncture of the artery. But the original article published by Dr. Seldinger in 1953 did not mention any details about a double-wall puncture; instead, the diagram provided in the article shows a single-wall puncture of the artery. In this article, we explore the reasons for this discrepancy in the literature.

VASCULAR DISEASE MANAGEMENT 2022;19(2):E39-E41
Key words: double-wall puncture, Seldinger technique, single-wall puncture

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Introduction

The first and foremost step in any percutaneous vascular intervention is gaining vascular access in a safe manner. Looking into the literature, many articles describe the traditional Seldinger technique as a double-wall puncture (DWP) of the artery.[1,2] But the original article published by Dr. Seldinger in 1953 did not mention any details about a DWP; instead, the diagram provided in the article shows a single-wall puncture (SWP) of the artery.[3]

The following are some of the contradictory comments we encountered in a few radiology books about the traditional Seldinger technique. The *Textbook of Radiology and Imaging,* 7th edition, mentions the Seldinger technique as a SWP.[4] *Abrams' Angiography: Interventional Radiology,* 3rd edition, uses the term "single-wall Seldinger technique."[5] In contrast, the *Handbook of Interventional Radiologic Procedures,* 5th edition, describes and depicts the Seldinger technique as a DWP of an artery.[6] Similarly, *Grainger & Allison's Diagnostic Radiology,* 7th edition, indirectly describes the traditional Seldinger technique as a DWP: "… The most important modifications are the single-wall arterial puncture…"[7] Here, we briefly explore the reasons for such discrepancies in the literature.

Arterial Access

Dr. Sven Ivar Seldinger, a Swedish radiologist, published an original article in *Acta Radiologica* in 1953, "Catheter Replacement of the Needle in Percutaneous Arteriography," in which he describes a new technique of gaining arterial access.[3] The technique described the puncture of an artery after local anesthesia,

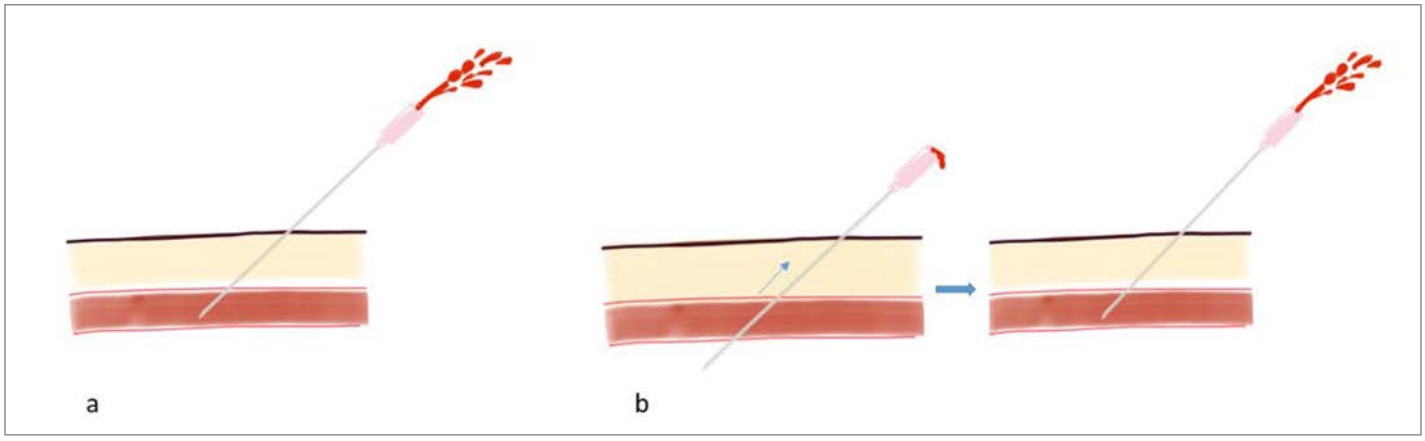

Figure 1. Single-wall puncture (SWP) and double-wall puncture (DWP) technique. Good backflow of blood in SWP technique **(a)**; no backflow when needle is beyond the posterior wall of the vessel in DWP and good backflow when the needle is withdrawn into the lumen of the vessel **(b)**.

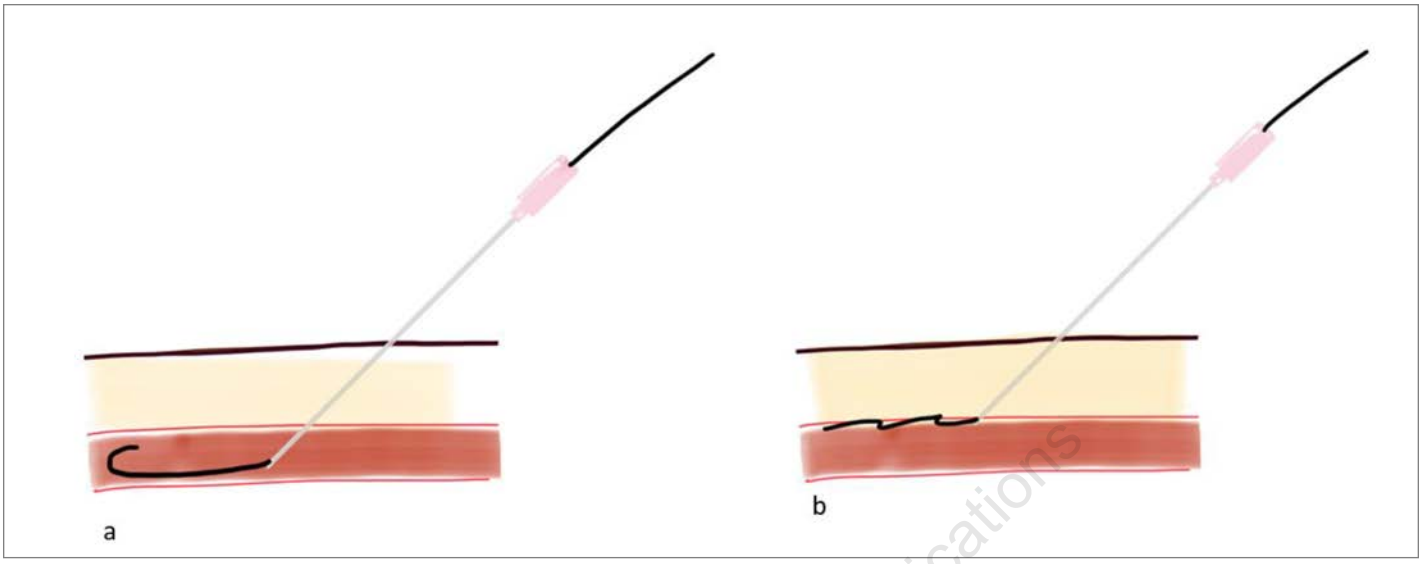

Figure 2. Arterial dissection with a single-wall puncture. Adequate insertion of the needle and normal passage of guidewire **(a)**; inadequate insertion of needle, guidewire bulking in subintimal plane causing arterial dissection **(b)**.

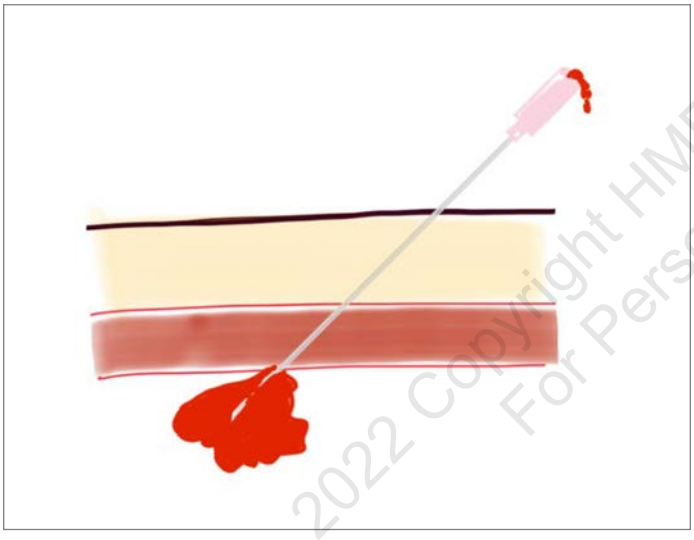

Figure 3. Hematoma with a double-wall puncture.

Table. Advantages and disadvantages of single-wall vs double-wall arterial punctures during vascular access.

	Advantages	Disadvantages
Single-wall puncture	Fewer arterial puncture site complications.	Risk of arterial dissection may be increased due to guidewire buckling if the bevel is partially in the lumen.
	Can be beneficial in patients with coagulopathy.[6]	
	Preferred technique during ultrasound-guided access.	
Double-wall puncture	Effectively reduces the time to arterial access and the number of attempts to access.[8]	More susceptible to complications such as hematoma, arteriovenous fistula, and retroperitoneal hemorrhage.[9]
	Can hit the bony landmark behind the vessel, such as the femoral head, to make sure the correct position of needle.	
	Less risk of arterial dissection.	

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introduction of the leader (the term used to describe a guidewire) into the lumen of the vessel, and removal of the needle followed by threading of a catheter over the leader. Details of a DWP were not illustrated.

Arterial puncture can be done in 2 ways: SWP and DWP (**Figure 1**). In a SWP, only the anterior wall of the artery is crossed with a needle. In a DWP, both anterior and posterior walls of the artery are crossed by the needle, then the needle is slowly withdrawn to gain intraluminal access. In either technique, intraluminal placement of the needle tip is ensured before advancing a guidewire into the lumen. When punctured based on palpation of the artery, the needle may be off-center within the artery. In a SWP, if the needle tip is partially in the lumen, there is a risk of the guidewire bucking in the anterior wall of the artery. Theoretically, because a DWP involves advancement across the posterior wall and withdrawal of the needle to the lumen, a longer portion of the needle bevel will be in the lumen. In addition, it may be easier for the guidewire to get into the lumen rather than subintimal space. The advantages and disadvantages of both techniques are described in the **Table**.

Based on the number of parts, there are 2 types of needles: single-part needles and 2-part needles. A 2-part needle has an outer blunt cannula and a beveled inner stylet.[10] A Cournand needle, an example of a 2-part needle, was commonly used in the past.[11] We assume there was a "condensation effect" between the Seldinger technique and the contemporary use

of a Cournand needle, which was a DWP needle. Subsequent introduction of SWP needles for arterial access probably led to the terms "single-wall Seldinger technique" or "modified Seldinger technique."

The description of a SWP and DWP was introduced in the 1950s during the era of arterial access by palpation and fluoroscopy. In our hospital, we prefer a SWP. Whenever there is high risk or difficulty in accessing an artery, we use additional ultrasound guidance to get into the center of the arterial lumen with the needle. In other words, availability of ultrasound guidance has made DWP less relevant.

Conclusion

The traditional Seldinger technique was originally not described as a DWP of an artery but was attributed to a DWP technique due to the concurrent use of 2-part needles at the time Seldinger's article was published. ■

Disclosure: *The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors report no conflicts of interest regarding the content herein.*

Manuscript accepted January 11, 2022.

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