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STARTING IVs MADE EASIER

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Abstract: Reducing the number of needle sticks while placing IVs reduces the pain and suffering patients endure along with reducing frustration and saving time for health care providers. Presented here is a method of starting IVs based on 20 years of experience which has produced excellent results clinically measured by reduced needle sticks. The technique has also been successfully taught to other health care providers. This technique can be used in combination with vein visualization technology. The authors are happy to collaborate in a formal evaluation of the technique.

Key Words: IV placement, intra-catheter, angiocatheter, IVs made easy, easier IVs, IV therapy

IV placement often can be challenging. What practitioner has not had the embarrassing experience of successfully seeing the flash of blood return during the placement (verifying that one has successfully punctured the vein) only to see the vein rupture when trying to advance the catheter portion?

In this article, we describe a subtle movement made by the practitioner during the critical point of the placement of the IV that can greatly improve the percentage of success. This "magic" move greatly decreases the chance of rupturing the vein when trying to introduce the catheter portion of the IV intra-catheter. It also enables the practitioner to place catheters in smaller veins with the maximal size catheter. This article is especially intended for those who think they are already competent at placing IV intra-catheters but would like to achieve a higher level of success. We are in agreement with the recommendation that in patients with

difficult access or in those who have failed multiple needle sticks that vein visualization technology¹ should be used. We feel that in instances where vein visualization technology is used the addition of the herein described method will increase the success rate even more.

To understand how to improve one's technique one must understand the anatomical and mechanical challenges of this technique. Why is IV placement so much more difficult than simple venipuncture? The difficulty lies in the fact that one must cannulate both the needle and the plastic catheter. When one examines the IV intra-catheter one will note that there is a one to two millimeter space between the tip of the needle and the beginning of the plastic catheter. The metal needle portion is one to two mm longer than the plastic catheter. See Figure 1.



Figure 1: Metal needle point in relation to plastic catheter

In order to successfully place the catheter, one must introduce both the metal needle and the plastic catheter into the lumen of the vessel without rupturing the back wall of the vein. That means one must place at least 2-4mm of the needle/catheter unit into the vessel without rupturing the

back wall before attempting to slide the rest of the catheter into place. The vein ruptures because the catheter portion is either not yet in the vein or the tip of the needle has punctured the back wall of the vein. See Figure 2.

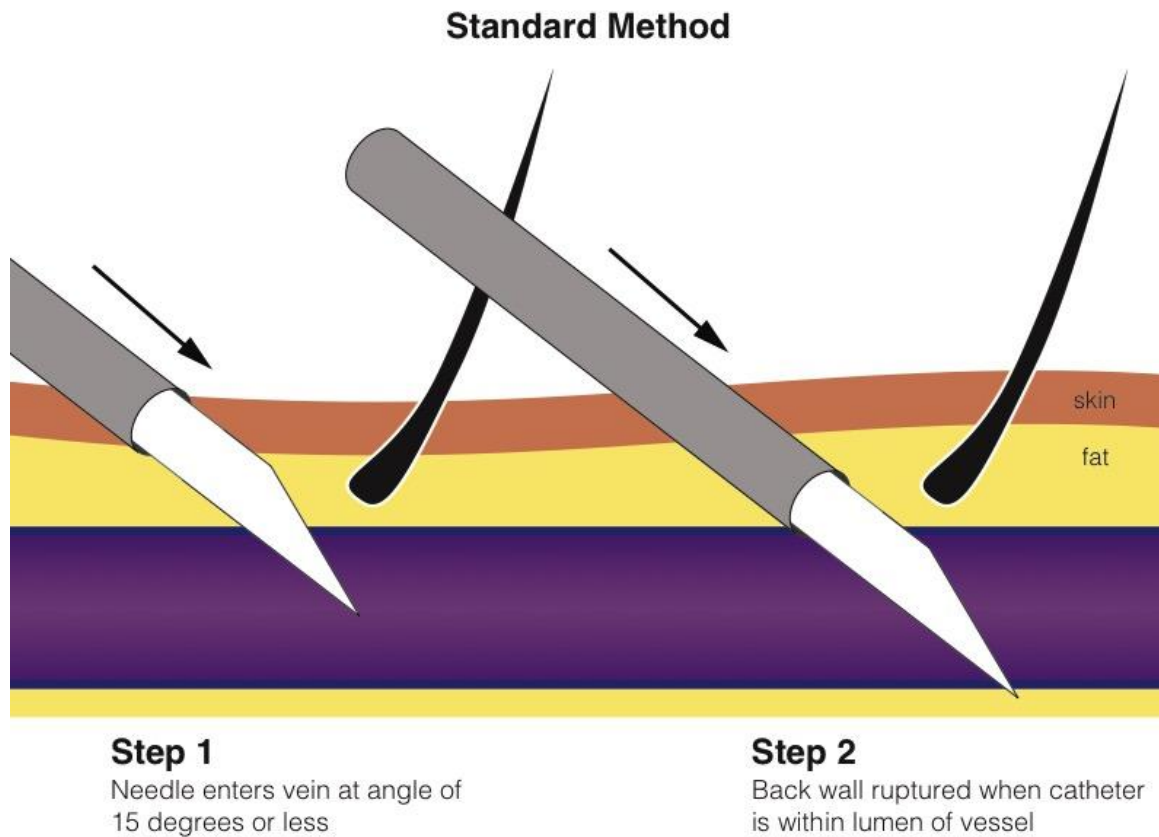


Figure 2. Standard Method

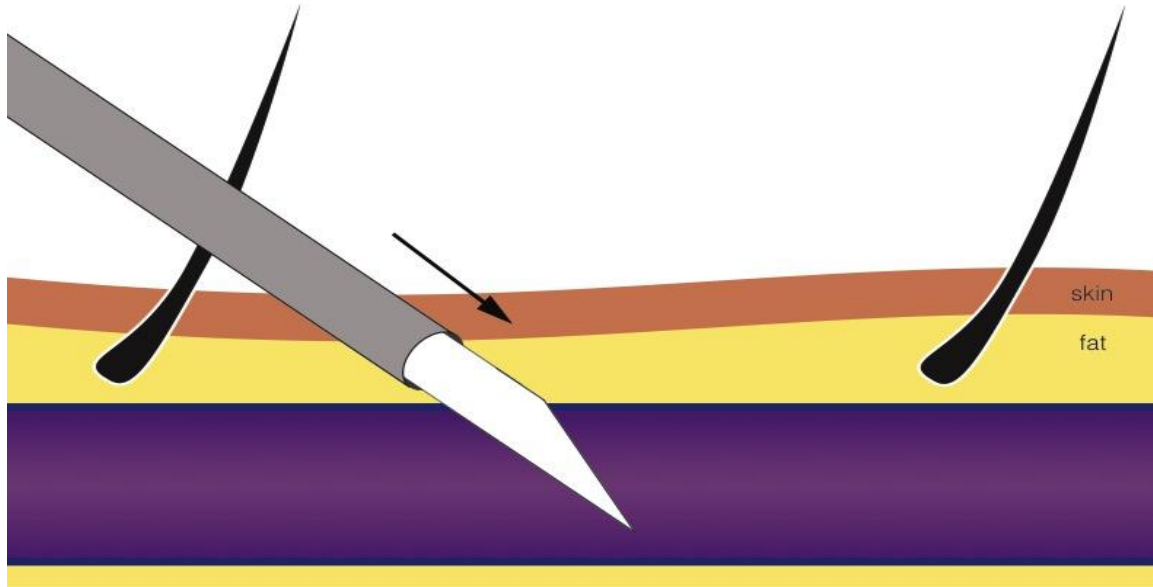
The key to successful IV placement is to be able to introduce the intra-catheter at least 3-4 mm along the lumen of the vein without rupturing the back wall. This is especially difficult if the vein itself is only 2-3 mm in diameter.

To understand how this technique works one must first understand how to utilize the properties of a typical beveled needle. If one were to place a standard hypodermic needle bevel side down at a 15 degree angle onto a sheet of paper representing the **anterior wall** of a vein that is being cannulated one could push the needle forward without having the needle get stuck or puncture the paper. In other words, the bevel side of the needle is not sharp but actually smooth. The "magic move" takes advantage of this fact.

The technique:

1. Place tourniquet on arm. It is always wise to check both arms for the best vein.
2. Identify the largest, straightest vein.
3. Place arm as far below the level of the heart as is practical to increase venous pressure to engorge the vein to its maximal size.
4. Stimulate further dilation of the vein by tapping the area of skin over the vein with snapping of the back of the middle finger or gentle slapping with the hand.
5. After the vein is maximally dilated, clean the skin over the vein, then puncture the skin slowly with the IV catheter with the needle bevel up at about 10 to 15% angle from the patient's skin surface.
6. Gradually advance the needle until a flash of blood is seen at the proximal end of the catheter/needle hub. See Figure 3.

New Method



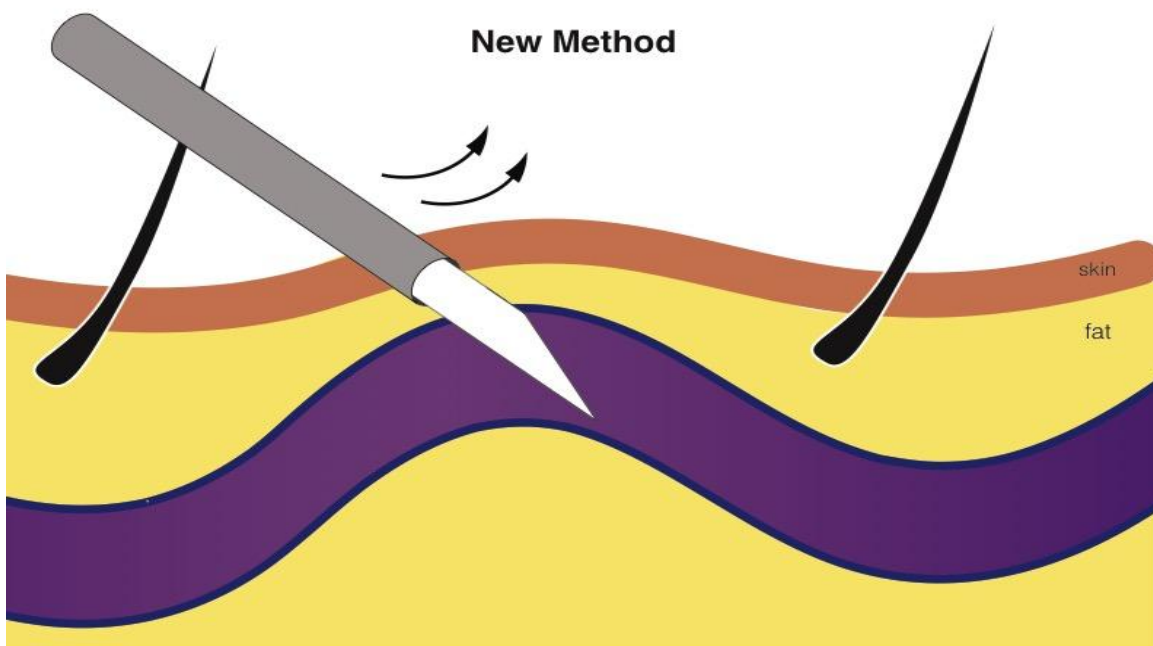
Step 1: Same as Standard Method

Figure 3. Step 1 of New Method

7. Wait about 0.5 to 1.0 second without advancing further. If the blood is still coming out of the hub of the needle, it is likely that the tip of the needle is still in the lumen of the vessel and has not pierced the back wall while the catheter portion may still have not entered the vessel.

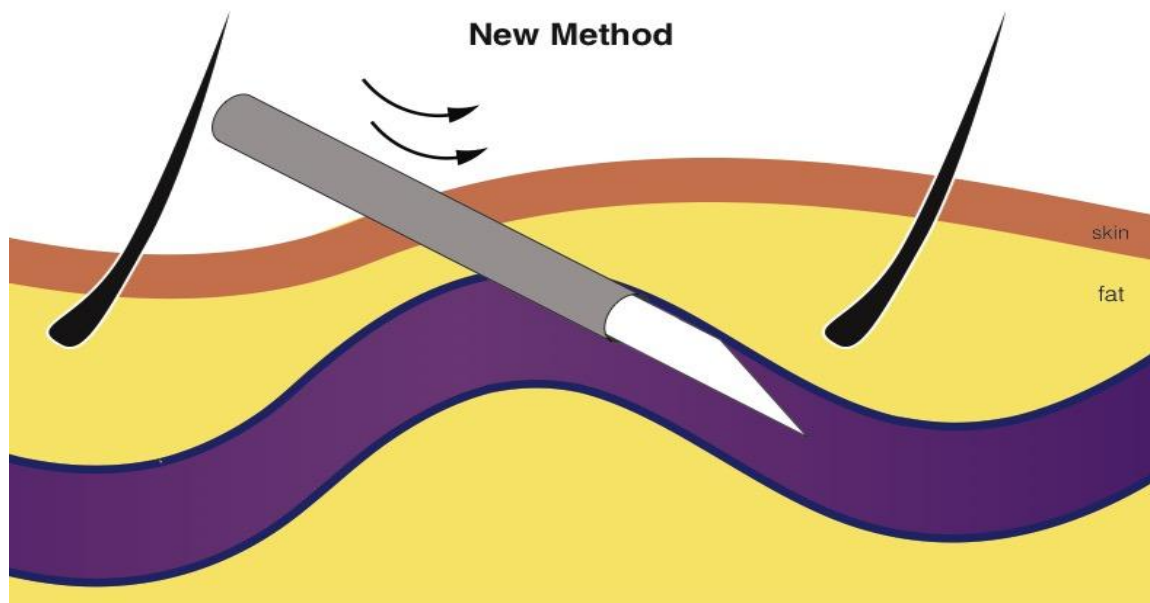
The “magic move”:

8. Now lift the needle gently as you advance the tip of the needle about 5-9 mm. See Figures 4 and 5. When done properly, the skin should tent up about 3mm-8mm during this process.



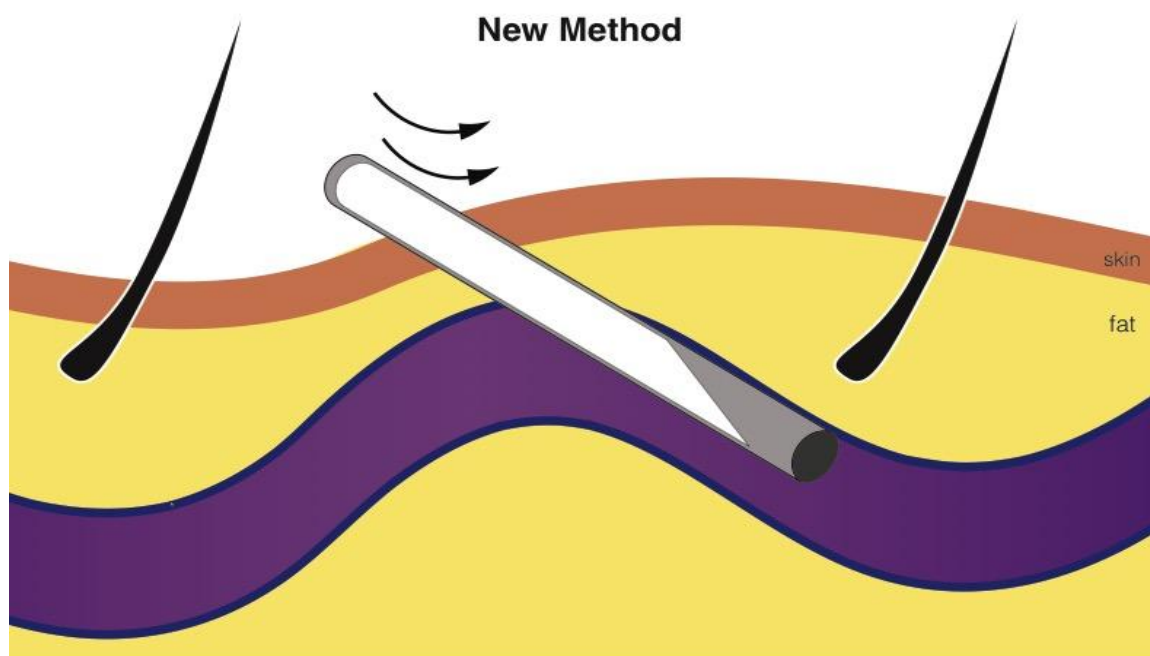
Step 2: “Magic Move” Lift up needle to raise anterior wall of blood vessel

Figure 4. Step 2 of New Method



Step 3:
Smoothly insert needle and catheter with a lifting action, skimming/sliding along the anterior vessel wall until catheter portion is well within the lumen.

Figure 5. Step 3 of New Method



Step 4:
Withdraw needle portion 3-4mm and insert entire unit 1-2 cm.

Figure 6. Step 4 of New Method

This critical lifting action places the smooth dull part of the bevel onto the anterior vessel wall and creates maximal distance between the needle tip and the posterior wall of the vessel. This move allows the catheter portion to be clearly in the vessel lumen without puncturing the back wall.

9. After having advanced the needle a total of 0.8-1cm, look to see that blood is still flowing out of the hub of the intra-catheter. If so, both the plastic catheter and needle have cannulated the vessel without rupturing the back wall. Once this is verified, the needle can be withdrawn 3-4 mm

while holding the plastic portion of the catheter in place to prevent the catheter from being withdrawn from the lumen. See Figure 6.

10. With the needle now being sheathed, both the catheter and the needle can be advanced another one centimeter or so. Now the sheathed needle is used more as a way to keep the whole catheter-needle unit stiff so that the catheter doesn't kink during its advancement.
11. Once at least 1.5 cm of the catheter-needle unit has been advanced, the rest of the catheter can be pushed into place while holding the hub of the needle in place.

The reason why this works is that by lifting the needle at the critical juncture of the placement, the dull portion of the bevel tip will actually bend the vessel so that the vessel axis aligns with the axis of the needle. When the axis of the needle is aligned with the axis of the vessel, it has more room and there is less likelihood of the tip of the needle puncturing the back wall. See Figure 5.

When teaching this technique, I have sometimes exaggerated the lifting of the needle and tented up the skin as much as 1cm and advanced the needle/catheter unit a full 2cm without rupturing the back wall of a vessel. I have done this to prove to students that this technique allows for maximal prevention of rupturing the back wall of the vessel with the needle tip and to demonstrate that lifting up does not harm

the anterior vessel wall. A video demonstration of the herein described technique is posted on YouTube: <https://www.youtube.com/watch?v=-t1SCZMO0Gc> .

This paper is positioned in the hierarchy of evidence at the level of expert opinion. We welcome others who would like to formally test the usefulness of the described technique. We are very happy to collaborate. A quasi-experimental method of testing the method could involve a setting where many IVs are started each day. A one month baseline count of the average number of needle sticks required for starting of the IVs could be tabulated. The staff could then be taught the herein described technique and be instructed to use this technique on the first needle stick for 1 month. After 1 month the baseline average number of needle sticks during the baseline period could be compared to the average number of needle sticks during the month the new technique was used. The difference could then be tested for statistical significance. Thereafter decisions could be made regarding further studies and adoption of the new technique.

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REFERENCES

- [1]. Infusion Therapy Standards and Practice. Infusion Nurses Society. 2016. Norwood, Massachusetts