

Zbylut J. Twardowski, MD

Synopsis from the article: [Twardowski ZJ. Constant site \(buttonhole\) method of needle insertion for hemodialysis. *Dialysis & Transplantation* 1995; 24: 559-60, 576.](#)

Overall fistula and graft survival depends on the quality of vessels, surgical technique, and the method of using the access. There is no generally accepted method for access puncture. An early recommendation was to change the site of puncture for each dialysis to allow good healing of the puncture wound and avoid complications, such as hematoma at the puncture site, dilatation, stenosis, infection, and pseudoaneurysm. On the contrary, some data indicate that insertion of the hemodialysis needles in exactly the same spot for consecutive dialyses may be associated with fewer complications when compared with different sites of needle insertion for each dialysis.

The initial experience with two methods based on almost ten thousand dialyses led to the following conclusions¹:

1. Insertion into a previously-used site is easier and can be done very quickly, in less than 10 seconds.
2. Cannulation is less painful and anesthetic use may be eliminated.
3. Reinsertions of needles because of poorly performed sticks are virtually eliminated.
4. Hematoma formation is reduced more than tenfold.
5. The infection rate was not significantly higher than with different-site method of needle insertion.

The consequences of repeated sticks depend on the puncture techniques.² If sticks are repeated in circumscribed areas (*area puncture technique*) aneurysmatic dilatations develop in these areas and stenoses develop in adjacent regions. Stenotic and aneurysmatic lesions tend to progress due to pressure and velocity distribution according to the Bernoulli's law of hydrodynamics. Another technique uses punctures equally distributed along the whole fistula length (*rope-ladder puncture technique*). Such a technique causes small dilatations over the whole length, but without aneurysmatic dilatations. The best technique involves the repeated punctures of the same site (*constant site method = buttonhole puncture technique*) because it does not cause dilatation and stenosis.

All authors reporting results with this method used it exclusively in patients with primary fistulas or saphenous vein grafts. According to our current knowledge, the graft is not suitable for the buttonhole technique. In recent years, primary fistulas are created only in a small proportion of patients. Most patients have porous polytetrafluoroethylene (PTFE) grafts. Perhaps these are not suitable for the buttonhole technique.

Details of the technique as established in the original study¹

- 1) ***Needle placement during the break-in period.*** After a period of several weeks of fistula maturation, the fistula was punctured by the same, experienced stickler, using sharp needles, until the best site was established. Only after good puncture sites were developed were less experienced sticklers allowed to puncture the sites. Needle placement by the same experienced person, during the initial period, might be crucial

for success. Each person has a distinct technique using the same direction and angle of the needle and the same depth of penetration. Good results in home hemodialysis patients may be related to the "single-sticker practice".

- 2) **The needles.** After the break-in period, the needles used for the buttonhole method had a somewhat dull edge and surface. Needles with a blunt edge tend to go through the established path; sharp needles tend to cut adjacent tissues, enlarge the hole, and cause bleeding along the needle. It is very important that the needle goes through the established puncture tunnel and does not cut the adjacent tissues. The needles giving the best results were not siliconized on the outside and did not have a very smooth surface. Blood oozing alongside the needles was more likely with the use of siliconized, smooth needles.¹
- 3) **Puncture direction.** Both needles were inserted in an antegrade direction that facilitated hemostasis after dialysis and decreased chances of hematoma formation. Antegrade needle direction does not predispose to recirculation. The recirculation may happen only when the flow through the dialyzer is higher than the flow through the fistula.
- 4) **Disinfection.** Prior to needle insertion, the puncture area should be disinfected and the scab removed with a 20-gauge needle. Then the area should be disinfected again and the hemodialysis needle inserted.

References

¹Twardowski Z, Kubara H. Different sites versus constant sites of needle insertion into arteriovenous fistula for treatment by repeated dialysis. *Dial Transplant* 1979;8:978-80.

²Krönung G. Plastic deformation of Cimino fistula by repeated puncture. *Dial Transplant* 1984; 13: 635-8.

Commentary by Todd S. Ing, MD

Dr. Twardowski's unique invention, the innovative buttonhole technique, is receiving an increasing and very well-deserved international recognition. The method is suitable for both in-center dialysis and the home dialysis settings. One would not be surprised if this approach became the technique of choice for puncturing arterio-venous fistulas one day.