

# Economics of an Interrupted Nonpenetrating Clip Anastomosis for Vascular Access Procedures

NOTES

A. Frederick Schild, MD, Miami, FL; Erin Gillaspie, BS

---

## Purpose

Vascular access procedures are becoming the most common surgery performed in the United States. Despite many advances over the years, the surgery is still associated with a high rate of early stenosis and hyperplasia. New mechanical closure systems have been devised to hopefully address this problem. Vessel Closure System (Anastoclip VCS) is one such technique being evaluated to replace sutures in creating arteriovenous anastomosis as well as nonautogenous anastomosis. The Anastoclip VCS is a nonpenetrating, arcuate-legged titanium clip, which forms an interrupted anastomosis. There is considerable data to show that an interrupted anastomosis is superior to a running anastomosis. The hope is to generate a better anastomosis than obtained with running sutures while minimizing operative time, reducing complications, minimizing trauma, and improving clinical patency.

## Methods

Two studies were performed comparing a running polypropylene suture to an interrupted anastomosis formed with Anastoclip VCS. The first study done by Schild and colleagues was a report published on the first use of the VCS clip on 96 patients, prospective-randomized, clip versus suture. The second was a multicenter study by Shenoy and colleagues where sutures and clips were compared in 1,387 autogenous fistulae and PTFE grafts. Data collected from these studies helped to evaluate the advantages and disadvantages of using clips versus sutures. Evaluation of cost saving was carried out and showed that owing to decreased operating time, fewer adverse events and better patency, the Anastoclip VCS was cost effective.

## Results

Anastoclip VCS provides many operative advantages over running sutures for arteriovenous fistulae. The Anastoclip VCS is easy to handle, and anastomotic time was significantly lower, 14 minutes versus 22 minutes, in the creation of an autogenous fistulae ( $p = .0001$ ). Less anastomotic bleeding was appreciated at the time of the procedure ( $p = .001$ ). Healing pattern for the Anastoclip VCS is equivalent if not superior to a running suture. Postoperatively, the clips help create a smooth interface between endothelial cells, which reduces intimal hyperplasia. The interrupted Anastoclip VCS provides superior burst and tensile strength. Studies have shown that fistulae created using Anastoclip VCS have smoother laminar flow. Most importantly Anastoclip VCS has superior primary and secondary patency when compared with a running suture in both autogenous fistulae and grafts. Primary patency rates at 24 months were 67% for clips and 48% for sutures in the creation of autogenous arteriovenous fistulae ( $p = .007$ ). Primary patency in grafts at 24 months was 39% for Anastoclip VCS and 19% for running sutures ( $p = .0001$ ).

## Conclusions

The Anastoclip VCS is nonpenetrating and forms a smooth intimal interrupted anastomosis. Anastoclip VCS should be considered as the standard of care in the creation of AV fistulae. There is sufficient data to show that the interrupted anastomosis is superior to running suture in every case with improved results across the board. The Anastoclip VCS has the potential to reduce long-term costs due to higher rates of patency and fewer revisions.

## References

1. Lee JW, Choo SJ, Oh JH, et al. Anastomosis of vessels less than 2 mm with vascular clip system clip applicator. *J Korean Med Sci* 2001;16:303-8.
2. Schild AF, Raines J. Preliminary prospective randomized experience with vascular clips in the creation of arteriovenous fistulae for hemodialysis. *Am J Surg* 1999;178:33-7.
3. Schild AS, Pruett CS, Newman M, et al. The utility of the VCS clips for creation of vascular access for hemodialysis: long-term results and intra-operative benefits. *Cardiovasc Surg* 2001; 9:526-30.
4. Schild AF. Use of a vascular staple device for creation of AV fistulas and bridge grafts for hemodialysis. In: Henry ML, Ferguson RM, (editors). *Vascular Access for Hemodialysis*. Precept Press: 1997; p. 95-102.
5. Shenoy S, Miller A, Peterson F, et al. A multicenter study of permanent hemodialysis access patency: beneficial effect of clipped vascular anastomotic technique. *J Vasc Surg* 2003;38:229-35.
6. Stansby G, Knez P, Berwanger CS, et al. Does vascular stapling improve compliance of vascular anastomoses? *Vasc Surg* 2001;35:115-21.
7. Zeebregts CJ. Randomized clinical trial of continuous sutures or non-penetrating clips for radiocephalic arteriovenous fistula. *Br J Surg* 2005; 92:654-5.
8. Zeebregts CJ, Kirsh WM, van den Dungen JJ, et al. Five years' world experience with nonpenetrating clips for vascular anastomoses. *Am J Surg* 2004;187:751-60.
9. Zeebregts CJ, van den Dungen JJ, Kalicharan D, et al. Non-penetrating vascular clips for small-caliber anastomoses. *Microsurgery* 2000;20:131-8.