A new microclip for vascular occlusion

Technical note

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A new microclip for use on blood vessels 300 μ to 1 mm in diameter is described. This clip is suitable for either temporary or permanent occlusion and has been used in experimental applications. Potential clinical applications are described.

KEY WORDS: vascular clip • microclip • blood vessel occlusion

A number of microvascular clips for both temporary and permanent occlusion of blood vessels have been described, but none appears to be appropriate for blood vessels smaller than 800 μ in diameter. We recently developed an easily constructed cross-lock microvascular clip that provides reliable, reversible occlusion of blood vessels 300 μ to 1 mm in diameter.

Description of Clip

The microclip is made of Type 302 stainless steel spring wire 0.28 mm (0.011 in.) in diameter. The clip is approximately 6.0 mm (0.240 in.) long and 2.5 mm (0.100 in.) wide, with a blade length of 2.0 mm (0.080 in.) and a maximum blade opening of 2.0 mm (0.080 in.).

The bending procedure is as follows: First, the wire is cut to a length of 75.0 mm (3.0 in.), and the center portion is flattened and "work hardened" for a length of 5.0 mm (0.200 in.) with a ball peen hammer and an anvil. Jeweler-style bending pliers are then used to bend the wire at the flattened area into a hairpin shape. Subsequent twists and bends, as indicated in Fig. 1, generate a cross-lock “bulldog” style clip. Next, the clip blades are cut to 2.0 mm (0.080 in.); a flexible shaft grinder with a diamond separating disc 0.25 mm (0.010 in.) thick and 25.0 mm (1.0 in.) in diameter is used to bevel the tips and grind the inner surface of the jaws so they are flat and opposed. Finally, the clip is manually deburred with 600 grit silicon-carbide abrasive paper and ultrasonically cleaned. The bending and grinding procedures are performed under × 10 magnification, as required.

The finished clip has a closing pressure of approximately 8 gm and is slightly magnetic because the spring

FIG. 1. Photograph of the microclip. The flattened, work-hardened region is indicated by the arrow. The total length is 6 mm and the blade length is 2 mm.
Vascular microclip

![Image of the 120-mm smooth-tissue forceps with a longitudinal groove](image)

Fig. 2. The 120-mm smooth-tissue forceps are ground to produce a longitudinal groove (arrow) 0.4 mm wide, 0.4 mm deep, and 4.0 mm long into each blade to hold the microclip during application.

wire has been “hard drawn” and work hardened. This magnetism is desirable for ease of introduction, but may be removed with an electric demagnetizer.

The introducer (Fig. 2) is made from 120-mm (4.75 in.) tissue forceps by grinding a 4.0-mm longitudinal groove 0.4 mm (0.015 in.) wide and 0.4 mm deep in each jaw of the forceps.

Discussion

We have used this clip for experimental temporary and permanent occlusion of the middle cerebral artery in rats and rabbits. The clip is very easy to apply and remove, and occludes the vessel completely. We have visually confirmed the patency of blood vessels larger than 300 μ in diameter after temporary occlusion of 1 hour or less; histological vessel damage and long-term patency have not been assessed. The clip has been used successfully for permanent occlusion of blood vessels as small as 200 μ in diameter. Potential clinical applications include the permanent occlusion of small friable blood vessels adjacent to an arteriovenous malformation that are resistant to bipolar coagulation. Further clinical applications for this clip are now being tested.

References


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