Memory clip for intracranial aneurysm surgery

Technical note

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The authors have devised a malleable V-shaped removable clip with mechanical memory effect or shape memory. This clip is easily removed by heating part of it to 79° to 107°C, causing the closed clip to return to its original V shape.

Key Words • Nitinol • aneurysm • memory clip • surgery

A clip for use in intracranial aneurysm surgery should not only be nontoxic, small, light, effective, reliable, and easy to handle, but also removable.1-3,5-12 Recently we have devised a malleable, V-shaped, removable clip made of Nitinol, an alloy endowed with mechanical memory effect.4 The clip is hand made at a temperature of 510° to 593°C; it is 0.4 × 0.7 mm in cross section, and 9 mm in length along the side of the V shape (Fig. 1).

Technique

This clip can be applied at room temperature on a small artery or a narrow neck of an aneurysm using a slim clip applier. If removal is necessary, a part of the clip is heated to 79° to 107°C by a sterilized small-tipped electric heater (Fig. 2); at this temperature range the clip returns to its original V shape; this process is called "mechanical memory effect, shape memory, or memory."4

This clip has been successfully used in animal experiments and in a series of clinical cases. An example of the value of the clip is shown in Fig. 3. This patient, a 43-year-old

![Fig. 1. The clip applier and the hand-made memory clip. 1 = tips of the clip applier; 2 = front view of the open clip; 3 = front view of the closed clip; 4 = side view of the clip.](image-url)
man, had an anterior communicating artery aneurysm. A right-sided unilateral craniotomy revealed the aneurysm, with a fragile thin-walled bleb threatening premature rupture, directly upon the optic chiasm and touching the A1 portion of the contralateral anterior cerebral artery. A small, light, aneurysm clip was required to avoid pressure from the weight of the clip on the optic chiasm. On the first attempt the opposite A1 portion was clipped together with the aneurysmal neck. The clip was removed and successfully placed on the second attempt.

The patient suffered no undesirable effects and was doing well 10 months postoperatively.

Comment

Nitinol, more precisely called "55 Nitinol," is a stainless nickel-titanium alloy that was developed at the U.S. Naval Ordnance Laboratory. In our animal experiments, clips in place for more than 2 months showed no unfavorable change of the brain or other important tissue either morphologically or neurophysiologically. The Nitinol presently available seems to be less malleable and less resistant to arterial tension than traditional silver clips, and we are at present working on a more suitable alloy for neurosurgical use.

References

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