A VASCULAR CLAMP FOR TEMPORARY ARREST OF BLOOD FLOW DURING CHRONIC EXPERIMENTS ON SMALL LABORATORY ANIMALS

G. N. Arkhipov

Laboratory of Experimental Pathology (Head—Professor S. L. Lebedinskaya)
Institute of Normal and Pathological Physiology (Director—Active Member AMN SSSR V. V. Parin) AMN SSSR, Moscow

Presented by Active Member AMN SSSR V. V. Parin
Translated from Byulleten's Éksperimental'noi Biologii i Meditsiny, Vol. 53, No. 1, pp. 122 - 124, January, 1962
Original article submitted December 19, 1960

The clamps proposed by many authors for arrest of blood flow in chronic experiments [1, 2, 3, 4, 5], which have been developed for large animals (dogs and rabbits) are unsuitable for small laboratory animals (rats and guinea pigs).

The vascular clamp described here is intended for chronic occlusion of blood vessels of small laboratory animals, or of superficial vessels of large animals, e.g. the vessels of the ear of a rabbit. The clamp is made of nichrome wire. The sleeve (1) for the vessel and spring and spiral (2) are made from a single piece of wire 0.3 - 0.5 mm in diameter (Fig. 1). The spiral is wound initially on a steel former 0.6 - 0.7 mm in diameter (0.1 mm thicker than rod (4), and then 5 - 7 turns of the spring are made to have an internal diameter of 1 mm, and the remaining free end of the wire measuring 25 - 30 mm is bent so as to lie perpendicular to the plane of the turns of the spring.

A fine polyethylene tube (7) is wound on to the straight end of the wire, and is bent with it to form a spiral of 2 - 3 turns. The internal diameter of the spiral should be equal to or somewhat greater than the diameter of the vessel which is to be clamped. The end of the wire and the polythene covering is cut off and twisted around to form a button.

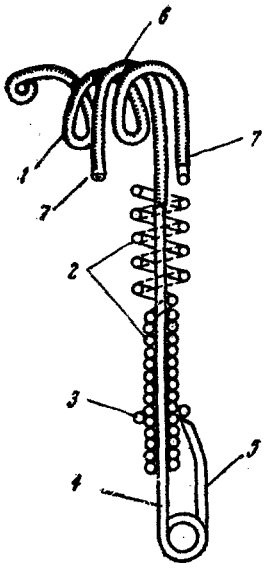

Fig. 1. Diagram of the clamp. Explanation in text.

The stem (4) is made from a straight piece of wire of diameter 0.5 - 0.6 mm and 50 - 70 mm in length; at one end, $1\frac{1}{2}$ turns of a spring are wound, and the end is bent back against the stem and cut off obliquely so as to serve as a catch (5) as indicated in Fig. 1.

Next the free end of the stem is brought into contact with the stopper turn (3) of the sleeve. Then a polyethylene tube is placed over the free end of the stem; the stem is bent to lie between the first and second sprial turns of the sleeve of the vessel so as to form a round hook (6).

The length of the sleeve (2) and hence the length of the stem is determined by the depth at which the vessel lies beneath the skin on to which the catch will be brought out. The diameter of the vessel determines the position of the stopper turn (3) on the sleeve (2). The distance between the edge of the sleeve (2) and the stopper turn must be somewhat greater than the internal diameter of the sleeve for the vessel. Therefore when the clamp is moved from position I into position II (Fig. 2), i.e. when the stem is pulled out and fixed by the catch inserted into the sleeve (2), the vessel lying in its sleeve is then securely but gently clamped between the hook of the stem and the first turn of the vessel sleeve. The pressure of the clamp is established by the springiness of the sleeve (2).

When the clamp is introduced, the place on the skin surface to which the clamp with its catch and part of sleeve (2) will be brought to the outside is determined; this point must not lie on the line of incision of the skin. After the skin has been divided and the vessel dissected out, by means of a thread passed through the catch and a cutaneous needle the clamp is brought out from the depth of the wound away from the prepared part of the vessel to the site selected for its emergence.

After the catch of the clamp has been brought out through the skin, the clamp is held by the catch and the sleeve for the vessel is brought beneath the vessel which by means of a hook is brought into the space between the first and second turns. Then, also with a hook, the vessel is brought successively between all the turns of the sleeve, so that it comes to lie within it.

If necessary, the vascular sleeve is fixed with a silk suture to the supporting tissues, and the wound is sewn up.

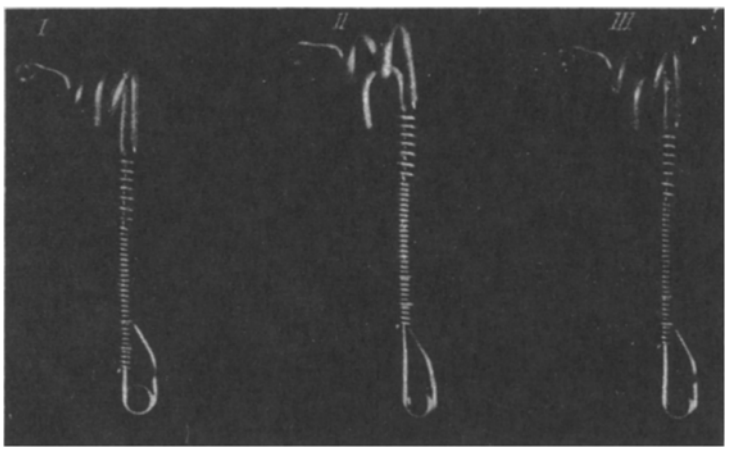

Fig. 2. Vascular clamp assembled; different settings
I) "Vessel free" – the catch at the end of the stem rests in the stopper turn of the sleeve; II) "vessel closed" – stem brought out to its limit from sleeve (2), catch is held in its end; III) "vessel partially closed." An additional stopper turn has been added to the control sleeve (2), and the catch is held in it.

When the device is used, the vessel is closed as follows: the animal is fixed in a convenient position, while the experimenter holds sleeve (2) with forceps, and with the fingers of his right hand he pulls the stem outwards by the catch until the latter comes against the edge of sleeve (2) (see Fig. 2, position II).

The vessel is released by pushing the stem into sleeve (2) until the catch is held against the stopper turn.

If when the clamp is being made, the diameter of the turns of the vascular sleeve and the length of sleeve (2) are altered, and the length of the stem adapted accordingly, the clamp may be used for vessels of a wide range of diameters lying at various distances from the cutaneous surface on to which the outer end of the clamp will be brought.

With minor constructional modifications (addition of another stopper turn on sleeve (2) the clamp may be used for partial closure of blood vessels (see Fig. 2, position III).

We have tested this clamp which operated faultlessly in experiments involving cutting off the blood supply to the hindlimbs of rats.

SUMMARY

A vascular clamp has been designed for use in chronic experiments on small laboratory animals. The clamps, which are made from nichrome wire may be applied to vessels of various diameters lying at different depths beneath the skin surface through which the outer end of the clamp is brought out. The instrument is of simple construction, and does not damage the vessels to which it is applied. It may be used for temporary arrest of visceral circulation.

LITERATURE CITED

1. I. S. Kanfor, Byull éksper. biol. i med., Vol. 40, No. 9 (1955), p. 78.
2. E. I. Khomchenovskii, Byull. éksper. biol. i med., Vol. 39, No. 1 (1955), p. 72.
3. E. I. Khomchenovskii, Byull. éksper. biol. i med., Vol. 46, No. 7 (1958), p. 177.
4. E. I. Khomchenovskii, Patol. fiziol. i éksper. terapiya, Vol. 4, No. 2 (1960), p. 74.
5. Goldblatt, Lynch, Hanzala. Summerville, J. Experim. Med., Vol. 59 (1934), p. 347.

All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
