

Swelling and congestion of flaps are frequently seen postoperatively and can cause unexpected necrosis. According to previous reports, venous thrombosis seems to be a more frequent problem than arterial occlusion in both experimental and clinical surgery. Few satisfactory venous trauma models exist, and reports on experimental venous thrombosis are rare. The object of this study was to create a rabbit venous occlusion flap model and to evaluate the effect of low-molecular-weight heparin on this flap. Eight New Zealand rabbits were used in the pilot study, in which the ideal congested flap was investigated using a flap pedicle based on the central auricular artery with a skin pedicle 0, 1, 2, or 3 cm wide. The flap (3 x 6 cm) was designed on the central part of the left ear, and the central auricular vein and nerve, the former for venous return, were cut out at the base of the flap. The flaps with skin pedicles 0, 1, 2, or 3 cm wide showed mean necrosis length of 60.0, 9.3, 4.2, and 0.0 mm, respectively. The flaps with skin pedicles 0, 1, 2, or 3 cm wide showed mean necrosis of 100, 15.5, 7, and 0 percent, respectively. Therefore, the flap, based on a 1-cm-wide skin pedicle and the central auricular artery, was selected as an optimal congested flap model showing 15.5 percent necrosis. The congested flap was then elevated on the left ear of another 10 rabbits. Subcutaneous low-molecular-weight heparin (320 IU/kg) was administered immediately after surgery to five of the rabbits (the low-molecular-weight heparin group), and the remaining five were used as a control group. Fluorescein was injected 15 minutes after surgery to evaluate the circulatory territory of the flap, and the circulatory territory was measured 5 minutes after injection. The flaps were assessed 7 days after surgery by angiography, histology, and clinical findings. The circulatory territory was significantly greater in the low-molecular-weight heparin group (mean \pm SD, 39.2 \pm 3.0 mm) than the control group (mean \pm SD, 48.0 \pm 1.0 mm) ($p < 0.001$) assessed 7 days after surgery. The longest flap survival length in group A and group B ranged from 40 to 55 mm (mean \pm SD, 49.4 \pm 5.6 mm) and complete survival (mean \pm SD, 60.0 \pm 0.0 mm). The improvement in survival was statistically significant for group B compared with group A ($p < 0.015$). Histologic evaluation revealed moderate to severe venous congestion and inflammation in the control group, whereas there were minimal changes in the low-molecular-weight heparin group. Angiography of the flap revealed obvious venous occlusion in the periphery in the control group compared with the low-molecular-weight heparin group. The authors conclude that subcutaneous administration of low-molecular-weight heparin has a great potential to improve the survival length of a congested flap without major complications.