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OP-49

Postconditioning to reduce local muscle injury after long-lasting vascular occlusions

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Introduction

Revascularization of long-lasting acute lower limb vascular occlusions might compromise the survival of both the extremity and the patient, due to severe local and systemic complications of the ischemia-reperfusion (IR) injury. Reducing the degree of IR damage has therefore, a great importance. Postconditioning (PostC) is an easily applicable surgical method consisting of brief repetitive reperfusion and reocclusion periods at the onset of reperfusion, which is reported capable of reducing IR injury.

Objectives

Our aim was to test the potency of postconditioning after a long-lasting ischemic event.

Material/Patients and Methods

Male Wistar rats (n=60) underwent 8 hours of bilateral lower limb ischemia achieved by infrarenal aortic occlusion. Ischemia was followed by 2, 6, 12, 24 hours of reperfusion. In one group of each reperfusion period, postconditioning (10/10 sec. in 6 cycles) was applied. Sham operated animals underwent the same procedure except ischemia induction. The microcirculatory changes were measured by laser Doppler flowmeter till the 2nd hour of reperfusion. At the end of reperfusion samples were collected from the anterior tibial muscle for routine histological staining and for NADH-tetrazolium reductase (TR) enzyme-histochemistry to assess viability. Blood samples were taken for necro-enzyme measurements (CK).

Results

The degree of muscle injury increased with the length of reperfusion in the IR group from the mild damage detected at 2nd post-ischemic hour to the severe necrotic changes detected at 24th post-operative hour. Strongly reduced histological injury was found in the IR+PostC group at every examined time point. Necro-enzyme levels showed a peak at the 6th post-ischemic hour (IR: 6146.5 ± 1708.6 , IR+PostC: 5948.4 ± 1972.7 IU/L) then decreased to the normal level by the end of the 1st day (IR: 256.8 ± 86.1 , IR+PostC: 190.3 ± 91.5 IU/L), significant difference was not shown between the IR groups except at the 2nd postoperative hour in favor of the IR+PostC group ($p=0.049$). Viability determined by the quantitative evaluation of NADH-TR staining reduced gradually in the IR group with the progress of reperfusion (2h: 12.2 ± 5.3 6h: 12.5 ± 2.1 ; 12h: 10.4 ± 3.1 ; 24h: 8.7 ± 2.3 %), the IR+PostC group however showed no further viability loss after the 2nd post-operative hour (2h: 29.4 ± 3.2 6h: 28.5 ± 9.2 ; 12h: 27.9 ± 5.4 ; 24h: 30.7 ± 4.1 %). Viability differed significantly between the IR and IR+PostC groups at every examined time points ($p<0.05$). Microcirculation showed significant amelioration of plateau maximum ($p=0.038$) and reperfusion area ($p=0.013$) in the IR+PostC group compared to the IR group. (PM: 24.5 ± 22.7 vs. 62.3 ± 20.3 , RT: 25.4 ± 17.8 vs. 63.3 ± 20.7 %).

Conclusion

Postconditioning could be a feasible technique to reduce IR injury after long-lasting lower limb vascular occlusions.

Conflict of interest : None

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Training a sophisticated microsurgical technique: Interposition of external vein graft in the common carotid arteries

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Introduction

Neointimal hyperplasia is the primary cause of stenosis in veins that are of great importance in arterial coronary bypass in peripheral arterial bypass surgery as well as in fistulas.¹⁻⁵ The experimental procedure of vein graft interposition in the common carotid artery has been applied in several researches to examine the aetiology of neointimal hyperplasia and thereby to address it.⁶⁻⁸ Using the superior caval vein graft is a small-animal model for venous arterialization experiments.

Objectives

To minimize the number of experimental animals needed for the procedure, this current paper proposes a new operation by video training which should help the novice surgeon to learn the cuff technique and the vein graft interposition.

Material/Patients and Methods

Hereby, the right external jugular vein was grafted into the common carotid artery of 21 female Sprague-Dawley rats categorized in three equal groups that were sacrificed at 2, 6, and 84 days, respectively. Notably, no donor animals were needed for auto-transplantations were performed.

Results

The survival rate was 100 % at the time point of sacrifice. The graft patency rate was 60 % for the first 10 operated rats. 82 % for the remaining 11 animals. The blood flow after sacrifice was 8 ± 3 ml/min.

Conclusion

In conclusion, this proposed surgical protocol considers and optimizes and standardizes this complicated procedure for surgeons easy, step-by-step instruction, explaining the steps thereby helping them to gain expertise fast and avoid the errors of experimental animals.

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