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THE INFLUENCE OF PROFUNDA POPLITEAL COLLATERAL INDEX ON THE RESULTS OF PROFUNDOPLASTY

Horlenko F.V.

SHEI «Uzhhorod National University», Medical Faculty, Department of Surgical Diseases, Uzhhorod

Вплив глибокостегново-підколінного індексу на результати профундопластики

Горленко Ф.В

Резюме. *Вступ.* Із метою ліквідації хронічної ішемії виконують прямі та непрямі реконструкційні операції. Вибір методу хірургічного лікування хворих із облітеруючим атеросклерозом судин нижніх кінцівок є однією із найскладніших проблем у судинній хірургії.

Мета дослідження - оцінити результати профундопластики в залежності від величини глибокостегново-підколінного індексу.

Матеріали та методи. В роботі проаналізовані результати лікування 124 хворих, яких прооперовано у відділенні судинної хірургії Закарпатської обласної клінічної лікарні ім. Андрія Новака в період з 2005 до 2018 року з приводу дистальних форм ураження артерій нижніх кінцівок при хронічній ішемії нижніх кінцівок.

Результати досліджень. Залежно від величини глибокостегново-підколінного індексу пацієнти, яким була виконана профундопластика, розділені на 3 групи. У результаті проведеного дослідження виявлено, що після виконання профундопластики у пацієнтів I групи 5-річне збереження кінцівки складало 74,2%, у пацієнтів II групи – 51,8% і пацієнтів III групи – 23,4%.

Висновки. Отже, глибокостегновий-підколінний індекс, що характеризує ступінь розвитку колатеральної системи підколінно-гомількового сегмента, є єдиним предиктором збереження нижньої кінцівки.

Ключові слова: облітеруючий атеросклероз судин нижніх кінцівок, хронічна ішемія нижніх кінцівок, глибокостегново-підколінний індекс, профундопластика.

Abstract. *Introduction.* In order to eliminate chronic ischemia, perform direct and indirect reconstruction operations. The choice of surgical treatment for patients with obliteration atherosclerosis of the vessels of the lower extremities is one of the most difficult problems in vascular surgery.

The purpose of the study: to evaluate the results of profundoplasty, depending on the magnitude of the deep-jaw and popliteal index.

Material and Methods. The results of the 124 patients treatment, which were operated in the department of vascular surgery of Zakarpattia Regional Clinical Hospital named after M.Sc. Andriy Novak during the period from 2005 to 2018. The patients had the following diagnosis distal forms of lower extremities lesion of arteries of the by chronic lower limb ischemia.

Results. Patients after profundoplasty were divided into 3 groups depending from the size of the Profundapopliteal collateral index (PPCI). PPCI in the Group I patients (the 5-year limb preservation) was 74.2%, in Group II patients - 51.8% and in Group III patients - 23.4% according of the study result with using profundoplasty.

Conclusion. PPCI which characterized by the collateral system development degree of the popliteal-pedicle segment, is considered to be useful for selecting of the optimal revascularization procedures for the saving limbs.

Key words: obliterating atherosclerosis of the lower extremities vessels, chronic ischemia of the lower extremities, profunda popliteal collateral index, profundoplasty.

Introduction

Atherosclerotic lesion of the lower extremities arteries have the second place in the heart disease structure. Critical ischemia is recorded from 400 to 1,000 cases on million population per year. Up to 1% of men over 55 years of age suffer from this pathology [4, 5]. However, reconstructive surgery can be performed only in half of such patients, and without surgery – in 95% of patients undergo

amputation of the lower extremity during the year [2, 3]. In order to eliminate chronic ischemia, perform direct and indirect reconstruction operations. The choice of surgical treatment for patients with obliteration atherosclerosis of the vessels of the lower extremities is one of the most difficult problems in vascular surgery.

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Patients, who have undergone profundoplasty, are divided by depending on the size of the profunda popliteal collateral index (PPCI) into the following groups:

1group - 77 (62,1%) patients, who were performed profundoplasty, with $GSPI \leq 0,35$;

The second group consisted of 27 (21.7%) patients, who were operated with GSPI value of 0.36-0.4;

The third group - 20 (16.1%) of patients who were performed the profundoplasty with the significance of GSPI in the range of 0.41-0.46.

The age of studied patients ranged from 46 to 78 years ($M \pm m = 61.7 + 4.2$ years). There were 28 patients with II-B degree of lower extremities ischemia, with III-A degree - 75 patients and III-B degree - 21 patients.

The survey algorithm included ultrasonic duplex scan of arteries with color flow mapping, reovasography of the lower extremities with Nitroglycerin; definition of GSPI, multispiral computed tomography of lower extremities arteries with contrast and contrast arteriography X-ray. PPCI was determined by the formula for the determine the functional capacity of deep femoral artery revascularization:

$PPCI = \frac{P_{де}}{P_{BK}}$ - regional systolic pressure in the popliteal artery above the knee, P_{BK} - pressure in the popliteal artery below the knee [6].

The obtained data by the duration of limb preservation after indirect revascularization of the lower extremities were statistically analyzed. Cox regression was used to study the PPCI influence on limb preservation after profundoplastics.

Deep hip artery (DAH) plastic surgery with using of autosomal patch was performed in 83 patients. As a patch, was used a segment of a large

subcutaneous vein from the thigh and an upper third shin.

In the 15 patients was performed an auto-therapeutic plastic due to the lack of suitable vein for plastic.

At the same time, the occlusal superficial femoral artery (SAF) was removed at a distance, after that was performed deobliteration of the cult of SAF, from which was formed a patch for plastics. Distalization of DAH was performed in 17 patients. In 7 cases some problems were encountered when performing of the endarterectomy from the general femoral artery (GFA) and from the deep artery initial department of the thigh (DAH). Resection of the GFA and the initial department of DAH with auto-venous prosthetics in 7 patients was executed. In 2 patients a reimplantation of DAH in the direction of SAF was performed.

Results

Lack of conditions for reconstruction is forcing surgeons to implement indirect surgical methods of revascularization, aimed at improving collateral circulation, increasing the volume of the microcirculation and neoanogeogenesis stimulating [2].

One of the important problems in planning of reconstruction type in the occlusion-stenotic defeat of the arteries of the femoral and pediculo-carpal segment is the assessment of the flow along the collateral strands and the state of the arteries of the shin, the occlusion of which creates obstacles for adequate blood flow to the distal limb parts and is the cause of shunting operations unsatisfactory results [4].

For the correlation study between the time saving limbs and PPCI, we constructed by the Cox model, which expresses the risk function in the following way:

$$h(t) = h_0(t) \times \exp(\beta x),$$

$h(t)$ - risk function, $h_0(t)$ - basic risk function, x - meaning covariates, β - regression coefficient, the exponent of this is the ratio of risks when changing the value of covariates per unit. At the same time, the Cox model is a model of proportional risks: without imposing any restrictions on the type of basic risk function, the model assumes that the ratio of risks due to differences in the value of covariates does not depend on time (the coefficient β does not depend from time t).

The value of the coefficient β in the model $h(t) = h_0(t) \times \exp(\beta [PPCI])$ is calculated at the level of $15,81 \pm 1,69$, using the collected clinical



data. The obtained model indicates about the close positive relationship between the level of GSPI and the length of the limb preservation: the coefficient of concordation of the model is 0.839, the statistical significance of the model by the criterion of the likelihood ratio ($p < 2.2 \times 10^{-16}$, the least positive number, which are available for the program R).

Since the values of PPCI were in the range of 0.3-0.5, the difference between the values of covariates per unit has no real content. At the same time, it is necessary to calculate the ratio of threats (risks) with the difference of values covariates (GSPI) by 0.1:

$$\frac{h^*(t)}{h(t)} = \exp(\beta \times 0,1) = \exp(1,581) = 4,86$$

Consequently, with an increase in PPCI from 0.3 to 0.4, are the threat of limb loss increasing in 4.86 times. The obtained model also gives an opportunity to calculate the probability of maintaining limb for one, three and five years after surgery at different values of PPCI (Table 1.) In order to select patients for profundoplasty, one must be guided by the data of instrumental examination methods and the significance of PPCI, which characterizes the degree of collateral system development of the deep hip artery. As a result of the study, it was found that after performing profidedoplasty in patients of Group I, the 5-year limb preservation was in 74.2%, in patients in Group II – in 51.8% and in patients in Group III – in 23.4%.

Table 1

Probability of lower extremity preserving with different values of PPCI

| Duration of limb preservation | Group I | Group II | Group III |
|-------------------------------|------------------|-----------------|------------------|
| | PPCI $\leq 0,35$ | PPCI = 0,36-0,4 | PPCI = 0,41-0,46 |
| 1 year | 92,8% | 84,9% | 69,7% |
| 3 years | 82,5% | 65,4% | 39,2% |
| 5 years | 74,2% | 51,8% | 23,4% |

Conservative therapy or amputation remains is the only methods if the patient have absence of an adequate peripheral vascular circulation and the presence of contraindications for the direct methods of revascularization. Therefore, as an alternative to amputation of the lower limb in the the complex treatment are the implementation of revascularization indirect methods, in particular, profundoplasty

Conclusions

1. The profunda popliteal collateral index, which characterizes by the degree of collateral system development of the popliteal- shin segment, is the test of choice for preservation of the lower limb.

2. The profundoplasty using was provided a steady positive result in the remote postoperative period when a profunda popliteal collateral index ≤ 0.35 .

ЛІТЕРАТУРА

1. Методи непрямой реваскуляризації при критичній ішемії нижніх кінцівок / Н.Ю. Літвінова, В.А. Черняк, О.В. Панчук // Серце і судини. – 2015. – №1. – С. 110–115.
2. Отдаленные результаты лечения больных с хронической ишемией нижних конечностей методами непрямой реваскуляризации и генотерапии / Ю.В. Червяков, И.Н. Староверов, О.Н. Власенко [и др.] // Ангиология и сосудистая хирургия. – 2016. – №22(1). – С. 29–37.
3. Пиптюк О.В. Досвід комплексного лікування хронічної критичної ішемії нижніх кінцівок / О.В. Пиптюк // Клінічна хірургія. – 2007. – №2-3. – С. 117–118.
4. Хірургія дистальних відділів термінальної аорти / [Русин В.І., Корсак В.В., Чобей С.М. та ін.]. – Ужгород: Карпати, 2012. – 486 с.
5. The impact of isolated tibial disease on outcomes in the critical limb ischemic population. B.H. Gray, A.A. Grant, C.A. [et al.] // Ann Vasc Surg. – 2010. – № 24(3). – P. 349–359.
6. Profunda popliteal collateral index. A guide to successful profundoplasty / C.H. Boren, J.B. Towne, V.M. Bemhard [et al.] // Arch Surg. – 1980. – № 115 (11). – P.1366–1372.

REFERENCES

1. Metody nepryamoji revaskulyaryzatsiyi pry krytychniy ishemiyi nyzhnikh kintsivok / N.YU. Litvinova, V.A. Chernyak, O.V. Panchuk // Sertse i sudyny. – 2015. – №1. – S. 110–115.



2. Otdalennye rezul'taty lechenyya bol'nykh s khronicheskoy yshemyey nyzhnykh konechnostey metodamy nepryamoy revaskulyaryzatsyy y henoterapyu / Yu.V. Chervyakov, Y.N. Staroverov, O.N. Vlasenko [y dr.] // Anhyolohyya y sosudystaya khyrurhyya. – 2016. – №22(1). – S. 29–37.
3. Pyptyuk O.V. Dosvid kompleksnoho likuvannya khronichnoyi krytychnoyi ishemiyi nyzhnykh kintsivok / O.V. Pyptyuk // Klinichna khirurhiya. – 2007. – №2-3. – S. 117–118.
4. Khirurhiya dystal'nykh viddiliv terminal'noyi aorty / [Rusyn V.I., Korsak V.V., Chobey S.M. ta in.]. – Uzhhorod: Karpaty, 2012. – 486 s.
5. The impact of isolated tibial disease on outcomes in the critical limb ischemic population. B.H. Gray, A.A. Grant, C.A. [et al.] // Ann Vasc Surg. – 2010. – № 24(3). – R. 349–359.
6. Profundapopliteal collateral index. A guide to successful profundaplasty / C.H. Boren, J.B. Towne, V.M. Bemhard [et al.] // Arch Surg. – 1980. – № 115 (11). – P.1366–1372.

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