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ORIGINAL ARTICLE

THE IMPORTANCE OF THE PROGNOSTIC SCORE FOR THE CHOICE OF CHIVA HEMODYNAMIC SURGERY AS A TREATMENT METHOD FOR VARICOSE VEINS OF THE LOWER EXTREMITIES

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ABSTRACT

The aim: To work out the predictive system that can help to determine the group of patients to whom the hemodynamic surgery of varicose disease, CHIVA, is beneficial.

Materials and methods: Results of examination and treatment of 58 patients of the main group who underwent hemodynamic surgery and 65 patients of the comparison group who underwent stripping. Patients of both groups were evaluated in the preoperative period using an evaluation scale, and divided into three subgroups depending on the scores: 5-8, 9-11, and 12-15 points.

Results: The best treatment results with the lowest number of relapses were obtained in the subgroup of patients with low scores on the prognostic scale (5-8 points) after hemodynamic treatment and in the subgroup of patients with a high number of points (12-15 points) after the classic stripping ($p < 0.05$). The same subgroups received more improvement in the quality of life of patients according to CIVIQ 20 ($p < 0.001$). The subgroup of patients with a high number of points (12-15 points) after the stripping received significantly more reduction in scores VCSS ($p < 0,01$).

Conclusions: Comprehensive assessment of factors such as the anamnestic duration of the disease, the diameter of the great saphenous vein, the presence of skin complications, dilated varicose collaterals and previous surgical treatment using a prognostic preoperative assessment score allows the surgeon to be more clearly guided in choosing the optimal method of treatment for each patient and achieve the best treatment results.

KEY WORDS: varicose veins, stripping, hemodynamic surgery, CHIVA

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INTRODUCTION

CHIVA (Cure Conservatrice et Hemodynamique de l'Insuffisance Veineuse en Ambulatoire) is a type of minimally invasive surgery for varicose vein disease that avoids destroying the saphenous vein and its collaterals [1].

Based on a theoretical hemodynamic model, CHIVA is an ultrasound-guided, minimally invasive surgical strategy performed under local anesthesia. The strategy has been shown in studies to be safe and effective [2].

CHIVA is a good alternative to common procedures that is associated with less bruising, nerve damage than stripping saphenectomy. The main advantages are preservation of the saphenous vein, local anesthesia, low cost, low pain, and fast post-operative recovery [3].

Despite the many advantages of the hemodynamic approach of CHIVA, there are some disadvantages of this technique. The main disadvantages for the patient

are the relatively high frequency of recurrences, and prolonged onset of clinical and cosmetic effects. For doctors, the main disadvantage is the need to train in features of venous hemodynamics and ultrasound mapping [3, 4].

Taking into account all these facts, an important question arises: which category of patients is best suited to the hemodynamic approach of CHIVA, for whom it will be most effective and efficient, and which category of patients with varicose veins is better to choose other treatments.

THE AIM

The purpose of the work is to work out the predictive system that can help to determine the group of patients to whom the hemodynamic surgery of varicose disease, CHIVA, is beneficial.

MATERIALS AND METHODS

The results of the examination and hemodynamic treatment of 58 patients with varicose veins of the lower extremities and symptoms of chronic venous insufficiency (CVI), who were hospitalized in the clinic in the period from 2018 to 2021 were analyzed. The comparison group consisted of 65 patients with varicose veins of the lower extremities who underwent stripping.

The inclusion criteria:

- 1) presence of varicose veins (C1 – C6 class of varicose veins according to CEAP classification);
- 2) age from 18 to 65 years;
- 3) saphenofemoral junction insufficiency;
- 4) good drainage in the deep venous system;
- 5) consent of the patient to participate in the study.

Exclusion criteria:

- 1) patients with severe comorbidities that may affect the course and outcome of treatment (diabetes mellitus, autoimmune diseases, oncological diseases, kidney failure, liver failure, heart failure, severe lung diseases);
- 2) deep venous system obstruction.
- 3) lack of compliance with the use of compression therapy and its duration.
- 4) patient disagreement.

In addition to general clinical examinations, all patients were required to undergo ultrasound duplex scanning (UDS) veins of the lower extremities in the supine and standing positions, using the of Paraná manoeuvre and Valsalva tests, with detailed mapping of the venous hemodynamics of the lower extremities. Ultrasound examination was performed according to a standardized scheme [5-7].

Based on the researchers' data and our own results, we selected the criteria that most influenced or could influence the outcome of hemodynamic treatment. The following criteria we included:

- duration of the disease – time limits, which we divided into: up to 5 years, 5-10 years, and more than 10 years (according to existing data, prolonged overstretching of venous structures by high pressure leads to the fact that when the pressure normalizes, the latter on the background of existing sclerotic processes cannot restore its original form);
- diameter of the great saphenous vein (GSV) according to ultrasound scanning;
- skin complications: pigmentation, venous eczema, lipodermatosclerosis, healed ulceration, active ulceration;
- visible extended tributaries (multiple varicose collaterals, tributaries, and nodules that can cause unsatisfactory cosmetic treatment results for the patient);
- previous surgical intervention in the anamnesis (especially the interventions performed on the GSV. Surgical treatment, first, strongly changes the hemodynamics. In such patients, it is difficult to determine the type of shunt, and therefore the right strategy. Secondly, if we are already dealing with relapse, it may indicate a high ability of veins to recanalize).

We grouped the above data as a scale, giving each of the parameters the appropriate number of points (Table I).

We evaluated all our patients according to the proposed scale and divided them into subgroups according to the obtained data. The first subgroup (A) included patients who scored from 5 to 8 points – their number was 22, the second subgroup (B) included 19 patients who scored from 9 to 11 points, and the third subgroup (C) included patients who scored the highest number of points – from 12 to 15 and the number of such patients was 17.

Patients in the comparison group were also evaluated according to our proposed scale and divided into appropriate subgroups: 5-8 points (A1) – 26 patients, 9-11 (B1) – 23, 12-15 points – 16 patients (C1), respectively.

Table I. Prognostic score of preoperative assessment of patients with varicose veins of the lower extremities

	Attribute	1 point	2 points	3 points
1	Duration of the disease	Up to 5 years	5-10 years	More than 10 years
2	The diameter of the GSV according to UDS	Up to 7.5 mm	7.5 -10 mm	More than 10 mm
3	Skin complications	None	Pigmentation, venous eczema, lipodermatosclerosis	Healed ulceration or active ulceration
4	Visible tributaries	None or reticular varicose veins and telangiectasias	Several: 1-3 veins up to 0.5 cm in diameter	Multiple nodes, varicose tributaries and collaterals
5	History of previous surgical treatment	No	Sclerotherapy, miniphlebectomy of tributaries, without intervention on GSV	Safenectomy, or any intervention on GSV

Table II. Clinical results of treatment

Evaluation period - 6 months												
Treatment result	Groups of patients											
	Main group						Comparison group					
	A (Total =22)		B (Total =19)		C (Total =17)		A1 (Total =26)		B1 (Total =23)		C1 (Total =16)	
	n	%	n	%	n	%	n	%	n	%	n	%
Complete recovery	14	63,6	9	47,4	5	29,4	13	50	13	56,5	9	56,2
Improvement	6	27,3	7	36,8	4	23,5	10	38,5	9	39,2	5	31,3
Absence of positive changes	2	9,1	3	15,8	8	47,1	3	11,2	1	4,3	2	12,5

Evaluation period - 12 months												
Treatment result	Groups of patients											
	Main group						Comparison group					
	A (Total =22)		B (Total =19)		C (Total =17)		A1 (Total =26)		B1 (Total =23)		C1 (Total =16)	
	n	%	n	%	n	%	n	%	n	%	n	%
Complete recovery	15	68,2	9	47,4	5	29,5	12	46,2	10	43,5	9	56,3
Improvement	5	22,7	8	42,1	3	17,6	11	43,3	10	43,5	5	31,2
Absence of positive changes	2	9,1	2	10,5	9	52,9	3	11,5	3	13	2	12,5

Table III. Treatment results according to VCSS

Assessment time	Groups of patients					
	Main group			Comparison group		
	A (N=22)	B (N=19)	C (N=17)	A1 (N=26)	B1 (N=23)	C1 (N=16)
Before treatment	3,86±0,41	9,26±0,82	16,44±1,84	3,58±0,39	9,57±0,69	15,5±1,88
6 months after treatment	1,59±0,4*	3,11±0,9*	6,94±1,55*	2,23±1,53*	2,13±0,31*	2,19±0,33*
12 months after treatment	1,68±0,48*	3±0,81*	6,81±1,25*	2,27±1,54*	2,3±0,38*	2,34±1,36*

*p<0,01 Multiple comparisons. Dunn test, compared with the before treatment assessment.

Table IV. The results of treatment according to the CIVIQ 20, presented in the GIS index presented in the GIS index

Assessment time	Groups of patients					
	Main group			Comparison group		
	A (N=22)	B (N=19)	C (N=17)	A1 (N=26)	B1 (N=23)	C1 (N=16)
Before treatment	76,77±2,44	69,37±1,96	34,18±2,86	75,92±2,24	68,17±1,72	34,25±3,05
6 months after treatment	98,09±0,96*	92,47±1,92*	76,59±2,63*	92,77±0,98*	94,13±1,55*	90,63±2,07*
12 months after treatment	98,27±0,97*	93±1,79*	75,53±2,52*	92,08±1,04*	92,74±1,86*	90,25±2,15*

*p<0,01 (Multiple comparisons. Dunn test), compared with the before treatment assessment.

Patients in the main group underwent hemodynamic treatment according to the principles of CHIVA. Patients in the comparison group underwent stripping, supplemented by miniphlebectomy and ligation of perforating veins.

The results of treatment were classified into three groups:

- complete recovery (complete absence of varicose veins and symptoms of CVI);
- improvement (visible residual or newly formed varicose veins or nodes that have no or little clinical and

hemodynamic significance);

- absence of positive changes (complete recurrence of varicose veins, recurrence of symptoms of CVI).

Separately, we counted the number of relapses.

Conducted a score using Venous Clinical Severity Scoring (VCSS) (according to Clinical practice guidelines of the Society for Vascular Surgery and the American Venous Forum) [8].

Satisfaction with the results of treatment was also assessed using a Chronic Venous Insufficiency quality of life Questionnaire (CIVIQ 20), in order to compare the average scores, the absolute scores were converted to a GIS index [9].

Treatment outcomes were assessed 6 and 12 months after treatment.

Based on the results, the significance of the proposed criteria for determining the group of patients for whom hemodynamic surgery would be the best choice was evaluated.

Statistical analysis was performed using Statistica 10 (Serial Number: STA999K347150-W) and MedStat. Data distribution normality was checked using the Shapiro-Uilk criterion. A comparison of the data between the groups was performed using Wilcoxon two-sample test. Multiple comparisons were performed using Rank Kruskal-Wallis test and Dunn's test, Scheeffe's method for multiple comparisons.

RESULTS

- **Complete recovery (complete absence of varicose veins and symptoms of CVI).**

In the main group in subgroup A after 6 months, 14 patients fully recovered (63,6%), subgroup B – 9 (47,4%), subgroup C – 5 (29,4%) In the comparison group (patients underwent stripping + miniphlebectomy + elimination of perforant) complete recovery was achieved in 13 (50%) patients of subgroup A1, 13 (56,5%) – subgroup B1 and 9 (56,2%) – subgroup C1. After a year of follow-up, the results were: subgroup A – 15 patients (68,2%), B – 9 (47,4%), C – 5 (29,5%); subgroup A1 – 12 (46,2%), B1 – 10 (43,5%) C1 – 9 (56,3%) persons accordingly.

- **Improvement (visible residual or newly formed varicose veins or nodes that have no or little clinical and hemodynamic significance);**

In the main group in subgroup A after 6 months insignificant residual veins were observed in 6 patients (27,3%), subgroup B – 7 (36,8%), subgroup C – 4 (23,5%). In the comparison group, improvements were achieved in 10 (38,5%) patients of the subgroup A1, 9 (39,2%) – subgroup B1 and 5 (31,3%) – subgroup C1. After one year of follow-up, the results were: subgroup A – 5

patients (22,7%), B – 8 (42,1%), C – 3 (17,6%); subgroup A1 – 11 (43,3%), B1 – 10 (43,5%) C1 – 5 (31,2%) persons accordingly.

- **Absence of positive changes (complete recurrence of varicose veins, recurrence of symptoms of CVI).**

In the main group in subgroup A after 6 months recurrence of varicose veins, return of symptoms of CVI was observed in 2 patients (9,1%), subgroup B – 3 (15,8%), subgroup C – 8 (47,1%). In the comparison group, no clinical changes were achieved in 3 (11,2%) patients of the subgroup A1, 1 (4,3%) – subgroup B1 and 2 (12,5%) – subgroup C1. After one year of follow-up, the results were: subgroup A – 2 patients (9,1%), B – 2 (10,5%), C – 9 (52,9%); subgroup A1 – 3 (11,5%), B1 – 3 (13%), C1 – 2 (12,5%) persons accordingly.

The results are grouped and shown in table (Table II).

There was no statistically significant difference between the main group and the comparison group when comparing subgroups, A and A1 ($p = 0.266$), between subgroups B and B1 ($p = 0.334$), but between subgroups C and C1 found a statistically significant difference at the level of significance ($p < 0.05$). After one year of follow-up, the data changed slightly, but this did not lead to statistically significant changes in the results $p > 0.05$. We would like to note that in the main group there was a trend in subgroups A and B to improve treatment outcomes in the assessment period of one year, compared to the 6-month period, and in subgroup C1 from the comparison group the most stable result among all subgroups during the whole observation period was noted.

The number of relapses in different subgroups was separately assessed and compared. The highest number of relapses was registered in subgroup C of the main group – 8 in total, which is statistically significant in comparison to subgroups A and B of the main group. ($p < 0,05$, Rank Kruskal-Wallis test.), and in comparison with the corresponding subgroup of the comparison group C1 ($p = 0,035$, Wilcoxon two sample test).

Evaluation of treatment results on the VCSS scale are given in table (Table III).

As shown in the table, the VCSS score in subgroups A was 3.86 ± 0.41 , B – 9.26 ± 0.82 , C – 16.44 ± 1.84 , A1 was 3.58 ± 0.39 , B1 – 9.57 ± 0.69 , and C1 15.5 ± 1.88 , respectively. The difference in score between subgroups A and C, and A1 and C1 before treatment was more than 75%. One year after treatment, the scores in subgroups A was 1.68 ± 0.48 , B – 9.3 ± 0.81 , C – 6.81 ± 1.25 , A1 – 2.27 ± 1.54 , B1 – 2.3 ± 0.38 , and C1 – 2.34 ± 1.36 , respectively. The difference between subgroups A and C was still about 70%, while the difference in VCSS between A1 and C1 after treatment was about 3% ($p < 0.01$).

Analyzing the data in Table 2, it can be stated that patients of all subgroups showed a statistically significant decrease in VCSS after treatment at an assessment time of 6 months and one year ($p < 0,01$). In the one-year period, compared to 6 months, there was a slight increase in all groups, but not statistically significant. The strongest decrease was observed in subgroups A, which underwent hemodynamic treatment and subgroup C1 (stripping). There was a statistically significant difference in the decrease in VCSS between similar subgroups C and C1 of the main group and the comparison group in the 6-month period ($p = 0.006$) and the annual period ($p = 0.008$), according to which subgroup C1 received significantly more reduction in VCSS after treatment in both terms of assessment.

The obtained results suggest that a more stable result is suitable for both patients with a low score on the prognostic preoperative scale and high scores can be obtained with stripping, while hemodynamic surgery is more suitable for patients with a low score.

The questionnaire CIVIQ 20 was also used to evaluate treatment outcomes. Relevant data are shown in table (Table IV).

GIS index was in subgroups A at the level $76,77 \pm 2,44$, B – $69,37 \pm 1,96$, C – $34,18 \pm 2,86$, A1 was $75,92 \pm 2,24$, B1 – $68,17 \pm 1,72$, and C1 $34,25 \pm 3,05$. The value of the index for subgroups A and A1 was determined to a greater extent by subjective symptoms related to cosmetic dissatisfaction and psychological discomfort, while for subgroups C and C1 physical symptoms of chronic venous insufficiency were in the first place.

Based on the results shown in the table, in all groups there was a statistically significant increase in the quality of life of patients after treatment for all subgroups ($p < 0.01$). It should be noted that in subgroup A there was a greater increase in the GIS index compared to subgroup A1 ($p < 0.001$), and in subgroup C1, on the contrary, the GIS index was higher compared to subgroup C ($p < 0.001$). There was no statistically significant difference in subgroups B and B1 ($p = 0.739$).

We proposed to use this scale to 15 colleagues from 4 surgical departments in Ukraine who treat varicose veins of the lower extremities and practice the hemodynamic approach CHIVA. A year later, we asked colleagues about their experience of using our scale and its usefulness. Among the respondents 93.3% said that the scale is simple and easy to understand, 86.6% used it in their daily routine. 73.3% of respondents noted its usefulness in the clinical evaluation of patients with varicose veins of the lower extremities and the choice of treatment. More than half of the respondents – 53.3% said that the result obtained according to the scale coincides with their opinion on the choice of treatment,

and 26.6% relied entirely on the scale when choosing a method of treatment. And 86.6% of respondents confirmed that they will continue to use the scale in their daily practice.

DISCUSSION

Varicose vein surgery is being increasingly offered and has many techniques in its arsenal. Much attention is now being paid to minimally invasive and hemodynamic techniques, but classic techniques such as stripping continue to be widely used. Each technique shows a number of advantages, but a number of disadvantages are also described in some groups of patients [10, 11] The results of treatment, the presence of relapses, as well as the occurrence of varicose veins itself, are influenced by many different factors. The presence of trophic ulcers as factors affecting the results of treatment are distinguished by many scientists. The influence of chronically increased intra-abdominal pressure due to obesity, and a history of deep venous thrombosis are also noted [12].

There are also a number of factors that can affect the outcome of the operation and the course of the postoperative period, both in vein surgery and in other surgical interventions, for example in abdominal surgery. Such factors include age, concomitant diseases, features of hemocoagulation, constant intake of hormonal drugs and some other medications, etc [13-15]. These factors are sometimes difficult to identify and take into account their influence on the effect of treatment.

Use of the CEAP classification system is important for diagnosis but does not provide guidance for treatment decisions [16]. For this topical issue for all surgeons is the choice of a specific technique for a particular patient.

Based on our experience in treating patients with varicose veins and literature data, we have identified several factors that could affect the results of operations to a greater extent. The results show that factors such as the duration of the disease, the diameter of the GSV, the presence of skin complications, visible varicose veins and previous history of surgical treatment affect the outcome of treatment, therefore, a comprehensive assessment of these factors using a scale allows the surgeon to better navigate and choose a method of treatment.

For patients with a short-term disease history, small GSV diameter, no or minor skin complications, no visible varicose tributaries and collaterals, and a history of previous surgical treatment, hemodynamic treatment will be the best option. This is clearly demonstrated by the assessment with the CIVIQ 20 questionnaire, which

combines not only an objective scale but also a subjective one, primarily related to the cosmetic comfort of the patient.

For patients with long-term disease history, large vein diameter, skin complications, numerous varicose tributaries and collaterals, the presence of trophic ulcers, para ulcer eczema, and surgical treatment in the anamnesis, the best choice will be stripping with careful elimination of pathological perforators and communicators and miniphlebectomy. For this category of patients, it will provide the most stable functional result with the minimum number of relapses and will give a satisfactory cosmetic treatment result.

CONCLUSIONS

1. The prognostic scale allowed to achieve the optimal surgical approach in 68.2% of patients with a low score (5-8 points) and this was hemodynamic treatment according to the principles of CHIVA and in 56.3% of

patients with high scores (12-15 points) when choosing a treatment method stripping, supplemented by miniphlebectomy and ligation of perforating veins ($p < 0.05$).

2. Highest relapse rate, compared to other subgroups, was observed in the subgroup of patients with high scores on the prognostic preoperative scale (12 -15 points) after hemodynamic treatment ($p < 0,05$).

3. The highest level of improvement in the quality of life of patients according to CIVIQ 20 was obtained in the subgroup of patients with low scores on the prognostic preoperative scale (5-8 points) after hemodynamic treatment, and in the subgroup of patients with high the number of points (12 -15 points) after the classic stripping supplemented by miniphlebectomy and elimination of perforators ($p < 0.001$).

4. The prognostic preoperative assessment scale is a simple, easy-to-understand, and accessible tool that can be used in the daily routine practice of a phlebologist. Nearly 90% of respondents gave positive feedback after using the proposed scale.

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