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Late results of lymphovenous anastomosis

by

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In 1966 at the meeting in Amsterdam we presented the operation of lymphovenous shunts as a simple procedure to relieve lymphedema of the lower extremities.^{1,2,3} In the following years various publications reported the results with this operation.^{4,5} This paper presents a critical analysis of the late results that were obtained in a series of 53 patients with different types of lymphedema submitted to lymphovenous shunts. A critical evaluation of the results is carried out and the indications for this operation are discussed.

The idea of a surgical lymphovenous shunt is to create a lasting drainage of the lymph by means of a surgical anastomosis between the cut surface of the lymph node and the neighbouring vein. It is thought that the subcapsular and medullary sinuses of the transected lymph node remain patent draining freely the lymph from the afferent vessels thus decompressing lymph stasis.^{1,2,3,4,5}

MATERIAL AND METHODS

From 1966 to 1972 225 patients with different types of lymphoedema of the lower extremities have been observed and treated. There were 135 patients with primary, 32 with secondary and 58 with lymphedema secondary to thrombophlebitis. In 53 patients a direct anastomosis

between the lymph node and the neighbouring vein was created according to the previously described technique.^{1,2,3} After discharge from the hospital it was possible to obtain a well documented and accurate follow up in all patients who were operated upon and a 1-3 years good follow up of 40 patients with primary lymphedema who were not operated upon.

In group I of 53 patients who were operated upon the lymphovenous shunt was performed in 29 patients with primary hypoplastic, 9 patients with primary hyperplastic and 15 with secondary lymphedema (Table 1). There were 9 men and 44 women (Table 2). In 31 cases the thigh as well the lower leg were oedematous while in 22 cases the lower leg only was involved (Table 3). The femoral as well as the iliac lymph nodes were anastomosed to the neighbouring veins (Table 4).

In group II of 40 patients with primary lymphedema the patients were not operated upon either because they refused the surgery or because no suitable lymph node for anastomosis was found at lymphography. All patients in this group were submitted to thorough clinical investigations, definite diagnosis was based on lymphangiography.

In all patients of both groups during the first years after discharge a thorough

TABLE 1.—Late results of L.V. shunts (1966-1973).

	Lymphedema	No. of patients
Patients operated upon and followed for 1-7 years	Primary hypoplastic	29
	Primary hyperplastic	9
	Secondary	15
	Total	53
Patients not operated upon followed for 1-3 years	Primary hypoplastic	40

TABLE 5.—Late results of L.V. shunts.

Time of follow up	Lymphedema			Total
	Primary hypoplastic	Primary hyperplastic	Secondary	
1 year	29	9	15	53
1-3 years	23	9	4	36
3-5 years	19	5	2	26
>5 years	16	3	2	21

TABLE 2.—Late results of L.V. shunts.

Lymphedema	Number of patients		
	Men	Women	Total
Primary hypoplastic	3	26	29
Primary hyperplastic	6	3	9
Secondary	—	15	15
Total	9	44	53

TABLE 6.—Primary lymphedema. Patients not operated upon.

Follow up	No. of patients	Results		
		Improvement	No change	Deterioration
1 year	40	11 (28%)	19	10 (24%)
2 years	37	8 (22%)	13	16 (43%)
3 years	28	7 (25%)	10	11 (40%)

TABLE 3.—Late results of L.V. shunts. Localisation of edema.

Lymphedema	Thigh and lower leg	Lower leg only	Total
Primary hypoplastic	12	17	29
Primary hyperplastic	4	5	9
Secondary	15	—	15
Total	31	22	53

TABLE 4.—Late results of L.V. shunts. Lymph nodes anastomosed to the vein.

Vein	Lymphedema			Total
	Primary hypoplastic	Primary hyperplastic	Secondary	
Saphenous	5	—	6	11
Saphenous femoral	4	1	1	6
Femoral	19	4	8	31
Iliac	1	2	—	3
Iliac femoral	—	2	—	2
Total	29	9	15	53

follow up examination was done every 3-6 months, in the later period every 12 months, always by the same group of doctors. The follow up ranged from 1 year to 7 years (Tables 5 and 6). At every follow up examination, circumference measurements at fixed levels (15 cm below the lower margin of patella and 5 cm above the ankles and around the foot) were done. Both extremities were always measured. The patients were also questioned about subsidence of recurrent lymphangitis and about edema regression, disappearance of pain, changes in consistency of its edematous leg, disappearance of edema after rest, as well as changes in configuration of the extremity. The results of operation were classified as very good, good, fair, and bad. The result was considered very good (1) if a circumference decrease of at least 2 cm occurred at least at two levels of the operated extremity compared to the non operated side, (2) if lymphangitis did not recur, (3) if the patients did no longer complain of pain, (4) if the movements of the ankle and knee joints were free

TABLE 7.—Late results of L.V. shunts.

Lymphedema	No. of patients	Results				
		Very good	Good	Fair	Bad	Disap. of pain
Primary hypoplastic	29	—	5 (17%)	2 (7%)	22 (76%)	10 (34%)
Primary hyperplastic	9	4 (44.5%)	1 (11%)	—	4 (44.5%)	5 (55%)
Secondary	15	6 (40%)	3 (20%)	2 (13%)	4 (27%)	7 + 4 (73%)
Total	53					

and painless, (5) if the edema, if present, disappeared readily after rest. The result was considered good (1) if a circumference decrease of at least 2 cm occurred at one level of the extremity, (2) if lymphangitis did not recur, (3) if the edema, if present, disappeared readily after rest. The result was fair (1) if despite the fact that the circumference of the extremity did not change in a remarkable ways bouts of lymphangitis did not reappear, (2) if there were no pains, (3) if the edema disappeared after rest. To facilitate the comparison of the operated cases with the non operated, very good, good, and fair results were classified together in one group as satisfactory. In primary lymphedema the result was considered satisfactory when improvement was still present at least one year after operation, in secondary with the majority of patients dying usually within the first year after operation the result was considered satisfactory if stated 6 months after the shunt.

In group II of 40 patients who were not operated upon the follow up was done every 12 months. The lymphedematous extremity was measured and the patients were questioned in the same way as was done with the patients of group I. If at the follow up the circumference decrease was at least 2 cm and the subjective troubles diminished, improvement was recognised, otherwise no change or deterioration were marked.

RESULTS

The results were different depending on the type of lymphedema for which the operation was done (Table 8). At least one year satisfactory results were obtained in 24% of patients with primary hypoplastic lymphedema, in 56% of patients with primary hyperplastic, and in 74% with secondary lymphedema. In primary hyperplastic lymphedema (Table 10) one year satisfactory results were observed only in 24% of patients, falling off to 17% and 6% in the following years. In

TABLE 8.—Late results of L.V. shunts.

Lymphedema	Number of patients operated upon	At least one year satisfactory res.
Primary hypoplastic	29	7 (24%)
Primary hyperplastic	9	5 (56%)
Secondary	15	11 (74%)
Total	53	

TABLE 9.—Late results of L.V. shunts. Secondary lymphedema.

Follow up	Number of patients alive	Satisfactory results
1 year	15	11 patients (74%)
1-3 years	4	2 patients (18%)
>3 years	2	—
The majority of patients died of malignancy in the first year after operation.		

TABLE 10.—Late results of L.V. shunts. Follow up of 1-7 years.

Primary lymphedema	Follow up	Satisfactory results
Hypoplastic	1 year	7 patients (24%)
	1-3 years	5 patients (17%)
	3-5 years	2 patients (6.8%)
	>5 years	2 patients (6.8%)
Hyperplastic	1 year	5 patients (56%)
	1-3 years	5 patients (56%)
	3-5 years	5 patients (56%)
	>5 years	3 patients (33%)

TABLE 11.—Primary hypoplastic lymphedema. Comparison of patients with surgical L.V. shunts with patients not operated upon.

	No. of patients	Improvement in the course of follow up		
		1 year	2 years	3 years
Patients with L.V. shunts	29	7 (29%)	5 (17%)	5 (17%)
Patients not operated upon	40	11 (28%)	8 (22%)	7 (25%)

primary hyperplastic lymphedema (Table 10) satisfactory results at the end of the first year were obtained in 54% (5 patients out of 9) remaining unchanged up to 5 years (Table 10). In secondary lymphedema (Table 9) 74% good results were observed in the first year, whereas in the second year with only 4 patients out of 15 left alive satisfactory results were lasting in only two patients.

In group II of unoperated patients with primary hypoplastic lymphedema at the end of the first year of follow up improvement was observed in 28%. In subsequent years this fell off to 22% and 25% (Table 6).

DISCUSSION

Good experimental results obtained^{1,2,4} with the anastomosis of the mesenteric lymph node to the I.V.C. have encouraged

our group to use this method in humans. Nevertheless it was not certain whether in human the anastomosis would remain patent long enough to justify that type of procedure. Although in all dogs similar anastomosis of smaller (popliteal or inguinal) nodes to the neighbouring vein occluded after 1-5 months,⁴ the 2 years patency after an anastomosis of a much bigger mesenteric node to the I.V.C. seemed to indicate that in humans the anastomosis of the large inguinal or iliac nodes to the femoral or iliac vein would stay open for long. Besides, since the experiments were performed in animals with normal circulation and no lymphstasis, it was felt that in humans with lymphedema and lymphstasis the condition for a good flow of lymph through the neoformed anastomosis would be much more favorable. A definite answer whether the lymphovenous shunt performed in humans has any practical value can be given only after a critical analysis of the late results. This paper intends to be an answer to this question. At the beginning of our experience the lymphovenous shunts were performed only in patients with secondary lymphedema most often in cases of incurable cancer of the uterus. The operation was considered as a palliation to relieve the pain caused by the longstanding lymphostasis. The first results were good and in this group of patients we observed a remarkable, up to 9 cm, decrease in calf circumference. Although the majority of these patients died during the first post-operative year, due to progression of malignancy neither venous thrombosis nor pulmonary embolism were observed. It was thus felt that this type of operation might be indicated in some cases of primary lymphedema too. As the primary lymphedema is the consequence of aplasia or hypoplasia of the lymphatics the indication for a lymphovenous shunt in these patients seemed open to discussion.

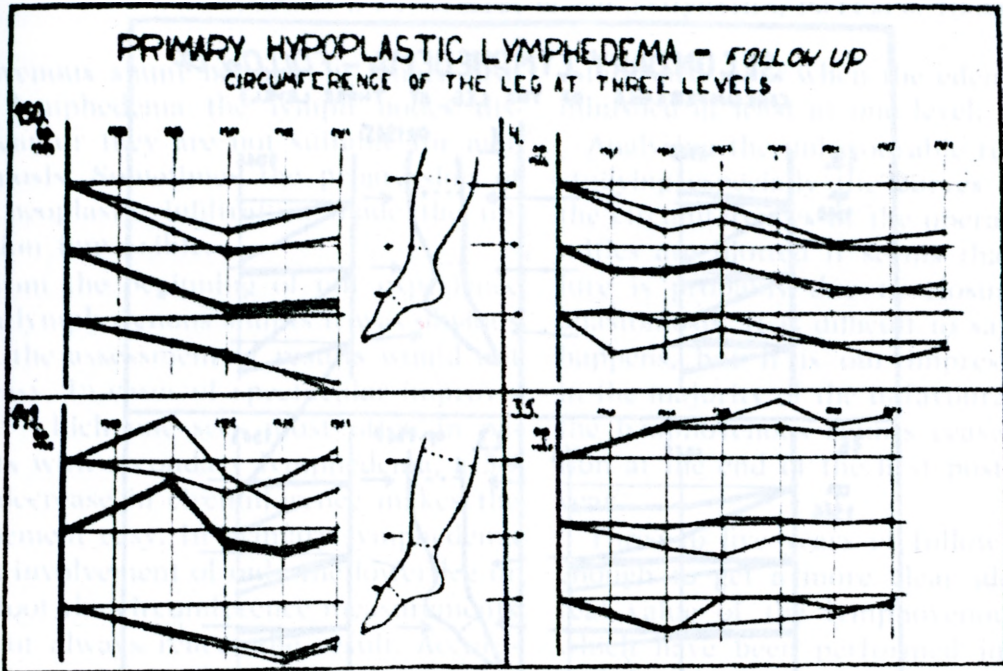


Fig. 1.

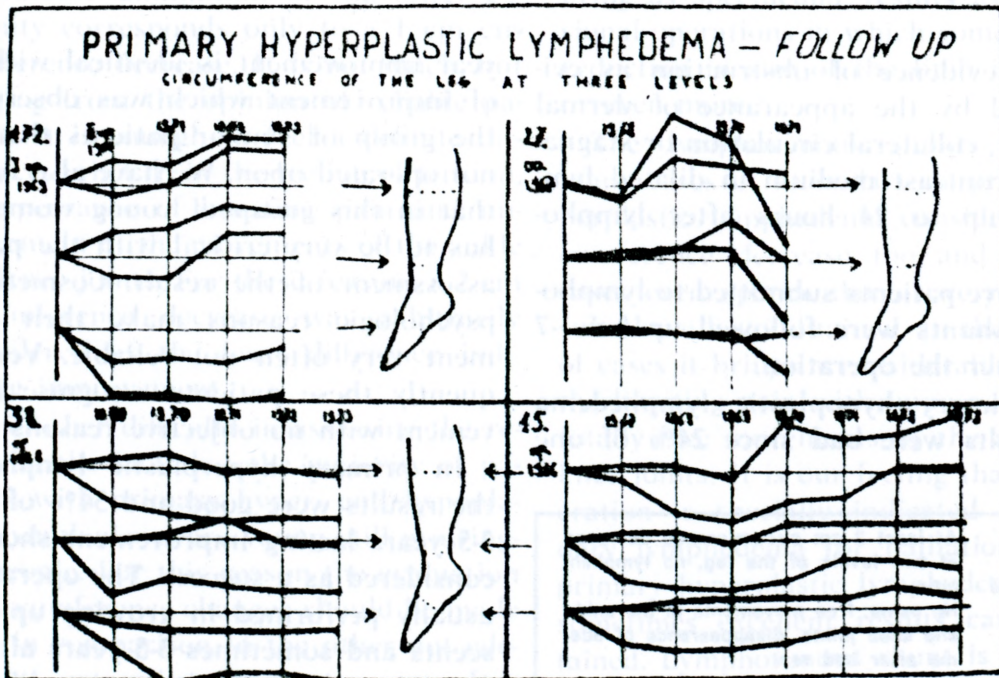


Fig. 2.

We have performed the lymphovenous shunt in a limited group of patients with primary lymphedema selecting only 29 cases out of 135 who were admitted during this time to the department. The fol-

lowing criteria were observed and the lymphovenous shunt was performed for: (1) Primary lymphedema of the hyperplastic type, (2) primary lymphedema with recurrent lymphangitis and lympho-

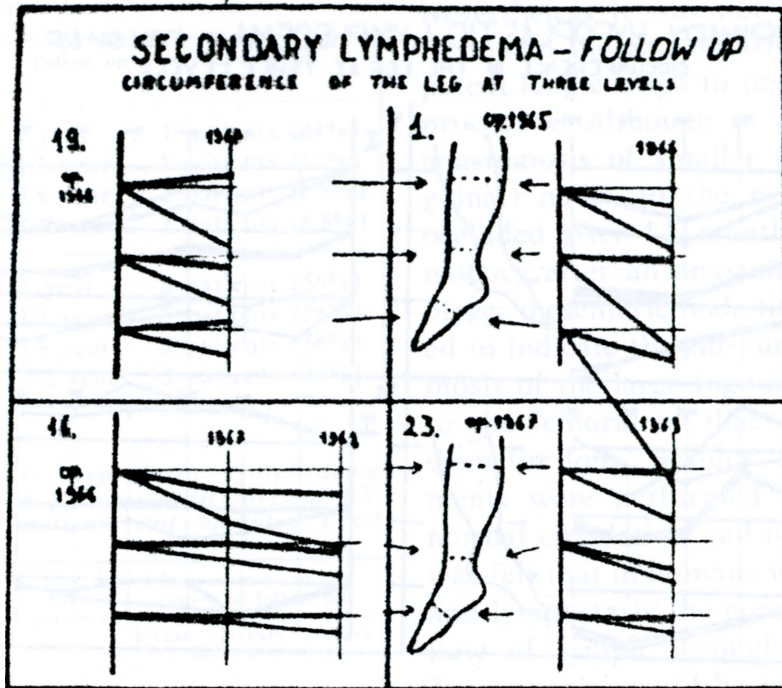


Fig. 3.

graphic evidence of obstruction as evidenced by the appearance of dermal backflow, collateral circulation or stagnation of contrast medium in dilated lymphatics up to 24 hours after lymphography.

Fifty-five patients submitted to lymphovenous shunts were followed up for 1-7 years after the operation.

In primary hypoplastic lymphedema the results were bad since 24% of one

year improvement is identical with 28% of improvement which was observed in the group of similar patients that were not operated upon. We have also realised that in this group of young women one has to be very critical with the patients assessment of the result. Cosmetic and psychologic reasons make their judgement very often not reliable. Very frequently these patients recognise improvement with no objective reasons for it.

In primary hyperplastic lymphedema the results were good and 54% of stable 3-5 years lasting improvement should be considered as a success. The operation is usually performed in growing up adolescents and sometimes 3-5 years after the operation there is almost no difference between both extremities.

In the group of secondary lymphedema satisfactory results were obtained in 74% at the end of 6-12 months follow up. Decrease in calf circumference was up to 7.9 cm and the severe bursting pain disappeared almost totally. Sometimes it was not possible to perform a good lymph

Very good	At least 2 cm circumference decrease at two levels of the leg, no lymphangitis No pains, free movements in the ankle and knee joints, disappearance of edema after bad rest
Good	At least 2 cm circumference decrease at one level of the leg, no lymphangitis, no pains, disappearance of edema after rest
Fair	Disappearance of pains, no lymphangitis, disappearance of edema after bad rest

Fig. 4.—Late results of L.V. shunts. Classification of results.

phovenous shunt because in longer lasting lymphedema the lymph nodes disappear or they are not suitable for anastomosis. Sometimes the progression of the neoplastic infiltration made the operation impossible.

From the beginning of our experience with lymphovenous shunts it was obvious that the assessment of results would not be easy. In cases of spectacular improvement which one sees most often in patients with secondary lymphedema, a 5-9 cm decrease in circumference makes the judgement easy. In primary lymphedema with involvement of only the lower leg or the foot the circumference measurements do not always reflect the result. According to our previous investigations with the water displacement technique a 200 ml volume diminution of the lower extremity corresponds only to a 1 cm circumference decrease. It is not much, but judging from the opinion of reliable patients it is enough to feel a definite difference; relief from the feeling of tension, disappearance of bursting pain and improvement of the movements of the ankle and knee joints. For these reasons a 2 cm circumference decrease was arbitrarily considered as the least difference indicating improvement.

The other difficulty in assessing the results is the fact that the majority of patients with primary hyper- and hypoplastic lymphedema are young still growing-up people. For this reason the evaluation of circumference changes should be made only in comparison to the other not edematous extremity. In some cases after lymphovenous shunt a strange change of configuration of the extremity was observed. Sometimes the edema disappeared after the operation only from the thigh with the calf left unchanged. No explanation for this peculiarity has been found so far but this was the reason to measure the circumference of the operated extremity at three levels and the result was

established good when the edema has diminished at least at one level.

Analysing the unfavourable results and studying especially the curves on which the circumferences of the operated extremities are plotted it seems that the failure is probably due to closure of the anastomosis. It is difficult to say when it happens, but it is our impression that in the majority of the unfavourable cases the lymphovenous shunts cease to function at the end of the first postoperative year.

Three to five years of follow up seem enough to get a more clear idea of the real value of the lymphovenous shunts which have been performed in patients with lymphedema of the lower extremity. It is clear that this operation does not bring as spectacular results as the excisional operations in which sometimes the reduction in size of the limb is by 75% or even more.

The lymphovenous shunts bring in many cases of secondary or primary hyperplastic lymphedema considerable circumference decrease too and in single cases even spectacular or very good results have been obtained. In the majority of cases it brings a considerable relief of the bursting pain with improved or even totally free movements of the ankle and knee joints. It is our feeling that this operation is specially indicated in secondary lymphedema for palliation and in primary hyperplastic lymphedema where sometimes excellent results can be obtained. Lymphovenous shunt is not indicated in primary hypoplastic lymphedema.

CONCLUSIONS AND SUMMARY

In 53 patients with secondary, primary hypoplastic, and primary hyperplastic lymphedema a surgical lymphovenous shunt was performed to decompress the lymphatics.

TABLE 2.—*Comparison of the results with recoronarography and the ultrasonic Doppler method. There was agreement in 34 vein grafts. In 6 cases a difference was seen between the bloodless findings of the ultrasonic method and the results obtained by recoronarography. The difference was due to wrong interpretation of the Doppler signals and to methodical reasons.*

Group	Number of vein-grafts	Agreement	No agreement
1. Occluded	12	9	3
2. Subtotal occlusion	4	3	1
3. Local stenosis >50%	1	1	—
4. Local stenosis <50%	4	3	1
5. Run off ↓	2	2	—
6. Patent	17	16	1
	40	34	6

results corresponded with recoronarography.

A wrong interpretation was given in so-called "borderline" cases with highly slowed-down blood flow and in three cases with open central bypass section and high turbulence.

In one case the internal mammary artery was interpreted as an open bypass to the right coronary artery with atypical systolic flow.

On the basis of our experiences further technical improvements are necessary to increase the reliability of findings obtained with this procedure.

We believe that the ultrasonic Doppler technique is a simple procedure without any risk of the patients life and suitable for follow-up studies.

SUMMARY

These are the results of a series of 40 patients supplied with an aorto-coronary vein bypass. The postoperative follow-up studies cover a period of up to 2 years. The function of the vein bypass was assessed by coronary angiography as well as by the ultrasonic Doppler technique. The bloodless examination with the ultrasonic Doppler technique allows the determination of some hemodynamic criteria such as the mean flow velocity, the duration of flow and the formal assessment of the flow curve. Reliability of the results obtained by the ultrasonic Doppler technique as against coronary angiography is 85%.

REFERENCES

1. Elkadi A.: « Evaluation of aorto-coronary bypass grafts with the Doppler ultrasonic flow meter ». *Mo. Med.*, 69, 359, 1972.
2. Gould K. L., Mozersky D. J., Aokauson D. E., Baker D. W., Kennedy J. W., Sumner D. S., Strandness D. E. Jr.: « A noninvasive technic for determining patency of saphenous vein coronary bypass grafts ». *Circulation*, 46, 595, 1972.
3. Hallin R. W., Page U. S., Bigelow J. C., Sweetman W. R.: « Revascularization of the heart ». *Amer. J. Surg.*, 122, 164, 1971.
4. Loisanec D. Y., Hinglais J., Peronneau P. A., Pellet M.: « Perioperative study of aorto-coronary bypass by ultrasonic flow meter. Preliminary results ». *La presse medicale*, 79, 47, 2130, 1971.
5. Vogel S., Pardemann G., Magnus S.: « Unblutige Untersuchungen über den Durchfluss im aortocoronaren Venenbypass mit dem Ultraschall-Doppler-Verfahren ». *Wiss. Zschr. Humboldt-Univ., Math. Nat. R., III Druck*, 23, 1974.

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The lymphovenous shunt between the cut surface of the lymph node and the neighbouring vein is indicated in: Secondary lymphedema and primary hyperplastic lymphedema. The shunt is not indicated in primary hypoplastic lymphedema.

Satisfactory one year results with a lymphovenous shunt were obtained in 74% of the patients operated upon because of secondary lymphedema, in 56% with primary hyperplastic lymphedema and in 24% with primary hypoplastic lymphedema.

REFERENCES

1. Nielubowicz J., Olszewski W.: «Journal of Cardiovascular Surgery. Special issue». Congress European Society International Cardiovascular Society, Amsterdam, 1966, pag. 384-385.
2. Nielubowicz J., Olszewski W.: «Anastomosis chirurgiche linfaticovenose». *Minerva Cardioangiologica*, 15, 254, 1967.
3. Nielubowicz J., Olszewski W., Sokolowski J.: «Surgical lymphovenous shunts». *J. Cardiovasc. Surg. Special Issue VIII Congress of the International Society for Cardiovascular Surgery*, Vienna, September 7-9, 1967.
4. Nielubowicz J., Olszewski W.: «Surgical lymphaticovenous shunts in patients with secondary lymphedema». *Brit. J. Surg.*, 55, 440, 1968.
5. Nielubowicz J., Olszewski W., Sokolowski J.: «Lymphovenous anastomosis». *J. Cardiovasc. Surg.*, 1968. Special issue. XVII Congress of the Europ. Soc. Cardiovasc. Surg. London, July 1-3, 1968, 98.
6. Calnan J. S., Reis N. D., Pilug M. D.: «The late results of lymph node to vein anastomoses in the dog». *J. Cardiovasc. Surg.*, 1968. Special issue. XVII Congress of the Europ. Soc. Cardiovasc. Surg. London, July 1-3, 1968, 116.

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