

INDICATION OF THROMBOENDARTERECTOMY WITH RING DISSECTOR IN TASC C AND D FEMOROPOPLITEAL LESIONS –A RE-EVALUATION

MIRCEA CĂTĂLIN COȘARCĂ¹, EMOKE HORVATH², COSMIN CARAȘCA³, RALUCA NICULESCU⁴, MEDEEA ROMAN⁵, IOANA HALMACIU⁶, KLARA BRÎNZANIUC⁷, LUCIAN PUȘCAȘIU⁸, ADRIAN VASILE MUREȘAN⁹, BOGDAN ANDREI SUCIU¹⁰, IOAN TEODOR BUD¹¹

^{1,2,3,6,7,8,9,10,11}Emergency Clinical County Hospital Târgu Mureș, ^{1,2,6,8,9,10}“George Emil Palade” University of Medicine, Pharmacy, Science and Technology of Târgu Mureș, ³ Forensic Medicine Institute of Târgu Mureș, ⁷Emergency Institute for Cardiovascular Diseases and Transplantation Târgu Mureș

Keywords:
endarterectomy, ring dissector, TASC C and D femoropopliteal lesions

Abstract: Purpose: to evaluate the effectiveness and benefits of Ring Dissector endarterectomy performed in patients with TASC C and D femoropopliteal lesions. Materials and methods: we performed a retrospective study, obtaining data from the medical records. The criteria for inclusion were the presence of TASC C and D lesions, in which endarterectomy with ring dissector was performed between January 2016 and February 2019 in the Vascular Surgery Department. Results: from demographics data, most were men, aged over 60. Most of the patients had lower limb pain at the moment of admission. They were also suffering from multiple conditions, many from heart diseases (40%) following chronic treatment, especially with anticoagulants (41%). As a major risk factor, we have identified a large number of smokers: 58%. In terms of intervention, the average time was 85 minutes. 93% of the patients were discharged without complications. Conclusions: the multiple benefits offered by the ring dissector endarterectomy: faster wound healing, native artery preservation, shorter operative time, lower rate of infections and many others. Analysing all these, this technique can be considered the primary therapeutic option in TASC C and D femoropopliteal lesions.

INTRODUCTION

According to the Trans-Atlantic Inter-Society Consensus (TASC II) guidelines, multiple stenosis and/or occlusions of the femoropopliteal artery, collectively measuring 15 cm in length, were defined as TASC C lesions, while the continuous ones that reach a value of 20 cm and include total chronic occlusions are referred to as TASC D lesions. These criteria of separation between TASC C and TASC D, together with patient comorbidities are taken into consideration when the therapeutic window is decided.(1,2) Revascularization, which represents the treatment of choice for critical limb ischemia, can be performed using either open medical procedures or endovascular ones. TASC II guidelines mention percutaneous transluminal angioplasty as gold standard for TASC A and B lesions, whereas surgical approach is recommended in the presence of type C and D lesions. Most of the patients suffering from TASC C and D lesions present with multiple medical comorbidities which represent a high operative risk. Consequently, a hybrid procedure combining both surgical and endovascular techniques (ring dissector thrombendarterectomy) is recommended.(3) Thrombendarterectomy is the technique of extracting the obstructive thrombus together with the atheromatous plaque that has complicated it, the inner layer and a part of the middle layer of the arterial wall. The aim is to use and preserve the native artery as much as possible, postponing the need for bypass and reconsidering the option for future endovascular interventions.(3,4)

AIM

The present retrospective study followed the patients

undergoing a ring dissector thrombendarterectomy, the benefits of the procedure, the patient's health status at admission and noted the results.

MATERIALS AND METHODS

Patients

134 patients presenting with chronic lower limb ischemia between January 2016 and February 2019 were retrospectively reviewed. Ring Dissector Endarterectomy was performed in all these patients admitted in the Vascular Surgery Department of the Mureș County Emergency Hospital. We used TASC II classification to define the severity of the disease. The inclusion criterion was the presence of femoropopliteal TASC C and D lesions. Medical data were extracted from patient records, such as: demographic data, disease characteristics, operative aspects, complications, evolution details and other outcome variables. The protocol for the study was approved by Mureș County Emergency Hospital ethics committee and we also collected the informed consent from all the patients.

Surgical procedure

We performed an incision through Scarpa's triangle, dissecting the subcutaneous cellular tissue and pushing the lymph nodes medially for the disclosure of the common, superficial and deep femoral artery. After their disclosure, we palpated their lumen, then suspended them on tourniquets. After clamping the common femoral artery, the superficial femoral and the deep femoral, with prior systemic heparinization, we performed a longitudinal arteriotomy of the common femoral artery, extended towards the superficial femoral artery. By making an incision in the popliteal region we entered the

⁶Corresponding author: Ioana Hălmăciu, Str. Aleea Cornișă, Nr. 6, Ap. 8, Târgu-Mureș, România, E-mail: anca_hălmăciu@yahoo.com, Phone: +40744 796343

Article received on 20.03.2019 and accepted for publication on 12.06.2019
ACTA MEDICA TRANSILVANICA September;24(3):24-27

CLINICAL ASPECTS

popliteal fossa through a medial approach. After discovering the popliteal artery by dissection with a Metzenbaum scissor, we practiced a longitudinal arteriotomy using Cooley scissors (after having previously clamped the artery). The next step was marking the arterial plaque from the common and superficial femoral artery and popliteal artery, then using the Schimdt spatula to remove the plaque from the arterial wall. After removing the femoral and popliteal plaque using the spatula, we used the Metzenbaum scissors to cut the plaque. The following step was to insert the ring dissector stripper at the level of the superficial femoral artery between the detached plaque and the arterial wall, and by twisting movements pushing the probe down, aiming the popliteal artery. Therefore, through twisting movements we extracted the probe coming from the popliteal artery through the proximal superficial femoral artery, while managing to completely remove the atheromatous plaque from the popliteal and superficial femoral artery. After removing the plaque from the surface of the superficial femoral artery by using the ring dissector probe, we practiced intravascular heparinization followed by arteriography, surveillance of hemostasis, subcutaneous draining if necessary, subcutaneous suture. All patients were discharged with oral anticoagulant treatment.

Statistical analysis

We performed a retrospective, observational study using demographic data and health status data. For statistical analysis we used data SPSS software 20. Categorical variables were presented as count and percentages and the continuous variables as mean±SD. To normalize the data, the normality test D'Agostino & Pearson was used. Associated t test samples were used to analyse the difference between pre and post-surgery performances. The confidence interval was set to CI = 95%, this being the standard.

RESULTS

Patient status data

According to the baseline demographic and clinical data found in table no. 1, the majority of patients included in the study were males. Most patients were between 63 and 67 years old, the most frequent admission symptom was lower limb pain, which appeared mostly at least 6 months prior from the time of the admission. 30% of the patients were showing skin trophic disorders at the time of their admission.

Table no. 1. Indication of thrombendarterectomy with ring dissector in TASC C and D femoropopliteal lesions - a re-evaluation

Age	Mean		min	max	95% confidence interval		p
	Statistic	Std. Error			Min	Max	
	65.6791	0.86	27	85	63.98	67.38	<0.0001
					Number		Rate(%)
Gender	Masculine				106		79.10
	Feminine				28		20.90
Symptoms	Lower limb pain				80		59.70
	Pain at rest				31		23.13
	Feeling cold leg				13		9.70
	Paresthesia				16		11.94
Symptomatology onset	> 1 year				52		38.81
	<6 months				53		39.55
	<3 months				29		21.64

The majority of the patients presented with various comorbidities, the most frequent being cardiac diseases, followed by hypertension and dyslipidemia. Due to that, 41% of them were treated with anticoagulants and 35% with antiplatelet therapy. 78 patients were active smokers and 26 were former smokers, most of them (32%) smoked a package a day. At the time of admission 55% were hypertensive, 45% of them having

second degree hypertension. 34% of the patients enrolled in the study were overweight.

Regarding the routine blood tests taken at admission, 29.85% of all patients suffered from leukocytosis, the mean value for Hgb was, and the INR value was between 1 and 3. Kalemia had increased values in 60% of the patients.

Table no. 2. Indication of thrombendarterectomy with ring dissector in TASC C and D femoropopliteal lesions - a re-evaluation

Personal physiological and pathological history	Cardiac affections	53	39.55	
	Diabetes	18	13.43	
	Dyslipidemia	29	21.64	
	Hypertension	52	38.81	
	Chronic kidney disease	9	6.72	
Fundamental medication	Anticoagulants	55	41.04	
	Antiplatelet	47	35.07	
	Lipid-lowering	21	15.67	
	Antianginal	15	11.19	
	β-blockers	19	14.18	
	Vasodilators	33	24.63	
	Calcium antagonists	6	4.48	
	Angiotensin- converting enzyme inhibitors	10	7.46	
	Diuretics	17	12.69	
Smoking	Yes	78	58.20	
	Former smoker	26	19.40	
	Under 1/2 package	17	12.68	
	1/2 package	30	22.38	
	1 package	44	32.83	
	more than 1 package	13	9.70	
Alcohol		14	10.45	
Blood pressure values at admission	Normotensive	58	43.28	
	Hypotensive	0	0.00	
	Hypertensive	gr1	34	25.37
		gr2	27	20.15
		gr3	14	10.45
Transfusions		0	0.00	
Skin trophic disorders	Skin trophic disorders	40	29.85	
	Gangrene	19	14.18	
	Edema	21	15.67	
	BMI	Obesity I	20	14.93
		Obesity II	8	5.97
		Obesity III	3	2.24
		Overweight	46	34.33
Normal weight		62	46.27	
Underweight	5	3.73		

Table no. 3. Indication of thrombendarterectomy with ring dissector in TASC C and D femoropopliteal lesions - a re-evaluation

	Mean		Min	Max	95% confidence interval	
	Statistic	Std. Error			Min	Max
Leucocytes	11.2396	1.57527	4.32	216	8.12371	14.35535
Haemoglobin	13.2687	.20819	6.50	30.45	12.8569	13.6805
Glucose	111.675	3.35762	67	286	105.033	118.317
Urea	43.5113	2.02324	14.80	142	39.5091	47.5135
AST	23.5421	1.18420	9	122.50	21.200	25.885
ALT	23.6439	1.31978	6	121	21.033	26.255
INR	1.2371	.05354	0.70	6.03	1.1312	1.3430
Creatinine	1.0704	.06584	.59	8.50	0.9401	1.2006
Sodium	139.634	.25397	133	152	139.132	140.137
Potassium	4.5677	.04187	3.20	6.33	4.4849	4.6505

Surgical data

We used the Ring Dissector in all 134 cases of TASC C and D femoropopliteal lesions, in 52% of the total interventions we also used the Fogarty probe. The average duration of the interventions was 85 minutes. Regarding the admission time, the average was 8 days, mentioning that those who needed extra admission days also underwent secondary

CLINICAL ASPECTS

interventions

The reintervention rate for complications was 7%, most of them consisting in wound revisions, only 3% of the patients required amputations. The patients included in the study did not require the administration of blood products or blood derivatives.

Table no. 4. Indication of thrombendarterectomy with Ring Dissector in TASC C and D femoropopliteal lesions - a re-evaluation

		Number of cases				Rate (%)	
Instrument used	Fogarty	69				51.49	
	Ring Dissector	134				100	
	Schmidt Spatula	30				22.39	
Duration of the intervention	0-60 min	36				26.87	
	>60 min	77				57.46	
	>120 min	20				14.93	
Period of admission	Under 5 days	14				10.45	
	5-7 days	59				44.03	
	above 7 days	61				45.52	
	Other interventions during this period		36				26.87
	Mean	Min	Max	95% confidence interval		Std deviation	
Statis- tic	Std. Error	3	25	Min	Max	4.1356	
	8.7239	.35727		7.78	9.31		
Post-op complications	Reintervention		10				7.462
	Surgeries of necessity	Necrectomy	2				1.49
		Amputation	3				2.23
		Revision of the plaques	5				3.731

A series of blood tests was performed at discharge. The kidney's function was determined, which had values approximately equal to those determined upon admission. The outcome of the treatment initiated with oral anticoagulants after surgery was monitored, the INR value being elevated compared to the one at admission ($p < 0.0001$).

Table no. 5. Indication of thrombendarterectomy with ring dissector in TASC C and D femoropopliteal lesions - a re-evaluation

	Paired Differences			t	df	Sig.(2-tailed)
	Mean	95% confidence interval of the difference				
		Lower	Upper			
Urea before / after	3.5000	-5.92110	12.92110	.743	61	.460
GOT before / after	222025	-2.24581	6.68631	.990	78	.325
GPT before / after	1.42857	-2.40419	5.26134	.742	76	.460
INR before / after	-66090	-.84489	-.47691	-7.105	132	.000
Creatinine before / after	.08186	.00682	.15689	2.166	96	.033

DISCUSSIONS

Between TASC I and Tasc II classification, major changes have been made regarding the therapeutic options and conditions, leading to an endovascular approach concerning the treatment of femoral-popliteal artery occlusions.(5) Worthy of mentioning is the work done by the two authors Ballotta et al. and Kang et al., concluded from their follow-up studies conducted over 7 years, 27 months, reaching rate values of

success in rescuing the limbs following endarterectomy of 90%, 96% and 100%. They established that this procedure remains the standard therapy in obliterant arteriopathies of the lower limbs.(6)

There are still many surgeons who claim that bypass should be the initial treatment for chronic obliterant arteriopathy of the lower limbs.(7) Quite frequently, following limb bypass surgery, there occurs an infection of the surgical site, this leads in most cases to graft infection, leading to a 58% rate of amputation. Besides the many side effects that these infections have on patients, they also lead to an increase in healthcare costs due to the need for extra interventions and the prolongation of the number of days of hospitalization.(8,9)

Taking into account other endovascular techniques for the treatment of chronic obliterant arteriopathy of the lower limbs, we can speak of percutaneous interventions with a high rate of success - 92.8%, presenting a complication rate of 1.4%, but having a restenosis rate of 30%.(10) By treating simple balloon angioplasty separately from that involving stent implantation, the second has a lower stenosis rate, but it should be taken into account that the aim is to preserve the native artery for as long as possible for future surgical interventions, so stenting it is avoided as much as possible and done only if needed.(6)

The limitations of this retrospective study are that the results of the patients have not been followed for a longer period of time. Another disadvantage is that patients come from a single hospital unit. But aside from this, endarterectomy with ring dissector shows satisfactory results.

CONCLUSIONS

This study highlights the fact that the ring dissector endarterectomy in the case of TASC C and D femoral-popliteal lesions can be considered a therapeutic option with increased success. Revascularization through this safe and effective method has led to the functional maintenance of the native artery and the preservation of collateral arteries at lesion level.

This surgical technique brings together both the advantages of minimally invasive surgery with endovascular techniques, which makes it useful for patients with prominent comorbidities due to the shorter operative duration and implicitly shortening the duration of anesthesia, a faster healing time due to smaller incisions, which also leads to healthcare savings.

REFERENCES

- Grenville JL, Tan TK, Moshonov H. Endovascular first strategy for de novo TransAtlantic Inter-Society Consensus C and D femoro-popliteal disease: Mid-term outcomes from a single tertiary referral center. *Vascular*. 2015;23(1):31-40.
- Aziz F, Bohr T, Lehman EB. Wound Disruption after Lower Extremity Bypass Surgery is a Predictor of Subsequent Development of Wound Infection. *Ann Vasc Surg*. 2017 Aug;43:176-187.Epub 2017 Mar 11
- Davaine JM, Querat J, Kaladji A, Guyomarch B, Chaillou P. Treatment of TASC C and D Femoropopliteal Lesions with Paclitaxel eluting Stents: 12 month Results of STELLA – PTX Registry. *Eur J Vasc Endovasc Surg*. 2015;50:631-637.
- Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FGR, on behalf of the TASC II Working Group Inter-society consensus for the management of peripheral arterial disease (TASC II) *Eur J Vasc Endovasc Surg*. 2007;33:S1-S70.
- Ahn S, Park KM, Kim YK, J ill Kim, Kee Chun Hong.

- Outcomes of endovascular treatment for TASC C and D aorto-iliac lesions. *Asian Journal of Surgery*.2016;XX:1-6.
6. Bonvini RF, Rastan A, Sixt S. Endovascular Treatment of Common Femoral Artery Disease: Medium-Term Outcomes of 360 Consecutive Procedures. *Journal of the American College of Cardiology*. 2011 Aug;58(8):792-798.
 7. Adam DJ, Beard JD, Cleveland T, Bell J, Bradbury AW, Forbes JF, Fowkes FG, Gillespie I, Ruckley CV, Raab G, Storkey H, BASIL trial participants. Bypass versus angioplasty in severe ischaemia of the leg (BASIL): multicentre, randomised controlled trial. *Lancet*. 2005 Dec 3;366(9501):1925-34.
 8. Vogel TR, Dombrovskiy VY, Carson JL, Haser PB, Lowry SF, Graham AM. Infectious complications after elective vascular surgical procedures. *J Vasc Surg*. 2010 Jan;51(1):122–9. Discussion 129-30. Epub 2009 Dec 2.
 9. Siracuse JJ, Nandivada P, Giles KA, Hamdan AD, Wyers MC, Chaikof EL, Pomposelli FB, Schermerhorn ML. Author information Copyright and License information Disclaimer. Ten Year Experience with Prosthetic Graft Infections Involving the Femoral Artery. *J Vasc Surg*. 2013 Mar;57(3):700–705.
 10. Kasapis C, Henke PK, Chetcuti SJ, et al. Routine stent implantation vs. percutaneous transluminal angioplasty in femoropopliteal artery disease: a meta-analysis of randomized controlled trials. *Eur Heart J*. 2009;30:44-55.