Unbalanced risk factors, could compromise the effectiveness of physical training in patients with intermittent claudication?

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Aim. **The correction of atherosclerotic risk factors is the unavoidable assumption to assure the maximal effectiveness and duration of the results of any therapeutic intervention (pharmacological and surgical) for the treatment of intermittent claudication. Aim of this study has been to verify if the presence/absence of risk factors and the degree of their correction could compromise the responsiveness of claudicant patients to the supervised physical training.**

Methods. **Initial (IDC), absolute (ACD) claudication distance, and recovery time (RT) have been measured by maximal treadmill exercise in 74 claudicants. The measurements have been repeated after 18 days of supervised physical training consisting of a daily walk reaching either a distance goal of 1-2 km or a time goal of at least 30 min. The working load of each single training session has been tailored at 60-70% of the ACD measured by a non-maximal treadmill exercise. The patients' cohort has been stratified in 7 groups and 18 sub-groups (no smokers, smokers in the past, still smokers, no-diabetics, well balanced and unbalanced diabetes, absent, well balanced and unbalanced hypercholesterolemia, normal weight, over weight and light obesity, hypertensive and no-hypertensive, with and without previous myocardial infarction and TIAs or stroke). The mean and standard error of ICD, ACD and RT before and after 18 days of physical training have been calculated and compared with Student's t test in each group and sub-group. On the data before and after training of ICD, ACD and RT of each group of risk factors the multivariate analysis of the variance has been carried out by analysis of variance (ANOVA). All the analyses were considered significant when the P value was less than 0.05.**

Results. **ICD values increased from 55.12 to 121.86 m, ACD from 103.16 to 191.58 m, RT reduced from 204.04 to 87.46 s, confirming the relevant ($P<0.0001$) effectiveness of supervised physical training on the walking capacity of claudicant patients. The comparison between the deltas (value after minus value before) of each sub-group did not show any significant difference. The multivariate ANOVA of before and after ICD ACD and RT of each risk factor groups showed values relevantly lesser than 0.05, indicating that risk factors did not influence the result of physical training.**

Conclusion. **The supervised physical training is confirmed as an effective tool for the treatment of claudicant patient. We did not find any significant difference in the response to the programme related with the presence, absence or balance degree of risk factors, and we conclude that physical training effectiveness is inde-**

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pendent from the their presence, absence or balance degree. This statement is very important because highlights the physical training as the only therapeutic tool for peripheral arterial disease (PAD) independent from the results of the risk factors' treatment.

Key words: **Physical fitness - Rehabilitation - Peripheral vascular arterial diseases - Intermittent claudication.**

Intermittent claudication (IC) is the main symptom of peripheral arterial disease (PAD), showing a prevalence between 3% and 10% in the general population, reaching 20% in the people over 70 years old,[1-5] and significantly limiting the daily activities [6] and quality of life (QoL).[7]

The goals of the management of IC are to prevent major cardiovascular events, to slow the progression of the local and/or systemic disease, and to improve the walking capacity.[8-11]

The primary therapeutic option is the correction of the risk factors, out of which the effectiveness of all therapeutic (pharmacological and surgical) interventions is reduced or compromised. Cigarette smoking is the more frequent risk factor in patients with IC, with a relevant role in the etiopathogenesis, progression and pathophysiology of the disease.[12] Smoking causes also a significant worsening of perfusion and oxygenation of muscles of the lower limbs.[13, 14] Smoker patients show a higher reduction in walking ability than patients who stop smoking.[15, 16] The diabetes, frequent as risk factor for PAD, anticipates of one decade the appearance of PAD, it resets the man/woman ratio for atherosclerosis and PAD,[17] and the PAD is yet present, when diabetes is diagnosed, at least in 8% of diabetic people.[18] The hypercholesterolemia, indicated overall as risk factor, is also responsible of a secondary hyperviscosity syndrome reducing the microcirculatory perfusion.[19] An adequate correction of the risk factors remains the main option of the management of IC.[20]

Regarding the walking ability, several pharmacological treatments, able to increase the initial (ICD) and absolute (ACD) claudication distances and improving the patients' QoL, have been proposed.[21-27] However, the more effective tool, recommended by all guidelines is the supervised physical training,[28-31] which improves both ICD and ACD and QoL.[29, 32-39]

Because of the correction of the risk factors is the unavoidable assumption to assure the maximal effectiveness and duration of the majority of the therapeutic tools, the aim of this study has been to verify if the presence/absence of risk factors and their correction could compromise the responsiveness of claudicant patients to the supervised physical training.

Materials and methods

Patients and protocol

Seventy-four patients with IC have been enrolled in the Vascular Rehabilitation Unit of our clinic for the supervised training program. All subjects provided informed consent and, the day before the beginning of the rehabilitation program, they all had an echo-colour Doppler of supra-aortic arteries, abdominal aorta and lower limb arteries (with ankle/brachial index [ABI] measurement) to confirm the diagnosis. Following this, they had a 10 min warm-up, consisting of a bicycle exercise without any load, and then familiarized with the treadmill test device. Subsequently, they performed a maximal treadmill test (speed 3 km/h, slope 12%) to evaluate the maximal walking ability. The test was discontinued when calf pain made it impossible to continue, thus measuring the initial claudication distance (ICD, distance walked before muscular symptoms appear without impeding walking) and the absolute claudication distance (ACD, distance at which the patient stops walking due to muscular cramps). The recovery time (RT: time needed for the calf pain to disappear and to recover the ability to restart walking) was measured too. These measurements have been repeated after 18 days of supervised physical training consisting of a daily walk reaching either a distance goal of 1-2 km or a time goal of at least 30 min. The working load of

TABLE I.—*Mean, SE and Student's t test of ICD, ACD, and recovery time, before and after 18 days of supervised physical training.*

		ICD			ACD			Recovery time		
		Before		After	Before		After	Before		After
Smokers										
No (18)	Mean	54.28		108.06	97.33		171.33	231.11		92.22
	SE	8.49		12.37	11.90		15.08	26.07		10.02
	P<		0.0001			0.0001			0.0001	
Yes (24)	Mean	63.13		140.00	111.71		219.04	189.17		76.04
	SE	7.25		14.70	9.72		18.46	22.16		7.09
	P<		0.0001			0.0001			0.0001	
In the past (32)	Mean	51.97		120.59	103.97		190.53	193.28		89.69
	SE	6.21		12.10	9.19		14.40	14.39		8.82
	P<		0.0001			0.0001			0.0001	
Diabetes										
No (33)	Mean	53.36		121.76	106.15		195.97	200.30		92.88
	SE	5.31		12.88	8.96		17.9	17.97		7.36
	P<		0.0001			0.0001			0.0001	
Well balanced (20)	Mean	49.70		103.05	92.50		173.85	179.25		75.5
	SE	7.93		11.47	10.40		12.74	18.21		11.3
	P<		0.0001			0.0001			0.0001	
Unbalanced (21)	Mean	66.67		147.19	114.62		214.00	223.33		84.76
	SE	9.00		13.58	11.26		13.5	22.84		8.38
	P<		0.0001			0.0001			0.0002	
Hypercholesterolemia										
No (38)	Mean	63.21		136.74	113.21		203.32	214.08		91.45
	SE	6.57		11.27	9.15		13.41	17.01		7.26
	P<		0.0001			0.0001			0.0001	
Well balanced (16)	Mean	42.62		107.00	98.56		181.25	206.25		68.75
	SE	5.36		12.91	8.97		15.35	27.27		12.01
	P<		0.0001			0.0001			0.0001	
Unbalanced (20)	Mean	53.55		113.10	94.05		190.60	172.50		89.00
	SE	6.98		15.47	10.09		21.32	16.03		8.02
	P<		0.001			0.0002			0.001	
BMI										
Normal weight (24)	Mean	68.13		113.71	110.71		196.75	209.79		89.38
	SE	9.42		11.13	8.96		16.67	23.34		9.01
	P<		0.003			0.0001			0.0001	
Overweight (43)	Mean	51.37		130.00	103.93		198.41	192.09		80.47
	SE	4.28		11.14	6.71		12.85	13.09		6.66
	P<		0.0001			0.0001			0.0001	
Light obesity (7)	Mean	44.43		121.57	90.57		169.14	227.14		107.14
	SE	9.30		25.00	12.09		27.16	45.18		15.07
	P<		0.001			0.02			0.02	
Hypertension										
No (32)	Mean	48.66		123.66	98.03		198.91	191.88		84.43
	SE	4.75		14.53	7.79		16.97	19.58		8.41
	P<		0.0001			0.0001			0.0001	
Yes (42)	Mean	61.86		124.11	110.07		192.21	208.21		86.98
	SE	6.17		8.11	8.30		10.81	13.65		6.33
	P<		0.0001			0.0001			0.0001	
Previous AMI										
No (59)	Mean	57.88		123.24	108.17		199.03	195.34		79.66
	SE	4.96		9.13	6.71		11.00	13.72		5.46
	P<		0.0001			0.0001			0.0001	
Yes (15)	Mean	49.33		126.60	91.87		179.67	224.00		110.33
	SE	5.31		13.33	10.71		18.19	15.70		11.09
	P<		0.0001			0.0001			0.0001	
Stroke										
No (68)	Mean	56.19		125.34	104.71		196.96	199.93		85.51
	SE	3.89		8.08	5.56		9.61	12.30		5.31
	P<		0.0001			0.0001			0.0001	
YES (6)	Mean	55.67		107.83	106.67		177.50	215.00		90.00
	SE	27.21		28.03	36.66		46.77	22.47		18.62
	P<		0.002			0.006			0.001	

ICD: initial claudication distance; ACD: absolute claudication distance; BMI: Body Mass Index.

TABLE II.—*Mean, SE and Student's t test of arithmetic deltas (after value minus before value) of ICD, ACD, and recovery time in all investigated sub-groups.*

	ICD			ACD			Recovery time		
	No	Yes	Past	No	Yes	Past	No	Yes	Past
Smokers									
Mean	53.77	77.13	68.63	74.00	107.33	89.56	-138.88	-113.13	-103.59
SE	7.80	12.24	8.33	8.35	14.91	8.10	26.59	21.14	9.57
P		NS			NS			NS	
	No	Well b	Unbal	No	Well b	Unbal	No	Well b	Unbal
Diabetes									
Mean	68.39	53.35	80.52	195.97	173.85	214.00	-107.42	-103.75	-138.57
SE	10.35	9.46	8.99	17.90	12.74	35.00	14.94	14.31	23.68
P		NS			NS			NS	
	No	Well b	Unbal	No	Well b	Unbal	No	Well b	Unbal
Hypercholesterolemia									
Mean	73.53	64.38	59.55	203.32	181.25	190.60	-122.63	-137.50	-83.50
SE	8.67	8.97	11.23	13.41	15.35	21.32	15.10	23.50	14.98
P		NS			NS			NS	
	Normal weight	Over weight	Light obesity	Normal weight	Over weight	Light obesity	Normal weight	Over weight	Light obesity
BMI									
Mean	45.58	78.63	77.14	86.64	94.49	78.51	-120.42	-111.63	-120.00
SE	6.62	9.18	17.67	10.60	8.96	17.01	21.84	11.11	43.92
P		NS			NS			NS	
	No		Yes	No		Yes	No		Yes
Hypertension									
Mean	75.00		62.26	100.88		82.14	-107.44		-121.24
SE	10.97		5.57	11.58		6.69	17.15		12.60
P		NSs			NS			NS	
	No		Yes	No		Yes	No		Yes
Previous AMI									
Mean	65.63		77.27	90.56		87.80	-115.68		-113.67
SE	6.69		10.00	7.62		10.34	12.11		17.77
P		NS			-NS			NS	
	No		Yes	No		Yes	No		Yes
Stroke									
MEAN	69.15		52.17	91.96		70.83	-114.41		-125.00
SE	6.12		11.51	6.77		18.51	11.01		22.62
P		NS			NS			NS	

ICD: initial claudication distance; ACD: absolute claudication distance; No: no smoker, no diabetes, no hypertensive; Yes: still smokers, hypertensive; Past: smoker in the past; Well b: well balanced diabetes; Unbal: unbalanced diabetes.

each single training session has been tailored at 60-70% of the ACD measured by a non-maximal treadmill exercise.

The patients' database has been divided into 7 groups according with the considered risk factors. Each group has been subdivided into sub-groups. Smoker patients have been classified as no smokers, smokers in the past and still smokers, following their replies to the anamnestic investigation. The patient has

TABLE III.—*Multivariate analysis of variance (split-plot model) of deltas values in several sub-groups with well balanced sample size.*

Δs mean	ICD			ACD			Recovery time		
	No	Yes	Past	No	Yes	Past	No	Yes	Past
Smokers									
Before	54.28	63.13	51.97	97.33	111.71	1039.19	231.11	189.17	193.28
After	108.06	140.00	120.59	171.33	219.04	190.53	92.22	76.04	89.64
Variance F		1.18			2.07			0.93	
P		0.313			0.133			0.393	
Δs mean	No	Well b	Unbal	No	Well b	Unbal	No	Well b	Unbal
Diabetes									
Before	53.36	49.70	66.67	106.15	92.50	114.62	200.30	179.25	223.33
After	121.73	103.05	147.19	195.97	173.85	214.00	92.88	75.50	84.76
Variance F		1.60			0.54			1.03	
P		0.21			0.583			0.360	
Δs mean	Normal weight	Over weight	Light obesity	Normal weight	Over weight	Light obesity	Normal weight	Over weight	Light obesity
BMI									
Before	68.13	51.37	44.43	110.71	103.93	90.57	209.79	192.09	227.14
After	113.71	130.00	121.57	150.75	198.41	169.14	89.38	80.47	107.14
Variance F		3.93			0.35			0.09	
P		0.024			0.703			0.918	
Δs mean	No		Yes	No		Yes	No		Yes
Hypertension									
Before	48.66		61.86	98.03		110.07	191.88		208.21
After	123.66		124.11	198.91		192.21	84.43		86.98
Variance F			1.23			2.14			0.44
P			0.271			0.148			0.509

ICD: initial claudication distance; ACD: absolute claudication distance; No: no smoker, no diabetes, no hypertension; Yes: still smokers, hypertenion; Past: smoker in the past; Well b: well balanced diabetes; Unibal: unbalanced diabetes.

been included as smoker in the past only if the relatives confirmed that he really stopped the smoking habit. Patients with diabetes have been classified as no-diabetics, well balanced diabetics (glicated hemoglobin < 7 mg%) and unbalanced diabetes (glicated hemoglobin > 7 mg%). Regarding the cholesterol level the patients have been classified as absent hypercholesterolemia, well balanced if treated with lipid-lowering drugs and LDL-Cholesterol < 100 mg/dL, and unbalanced hypercholesterolemia (untreated or treated with lipid lowering drugs with LDL-Cholesterol > 100 mg/dL. Concerning the body mass index the patients have been classified as normal weight (BMI 18.5 ↔ 24.9) over weight (BMI 25.0 ↔ 29.9) and with light obesity (BMI 30.0 ↔ 34.9). As to blood pressure, we considered as hypertensive the patients assuming regularly antihypertensive drugs and patients with systolic blood pressure over 140 mmHg and diastolic blood pressure over 100 mmHg. All other patients have been considered as no-hypertensive. Finally, as to the previous medical history, the patients have been classified with or without previous acute myocardial infarction (AMI) and stroke.

Supervised physical training

Supervised training was 3 times weekly, for 6 weeks. The day before the starting program, 1 h after the maximal treadmill test, the patient received a lighter treadmill exercise (speed 1.5 km/h, slope 6±2%) to define the training load of the single ses-

sions, which was tailored at 60-70% (aerobic exercise) of the walking ability measured during this non-maximal treadmill exercise. The single exercise session was repeated after a resting period so as to reach the daily distance of 1-2 km or 30 min of effective walking. To assure the wider possible muscle recovery, the resting period between two single training sessions was equal to the recovery time measured during the maximal treadmill test.

After 3 weeks a new non-maximal test has been realized to assess the new performance of the patients, and to modify the load of the single training session (incremental protocol of the physical training program).

After day 18 of training (week 6) a new maximal treadmill test has been performed to assess the walking ability after training.[40]

Statistical analysis

For each sub-group we calculated the mean and standard error of ICD, ACD and RT before and after 18 days of physical training, and the difference between the final and initial values (arithmetic delta).

The values of ICD, ACD and TR before and after training have been compared with the Student's t test for paired data, to assess the effectiveness of the physical training on the walking ability.

To assess the possible differences of gains between the patients' sub-groups within each groups of patients, the arithmetic deltas of sub-groups have been compared with the Student's t test for paired data. Finally, considering the possible influence of various variables and to verify the possible difference of the gains, the analysis of the variance by a split-plot model has been done on the deltas values (sub-groups with well balanced sample size, smokers, diabetes, BMI, hypertension).

Results

The mean age of the enrolled patients was 66.55 years (range 38-89); 67 out of the 74 total were males (mean age 67 years [range 40-89] and 7 were women (mean age 58 years [38-73]). All patients were able to perform the treadmill exercise. Thirty-three patients (mean age 64.93 years) with ACD (mean±SE) 149.36±37.23 m, have been classified as moderate claudication, and 41 (mean age 67.83 years) with ACD 69.04±21.86 have been classified as severe claudication. Eighteen patients were no smokers, 24 were still smoked up to 10 cigarettes per day, and 32 had been smokers in the past and had not smoked for at least 3 years.

Forty-one patients had type 2 diabetes, 20 had glicated hemoglobin less than 7 mg%, and 21 over the cut-off value. Thirty-six patients had a hypercholesterolemia, 20 with a LDL-Cholesterol > 100 mg/dL.

Forty-three patients were over weight and 7 had a light obesity. Forty-two patients were hypertensive, 15 had a history of myocardial infarction without heart failure, and 6 had a transient ischemic attack or stroke with good clinical recovery (Table I, first column).

Considering all risk factors' groups, the ICD baseline values were between 48.66±4.75 and 68.13±7.25 m, ACD between 92.50±10.40 and 114.62±11.26 m, RT between 231.11±26.07 and 172.50±16.03 s. Regarding the sub-groups (presence or absence, well balance or unbalanced) we did not find significant differences. In the group with hypercholesterolemia the higher ACD has been found in normolipemic patients, and in patients with normal weight than overweight or light obesity. In the smoking group a higher ACD has been found in patients still smokers than in no smokers, and in the diabetes group a higher ACD has been found in unbalanced patients than the well balanced or in people without diabetes. Hypertensive patients showed higher ACD than patients without arterial hypertension. Considering the group with previous CV events, patients without history of AMI showed an ACD higher than patients without previous AMI, whilst ACD was equivalent in patients with or without previous TIAs or stroke (Table I).

After training ICD values were between 103.05±1147 and 147.19±13.58 m, ACD was

between 169.14±27.16 and 203.32±13.41 m, and RT was between 92.88±7.36 and 68.75±12.01 s.

All the differences before and after the training programme were very significant (P<0.0001) in all patients of each sub-group (Table I).

The analysis of the deltas of all parameters within each sub-group did not show significant differences (Table II).

The multivariate analysis of the variance on the deltas values, carried out on sub-groups with well balanced sample size, did not reach significant values, confirming the results of the analysis performed by the Student's t test (Table III).

Discussion

A total of 74 claudicant patients have been enrolled in this study. It could be considered not enough for the aims of the study, but we must consider the difficult patients' recruitment in this kind of studies, due to the under utilization of physical training in the treatment of intermittent claudication notwithstanding it is one of the first and strong recommendations of all guidelines.[8-11] On the other hand the majority of the studies quoted in the references of the present paper has been carried out with equivalent sample sizes.

The first comment of our results is the relevant prevalence (near 50%) of patients with inadequate control of risk factors in the cohort of this study. This observation is not fortuitous and it has been described by several paper.[41-44] In our opinion, it can be due to a low adherence in the clinical practice to the guidelines' reco0mmendations.[45]

Regarding the main goal of the study, the significant increase of ICD from 55.12 to 121.86 m, of ACD from 103.16 to 191.58 m, and the reduction of RT from 204.04 to 87.46 s, confirm the relevant (P<0.0001) effectiveness of supervised physical training on the walking capacity of claudicant patients.

We did not find significant differences between the increase of ICD, ACD and the reduction of RT in the different groups of risk factors, and within the different sub-groups of each risk factor.

The unbalanced condition seems to be relevant in reducing baseline ACD only for the sub-groups with hypercholesterolemia and increased BMI. Paradoxically, smoker patients and people with unbalanced diabetes showed a higher ACD than no-smokers and patients without diabetes or well balanced diabetes, respectively. It is an interesting data from our study, in contrast with other studies, but the smallness of our cohort does not permit definitive conclusions.

Hypertensive patients have a higher ACD because of the major perfusion pressure trough the arterial three of the lower limbs, and patients with previous AMI show a worse ACD. Previous cerebral disease seems to be not relevant in compromising walking ability if the recovery of motility is good. Nevertheless, we did not find any significant difference in the response to the physical training programme related with the presence, absence or balance degree of the risk factors.

Previous studies yet referred that diabetes [46] and smoking [47] do not reduce the effectiveness of physical training in patients with intermittent claudication, underlining that the diabetic impairment of microcirculation is not relevant in conditioning the therapeutic replies and that physical training should be primarily indicated in smoker diabetics than no smokers.

Our study extents this concept to the other considered risk factors, confirming that effectiveness of supervised physical training is independent from the their presence, absence or balance degree.

This statement is very important because highlights the physical training as the only therapeutic tool for PAD independent from the results of the risk factors' treatment. In another study on the endothelial function (EF), maximal exercise and physical training,[31] we found that two thirds of PAD patients had an EF lower than the normal cut-off value (10% of flow mediated vasodilation, FMVD). A significant increase of walking capacity has been found both in patients with EF lower or upper 10%, without differences within two groups.

Conclusions

The supervised physical training is confirmed as an effective tool for the treatment of claudicant patient. The patients walk better, for longer time and with higher speed,[48] independently from the risk factors correction.

The correction of the risk factors of course remains the first step in the treatment of intermittent claudication, nevertheless this study underlines that this correction is not essential to obtain good results in physical training.

What does it mean? GPs and vascular specialists can propose the physical training in claudicants even if the correction of risk factors is not adequate. This statement, in our opinion, is very important because of the frequent inadequate control of the risk factors, discussed above.

The improvement of the walking ability, together with the improvement of EF, the reduction of inflammatory activation [49] and the independence from the risk factors lead to hypothesize that supervised physical training could improve also the systemic outcome of claudicant patients, as yet demonstrated for patients with coronary artery disease and ischemic heart failure.[50, 51]

Riassunto

La presenza/assenza di fattori di rischio può compromettere l'efficacia del training fisico in pazienti con claudicazione intermittente?

Obiettivo. La correzione dei fattori di rischio dell'aterosclerosi è un'imprescindibile condizione per ottenere la massima efficacia e durata dei risultati di ogni intervento terapeutico (farmacologico e chirurgico) nel trattamento della claudicazione intermittente. Scopo di questo studio è stato verificare se la presenza/assenza di fattori di rischio e il loro grado di compenso condiziona la risposta del paziente con claudicazione intermittente al training fisico controllato.

Metodi. La distanza di claudicazione iniziale (*initial claudication distance*, ICD), la distanza assoluta (*absolute claudication distance*, ACD) e il tempo di recupero (*recovery time*, RT) sono stati misurati mediante treadmill test massimale in 74 pazienti claudicanti. Le misure sono state ripetute dopo 18 giorni di training fisico controllato (deambulazione quotidiana per 1-2 km o per almeno 30 min) in frazioni pari al 60-70% della capacità deambulatoria misurata mediante treadmill test sotto-massimale. I pazienti arruolati sono stati stratificati in 7 gruppi e 18 sottogruppi (non fumatori, fumatori, ex-fumatori, non diabetici, diabetici compensati e diabetici scompensati, normolipemici, ipercolesterolemici compensati e ipercolesterolemici scompensati, pazienti normopeso, sovrappeso e con obesità lieve, ipertesi e normotesi, pazienti con e senza pregresso infarto miocardico o TIA/stroke). La media e l'errore standard di ICD ACD e RT di ogni gruppo e sottogruppo, prima e dopo i 18 giorni di training, sono stati calcolati e confrontati mediante il test t di Student. Sui valori pre- e post-training di ICD ACD e RT di ogni gruppo è stata eseguita l'analisi multivariata della varianza (ANOVA). Tutte le analisi statistiche sono state considerate significative per un valore di $P < 0,05$.

Risultati. ICD è aumentato da 55,12 a 121,86 m, ACD da 103,16 a 191,58 m, TR è diminuito da 204,04 a 87,46 s, confermando la significativa ($P<0,0001$) efficacia del training fisico controllato sulla capacità di marcia del claudicante. Il confronto tra i delta (valore pre meno valore post) di ogni sottogruppo non ha mostrato differenze significative. L'analisi multivariata della varianza dei valori pre e post di ICD ACD e RT di ogni gruppo di fattori di rischio è stata inferiore a 0,05, dimostrando che i fattori di rischio non influenzano il risultato del training.

Conclusioni. Il training fisico controllato si conferma un mezzo efficace per il trattamento della claudicazione intermittente. Non abbiamo trovato alcuna differenza significativa nella risposta al training correlabile con la presenza, l'assenza e lo stato di compenso dei fattori di rischio considerati, e possiamo concludere con l'importante considerazione che il training fisico controllato è l'unica terapia per il paziente claudicante indipendente dall'intervento sui fattori di rischio.

Parole chiave: Esercisio fisico - Riabilitazione - Arteriopatia vascolare periferica - Claudicatio.

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