

APPENDICE SUPPLEMENTARE – SUPPLEMENTARY APPENDIX

Lo stress test elettrocardiografico dopo rivascolarizzazione miocardica: utilità, tempistica, modalità di esecuzione e confronto con altre procedure diagnostiche

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Tabella S1. Persistenza di ischemia miocardica dopo PCI

Studio	Tempo dalla procedura	N. pazienti	Stress test positivi dopo rivascolarizzazione (%)
El Tamimi et al. (1991) (1)	1 settimana	14	50
De La Morena et al. (1993) (2)	2-4 giorni	75	30 (solo nei pazienti monovasali)
Martins et al. (1998) (3)	3-6 mesi	59	19
Badacz et al. (1998)(4)	3 giorni	94	49
	6 mesi		59
Aytemir et al. (1999) (5)	7 mesi	56	54
Malekianpour et al. (1999) (6)	6 mesi	29	41
Beygui et al. (2000) (7)	6 mesi	179	37
Galassi et al. (2000) (8)	128 giorni	46	50
Pierce et al. (2000) (9)	<60 giorni	261	26 (31 se <7 giorni, 20 se >7 giorni)
Sheppard et al. (2001) (10)	6 mesi	183	28
Lauer et al. (2004) (11)	3-6 mesi	201	48
Chalela et al. (2006) (12)	6 mesi	84	36
Babapulle et al. (2007) (13)	6 settimane	136	23
Shaw et al. (2008)(14)	374 ± 50 giorni	159	16 (ischemia moderato-severa)
Wenaweser et al. (2008) (15)	1 giorno	466	23
Nerla et al. (2010) (16)	1 mese	160	39 (49 con DES, 32 con BMS)
Marzilli et al. (2010) (17)	4 settimane	220	52
	1 mese		29
	6 mesi		31
Huqi et al. (2016) (18)	6 mesi	195	31
	12 mesi		28

Tabella S2. Persistenza di angina a distanza da una PCI

a 1 mese				
Studio	N. pazienti	PTCA, BMS, DES, BRS	Persistenza angina (%)	Monovasali (+/-)
Parisi et al. (1992) (19)	105	PTCA	50	+
Shaw et al. (2008) (14)	1149	BMS	58	-
Marzilli et al. (2010) (17)	220	DES	21	-
Goktekin et al. (2015) (20)	70	BRS	15	-
Huqi et al. (2016) (18)	198	DES	29	-
a 6 mesi				
Studio	N. pazienti	PTCA, BMS, DES, BRS	Persistenza angina (%)	Monovasali (+/-)
Folland et al. (1997) (21)	115	PTCA	35	+
Hartigan et al. (1998) (22)	105	BMS	35	+
Daemen et al. (2008) (23)	483	BMS	20	-
Cohen et al. (2011) (24)	903	DES	30	-
De Quadros et al. (2011) (25)	110	?	25	?
Saeed et al. (2013) (26)	953	DES	20	-
Huqi et al. (2016) (18)	195	DES	31	-
a 1 anno				
Studio	N. pazienti	PTCA, BMS, DES, BRS	Persistenza angina (%)	Monovasali (+/-)
CABRI trial (1995) (27)	541	+ PTCA	30	-
Olivari et al. (2003) (28)	248	+ BMS	13	-
Henderson et al. (2003) (29)	504	+ PTCA	35	-
Hueb et al. (2004) (30)	205	+ BMS	45	-
Alderman et al. (2004) (31)	202	+ PTCA	30	-
Rodriguez et al. (2005) (32)	225	+ BMS	15	-
Herz et al. (2005) (33)	113	+ DES	30	-
Rathore et al. (2006) (34)	400	+ BMS	20	-
Shaw et al. (2008) (14)	1149	+ BMS	35	-
Biryukova et al. (2010) (35)	313	+?	30	-
Zhao et al. (2010) (36)	1142	+ BMS,DES	24 BMS, 11 DES	-
Cohen et al. (2011) (24)	903	+ DES	30	-
De Quadros et al. (2011) (25)	110	+ ?	20	?
Shah et al. (2013) (37)	245	+ DES	30	-
Saeed et al. (2013) (26)	953	+ DES	20	-
Gaglia et al. (2016) (38)	8804	+ BMS,DES	30	-
Huqi et al. (2016) (18)	186	DES	28	-

PTCA, percutaneous transluminal coronary angioplasty; BRS, bioresorbable scaffold; BMS, bare metal stent; DES, drug eluting stent; PCI, percutaneous coronary intervention.

BIBLIOGRAFIA

1. el-Tamimi H, Davies GJ, Sritara P, Hackett D, Crea F, Maseri A. Inappropriate constriction of small coronary vessels as a possible cause of a positive exercise test early after successful coronary angioplasty. *Circulation* 1991;84:2307-12.
2. de la Morena G, Sanchez-Munoz JJ, Lopez Candel J, Pico-Aracil F, Ruiperez JA. Early and late exercise testing. Usefulness after percutaneous transluminal coronary angioplasty. *Chest* 1993;103:391-5.
3. Martins C, Joao I, Fazendas P et al. [Is the stress test useful in the detection of post-angioplasty restenosis?]. *Rev Port Cardiol* 1998;17:897-900.
4. Badacz L, Kozanecki A, Tracz W et al. [Usefulness of electrocardiographic exercise tests for evaluation of percutaneous transluminal coronary angioplasty results]. *Przegl Lek* 1998;55:368-72.
5. Aytemir K, Ozer N, Aksoyek S, Ozkutlu H, Oto A, Ozmen F. QT dispersion plus ST-segment depression: a new predictor of restenosis after successful percutaneous transluminal coronary angioplasty. *Clin Cardiol* 1999;22:409-12.
6. Malekianpour M, Rodes J, Cote G et al. Value of exercise electrocardiography in the detection of restenosis after coronary angioplasty in patients with one-vessel disease. *Am J Cardiol* 1999;84:258-63.
7. Beygui F, Le Feuvre C, Maunoury C et al. Detection of coronary restenosis by exercise electrocardiography thallium-201 perfusion imaging and coronary angiography in asymptomatic patients after percutaneous transluminal coronary angioplasty. *Am J Cardiol* 2000;86:35-40.
8. Galassi AR, Foti R, Azzarelli S et al. Usefulness of exercise tomographic myocardial perfusion imaging for detection of restenosis after coronary stent implantation. *Am J Cardiol* 2000;85:1362-4.
9. Pierce GL, Seferlis C, Kirshenbaum J, Hartley LH. Lack of association of exercise testing with coronary stent closure. *Am J Cardiol* 2000;86:1259-61, A6.
10. Sheppard R, Schechter D, Azoulay A, Witt H, Garzon P, Eisenberg MJ. Results of a routine exercise treadmill testing strategy early after percutaneous transluminal coronary angioplasty. *Can J Cardiol* 2001;17:407-14.
11. Lauer F, Herrlinger JD. [Does routine angiographic control make sense after percutaneous coronary intervention?]. *Med Klin (Munich)* 2004;99:217-22.
12. Chalela WA, Kreling JC, Falcao AM et al. Exercise stress testing before and after successful multivessel percutaneous transluminal coronary angioplasty. *Braz J Med Biol Res* 2006;39:475-82.
13. Babapulle MN, Diodati JG, Blankenship JC et al. Utility of routine exercise treadmill testing early after percutaneous coronary intervention. *BMC Cardiovasc Disord* 2007;7:12.

14. Shaw LJ, Berman DS, Maron DJ et al. Optimal medical therapy with or without percutaneous coronary intervention to reduce ischemic burden: results from the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) trial nuclear substudy. *Circulation* 2008;117:1283-91.
15. Wenaweser P, Surmely JF, Windecker S et al. Prognostic value of early exercise testing after coronary stent implantation. *Am J Cardiol* 2008;101:807-11.
16. Nerla R, Di Monaco A, Sgueglia GA et al. Exercise stress test results in patients with bare metal stents or drug-eluting stents: pathophysiological and clinical implications. *Circ J* 2010;74:2372-8.
17. Marzilli M, Huqi A, Morrone D. Persistent angina: the Araba Phoenix of cardiology. *Am J Cardiovasc Drugs* 2010;10 Suppl 1:27-32.
18. Huqi A, Morrone D, Guarini G, Capozza P, Orsini E, Marzilli M. Stress Testing After Complete and Successful Coronary Revascularization. *Can J Cardiol* 2016;32:986 e23-9.
19. Parisi AF, Folland ED, Hartigan P. A comparison of angioplasty with medical therapy in the treatment of single-vessel coronary artery disease. Veterans Affairs ACME Investigators. *N Engl J Med* 1992;326:10-6.
20. Goktekin O, Yamac AH, Latib A et al. Evaluation of the Safety of Everolimus-Eluting Bioresorbable Vascular Scaffold (BVS) Implantation in Patients With Chronic Total Coronary Occlusions: Acute Procedural and Short-Term Clinical Results. *J Invasive Cardiol* 2015;27:461-6.
21. Folland ED, Hartigan PM, Parisi AF. Percutaneous transluminal coronary angioplasty versus medical therapy for stable angina pectoris: outcomes for patients with double-vessel versus single-vessel coronary artery disease in a Veterans Affairs Cooperative randomized trial. Veterans Affairs ACME InvestigatorS. *J Am Coll Cardiol* 1997;29:1505-11.
22. Hartigan PM, Giacomini JC, Folland ED, Parisi AF. Two- to three-year follow-up of patients with single-vessel coronary artery disease randomized to PTCA or medical therapy (results of a VA cooperative study). Veterans Affairs Cooperative Studies Program ACME Investigators. Angioplasty Compared to Medicine. *Am J Cardiol* 1998;82:1445-50.
23. Daemen J, Kuck KH, Macaya C et al. Multivessel coronary revascularization in patients with and without diabetes mellitus: 3-year follow-up of the ARTS-II (Arterial Revascularization Therapies Study-Part II) trial. *J Am Coll Cardiol* 2008;52:1957-67.
24. Cohen DJ, Van Hout B, Serruys PW et al. Quality of life after PCI with drug-eluting stents or coronary-artery bypass surgery. *N Engl J Med* 2011;364:1016-26.
25. de Quadros AS, Lima TC, Rodrigues AP et al. Quality of life and health status after percutaneous coronary intervention in stable angina patients: results from the real-world practice. *Catheter Cardiovasc Interv* 2011;77:954-60.

26. Saeed G, Gradaus R, Neuzner J, Aggarwal B, Shishehbor MH. The FREEDOM trial (AUGUST 2013). *Cleve Clin J Med* 2013;80:748-9.
27. First-year results of CABRI (Coronary Angioplasty versus Bypass Revascularisation Investigation). CABRI Trial Participants. *Lancet* 1995;346:1179-84.
28. Olivari Z, Rubartelli P, Piscione F et al. Immediate results and one-year clinical outcome after percutaneous coronary interventions in chronic total occlusions: data from a multicenter, prospective, observational study (TOAST-GISE). *J Am Coll Cardiol* 2003;41:1672-8.
29. Henderson RA, Pocock SJ, Clayton TC et al. Seven-year outcome in the RITA-2 trial: coronary angioplasty versus medical therapy. *J Am Coll Cardiol* 2003;42:1161-70.
30. Hueb W, Soares PR, Gersh BJ et al. The medicine, angioplasty, or surgery study (MASS-II): a randomized, controlled clinical trial of three therapeutic strategies for multivessel coronary artery disease: one-year results. *J Am Coll Cardiol* 2004;43:1743-51.
31. Alderman EL, Kip KE, Whitlow PL et al. Native coronary disease progression exceeds failed revascularization as cause of angina after five years in the Bypass Angioplasty Revascularization Investigation (BARI). *J Am Coll Cardiol* 2004;44:766-74.
32. Rodriguez AE, Baldi J, Fernandez Pereira C et al. Five-year follow-up of the Argentine randomized trial of coronary angioplasty with stenting versus coronary bypass surgery in patients with multiple vessel disease (ERACI II). *J Am Coll Cardiol* 2005;46:582-8.
33. Herz I, Moshkovitz Y, Loberman D et al. Drug-eluting stents versus bilateral internal thoracic grafting for multivessel coronary disease. *Ann Thorac Surg* 2005;80:2086-90.
34. Rathore S, Rhys J, Buchalter MB, Gerning NO, Groves PH, Penny W. Impact of age on the outcomes of women following percutaneous coronary intervention in the bare-metal stent era. *J Interv Cardiol* 2006;19:245-9.
35. Biryukova E, Williams FM, Valencia O, Kaski JC, Bland M, Jahangiri M. Comparison of mid-term outcome in patients with three-vessel and/or left main disease undergoing percutaneous coronary intervention and coronary artery bypass graft surgery. *Eur J Cardiothorac Surg* 2010;37:905-11.
36. Zhao FH, Lu SZ, Li H et al. Clinical outcomes and cost-utility after sirolimus-eluting versus bare metal stent implantation. *Chin Med J (Engl)* 2010;123:2797-802.
37. Shah B, Srinivas VS, Lu J et al. Change in enrollment patterns, patient selection, and clinical outcomes with the availability of drug-eluting stents in the Bypass Angioplasty Revascularization Investigation 2 Diabetes trial. *Am Heart J* 2013;166:519-26.
38. Gaglia MA, Jr., Torguson R, Lipinski MJ et al. Frequency of Angina Pectoris After Percutaneous Coronary Intervention and the Effect of Metallic Stent Type. *Am J Cardiol* 2016;117:526-31.