

RECOMMENDATION

We recommend the use of gated myocardial perfusion studies for assessment of myocardial viability, as it allows simultaneous assessment of myocardial perfusion & function at the same study, and it is a reproducible method for follow up studies of ischemic cardiomyopathy patients after revascularization.

Future studies in larger numbers of patients are required to assess territory of perfusion defects and correlation with blunted HRR group.

REFERENCES

1. Hinkle LE Jr, Carver ST, Plakun A, et al. Slow heart rates and increased risk of cardiac death in middle-aged men. *Arch Intern Med* 1972; 129:732-48.
2. Sanchez-Quintana D, Cabrera JA, Ferre' J, et al. Sinus node revisited in the era of electronanatomical mapping and catheter ablation. *Heart* 2005; 91:189.
3. Janet Foltin, Isabel Nogueira, Jim Ransom et al. Origin of heart beat and electrical activity of the heart. In: William F. Ganong ed. *Review of medical physiology*, 20th eds. Mc Grow- Hill 2001; 528-78.
4. Dampney RAL : Functional organization of central pathways regulating the cardiovascular system. *Physiology review* 1994; 74:323.
5. Taylor EW, Jordan D, Coote JH. Central control of the cardiovascular and respiratory systems and their interactions in vertebrates. *Physiol Rev.* Jul 1999;79(3):855-916.
6. Heesch CM. Reflexes that control cardiovascular function. *Am.J.Physiol* 277 (6 Pt 2):S234-S243, 1999.
7. Adams DB, Baccelli G, Mancina G, Zanchetti A. Relation of cardiovascular changes in fighting to emotion and exercise. *The Journal of physiology* 1971;212:321-35.
8. Barbieri R, Triedman JK, Saul JP. Heart rate control and mechanical cardiopulmonary coupling to assess central volume: a systems analysis. *American journal of physiology Regulatory, integrative and comparative physiology* 2002;283:R1210-20.
9. Cowley, A. W., Jr., J. F. Liard, and A. C. Guyton. Role of baroreceptor reflex in daily control of arterial blood pressure and other variables in dogs. *Circ. Res.* 32: 564–576, 1973.
10. Birrer RB : sports medicine for primary care physician. Appleton-Century-Crofts,1984.
11. Crystal George J., Salem M. Ramez. The Bainbridge and the “Reverse” Bainbridge Reflexes: history, physiology and clinical relevance. *Anesthesia and analgesia* March 2012- volume114-issue 3 ; 520:32.

12. Salo LM, Woods RL, Anderson CR, McAllen RM. Nonuniformity in the von Bezold-Jarisch reflex. *American journal of physiology Regulatory, integrative and comparative physiology* 2007;293:R714-20.
13. Timmers HJ, Wieling W, Karemaker JM, Lenders JW. Denervation of carotid baro- and chemoreceptors in humans. *The Journal of physiology* 2003;553:3-11.
14. Rowell LB: *Human Cardiovascular Control*. Oxford Univ. Press; 1993.
15. Burn JH, Gunning AJ, Walker JM. Effects of noradrenaline and adrenaline on the atrial rhythm in the heart-jung preparation. *The Journal of physiology* 1957;137:141-53.
16. Hillier AP. The uptake of thyroxine and tri-iodothyronine by perfused hearts. *The Journal of physiology* 1969;203:665-74.
17. Brown AM. Cardiac sympathetic adrenergic pathways in which synaptic transmission is blocked by atropine sulfate. *The Journal of physiology* 1967;191:271-88.
18. Sanita Atwal, Jack Pauter, Paul MacDonal, et al. Cardiovascular effects of strenuous exercise in adult recreational hockey: The Hokey heart. *CMA Journal*. Feb5, 2002; 166(3).
19. Astrand PO, Rodahl K, Dahl HA et al. eds. *Textbook of work physiology. Physiological basis of exercise*, 4th ed. McGraw-Hill 2003; 134-76.
20. Morise AP. Heart rate recovery: predictor of risk today and target of therapy tomorrow. *Circulation* 2004 ;110 :2778-80.
21. Jouven X, Empana JP, Schwartz PJ, et al. Heart rate profile during exercise as a predictor of sudden death. *New England med. J*. 2005; 352:1951-8.
22. Myers J, Tan SY, Abella J et al. Comparison of chronotropic response to exercise and heart rate recovery in predicting cardiovascular mortality. *Eur. J cardiovasc prev Rehabil* 2007; 14:215-21.
23. Lauer MS. Chronotropic incompetence: ready for prime time. *Am Coll Cardiol J* 2004; 44:431-2.
24. Narkiewicz K, Van de Borne PJ, Hausberg M, et al. cigarette smoking increases sympathetic outflow in humans. *Circulation* 1998; 98:528-34.
25. Zamarano GK. Inflammation, atherosclerosis and coronary heart disease. *N Engl Med J* 2005; 352:1685-95.

26. Giannoglou GD, Chatzizisis YS, Zamboulis C, et al. elevated heart rate and atherosclerosis: an overview of the pathogenetic mechanism. *Int J cardiol* 2008; 126:302-12.
27. Tracey KJ. Inflammatory reflex. *Nature* 2002; 420:853-9.
28. Boravikova LV, Ivanova S, Zhang M, et al. vagus nerve stimulation attenuates the systemic inflammatory response to endotoxin. *Nature* 2000; 405:458-62.
29. Mancia G, De Backer G, Dominiczak A, et al. 2007ESH-ESC practice guidelines for management of arterial hypertension: ESH-ESC Task force on the management of arterial hypertension. *J hypertension* 2007; 25:1751-62.
30. Batman TM, Heller GV, McGhie AI, et al. diagnostic accuracy of rest/stress ECG gated Rb-82 myocardial perfusion PET: comparison with ECG-gated Tc-99m sestamibi SPECT. *J Nucl. Cardiol.* 2006;13(1):24-33.
31. Pennel DJ, Prvulovich E (1995) 1. *Clinicians Guide to Nuclear Medicine: Nuclear Cardiology*, 1st edn. London, BNMS.
32. Klocke FJ, Baird MG, Lorell LH, et al. ACC/AHA/ASNC guidelines for clinical use cardiac radionuclide imaging- executive summary: a report of American College of Cardiology/American Heart Association Task force on practice guidelines (ACC/AHA/ASNC Committee to Revise the 1995 guidelines for the clinical use of cardiac radionuclide imaging). *Circulation.* 2003; 108:1404-18.
33. Pennel DJ, Prvulovich E (1995) 1. *Clinicians Guide to Nuclear Medicine: Nuclear Cardiology*, 1st edn. London, BNMS.
34. Kathryn Adamson. Principles of myocardial SPECT images. In: Kassad Movahed, Gopinath Gnanasegaran, John R. Buscombe et al. eds. *Integrating cardiology for nuclear medicine physicians*, Springer-Verlag Berlin Heidelberg 2009; 193.
35. Nallamothu N, Cerqueira MD, Hansen CL, et al. ASNC imaging guidelines for nuclear cardiology procedures: stress protocols and tracers. *J Nucl Cardiol.* 2009
36. Strauss HW, Zaret BL, Hurley PJ, Natarajan TK, Pitt B. A scintigraphic method for measuring left ventricular ejection fraction in man without cardiac catheterization. *The American journal of cardiology* 1971;28:575-80.
37. Bateman TM, Berman DS, Heller GV et al. American Society of Nuclear Cardiology position statement on electrocardiographic

- gating of myocardial perfusion SPECT scintigrams. *Journal of nuclear cardiology : official publication of the American Society of Nuclear Cardiology* 1999;6:470-1.
38. DePuey EG, Heller G, R T. Clinical application of gated myocardial perfusion spect. 2nd edn ed: Lippincott Williams and Wilkins, 2001.
 39. Smanio PE, Watson DD, Segalla DL, Vinson EL, Smith WH, Beller GA. Value of gating of technetium-99m sestamibi single-photon emission computed tomographic imaging. *Journal of the American College of Cardiology* 1997;30:1687-92.
 40. Hung GU, Lee KW, Chen CP, Lin WY, Yang KT. Relationship of transient ischemic dilation in dipyridamole myocardial perfusion imaging and stress-induced changes of functional parameters evaluated by Tl-201 gated SPECT. *Journal of nuclear cardiology : official publication of the American Society of Nuclear Cardiology* 2005;12:268-75.
 41. DePuey EG, Nichols K, Dobrinsky C. Left ventricular ejection fraction assessed from gated technetium-99m-sestamibi SPECT. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine* 1993;34:1871-6.
 42. American Society of Nuclear Cardiology. Imaging guidelines for nuclear cardiology procedures, part 1. Myocardial perfusion stress protocols. *J Nucl Cardiol.* 1996;3(3):G11–15.
 43. American Society of Nuclear Cardiology (1996) Imaging guidelines for nuclear cardiology procedures, part1. Myocardial perfusion stress protocols. *J Nucl Cardiol* 3(3):G11–G15.
 44. Henzlova MJ, Cerqueira MD, Hansen CL, et al. ASNC imaging guidelines for nuclear cardiology procedures: stress protocols and tracers. *J Nucl Cardiol.* 2009.
 45. Esquivel L, Pollock SG, Beller GA, et al. Effect of the degree of effort on the sensitivity of the exercise thallium-201 stress test in symptomatic coronary artery disease. *Am J Cardiol.* 1989;63:160.
 46. Mark DB, Hlatky MA, Harrel Jr FE, et al. Exercise treadmill score for predicting prognosis in coronary artery disease. *Ann Intern Med.* 1987;106:793.
 47. Henzlova MJ, Cerqueira MD, Hansen CL, et al. ASNC imaging guidelines for nuclear cardiology procedures: stress protocols and

- tracers. *J Nucl Cardiol*. 2009. <http://www.asnc.org/imageuploads/ImagingGuidelinesStressProtocols021109.pdf> . Accessed 7 July 2009.
48. Iskandrian AS, Verani MS, Heo J. Pharmacologic stress testing: mechanism of action, hemodynamic responses, and results in detection of coronary artery disease. *Journal of nuclear cardiology : official publication of the American Society of Nuclear Cardiology* 1994;1:94-111.
 49. Marchant E, Pichard A, Rodriguez JA, Casanegra P. Acute effect of systemic versus intracoronary dipyridamole on coronary circulation. *The American journal of cardiology* 1986;57:1401-4.
 50. Picano E. Dipyridamole-echocardiography test: historical background and physiologic basis. *European heart journal* 1989;10:365-76.
 51. Badheka AO, Hendel RC. Nuclear stress testing. *Curr Opin Cardiol*. 2011;26(5):370–8.
 52. Heller GV, Hendel RC. *Nuclear cardiology: practical applications*. 2nd ed. New York: McGraw Hill Medical; 2011.
 53. Hansen CL. The role of the translation table in cardiac image display. *J Nucl Cardiol* 2006;13:571-5.
 54. Friedman J, Berman DS, Van Train K, Garcia EV, Bietendorf J, Prigent F, et al. Patient motion in thallium-201 myocardial SPECT imaging. An easily identified frequent source of artifactual defect. *Clin Nucl Med* 1988;13:321-4.
 55. Choi JY, Lee KH, Kim SJ, Kim SE, Kim BT, Lee SH, et al. Gating provides improved accuracy for differentiating artifacts from true lesions in equivocal fixed defects on technetium 99m tetrofosmin perfusion SPECT. *J Nucl Cardiol* 1998;5:395-401.
 56. Weiss AT, Berman DS, Lew AS, et al. Transient ischemic dilation of the left ventricle on stress thallium-201 scintigraphy: A marker of severe and extensive coronary artery disease. *J Am Coll Cardiol* 1987;9:752-9.
 57. Abidov A, Bax JJ, Hayes SW, et al. Integration of automatically measured transient ischemic dilation ratio into interpretation of adenosine stress myocardial perfusion SPECT for detection of severe and extensive CAD. *J Nucl Med* 2004;45:1999-2007.
 58. Gill JB, Ruddy TD, Newell JB, et al. Prognostic importance of thallium uptake by the lungs during exercise in coronary artery disease. *N Engl J Med* 1987;317:1486-9.

59. Williams KA, Schneider CM. Increased stress right ventricular activity on dual isotope perfusion SPECT: A sign of multivessel and/or left main coronary artery disease. *J Am Coll Cardiol* 1999;34:420-7.
60. Cerqueira MD, Weissman NJ, Dilsizian V, et al. Standardized myocardial segmentation and nomenclature for tomographic imaging of the heart: A statement for healthcare professionals from the Cardiac Imaging Committee of the Council on Clinical Cardiology of the American Heart Association. *J Nucl Cardiol* 2002;9:240-5.
61. Shaw LJ, Hendel RC, Heller GV, et al. Prognostic estimation of coronary artery disease risk with resting perfusion abnormalities and stress ischemia on myocardial perfusion SPECT. *J Nucl Cardiol* 2009;15:762-73.
62. Takeishi Y, Sukekawa H, Fujiwara S, et al. Reverse redistribution of technetium-99m-sestamibi following direct PTCA in acute myocardial infarction. *J Nucl Med* 1996;37:1289-94.
63. Cerqueira MD, Weissman NJ, Dilsizian V et al. Standardized myocardial segmentation and nomenclature for tomographic imaging of the heart. A statement for healthcare professionals from the Cardiac Imaging Committee of the Council on Clinical Cardiology of the American Heart Association. *Circulation* 2002;105:539-42.
64. Malouf JF, Edwards WD, Tajil AJ, Seward JB (2001) Functional anatomy of the heart. In Fuster F, Alexander RW, O'Rourke RA (eds), *Hurst's: The Heart*, 10th edn. McGraw- Hill Inc., pp. 19–62.
65. Tortora GJ, Grabowski SR (1996) *Principles of Anatomy and Physiology*, 8th edn. HarperCollins College Publishers, New York, pp. 598–600.
66. Gray's PG (1995) In *Gray's Anatomy*, 38th edn. Churchill Livingstone, New York, p.1498.
67. Hung JC, Mahoney DW, Huang DC, Wang A. The relationship between elution time and eluate volume using the Ultra-TechneKow DTE technetium-99m generator. *Journal of nuclear medicine technology* 2000;28:178-81.
68. Castronovo FP, Jr. Technetium-99m: basic nuclear physics and chemical properties. *American journal of hospital pharmacy* 1975;32:480-8.
69. Jain D. Technetium-99m labeled myocardial perfusion imaging agents. *Semin Nucl Med* 1999;29:221–36.

70. Beller GA, Bergmann SR. Myocardial perfusion imaging agents: SPECT and PET. *Journal of nuclear cardiology : official publication of the American Society of Nuclear Cardiology* 2004;11:71-86.
71. Hesse B, Tagil K, Cuocolo A et al. EANM/ESC procedural guidelines for myocardial perfusion imaging in nuclear cardiology. *European journal of nuclear medicine and molecular imaging* 2005;32:855-97.
72. Mauderli W, Luthmann RW: A computerized Rotating Lamina Radionuclide Camera. *J Nuclear Med*, 1979; 20: 341-44
73. Garcia EV, Galt JR, Faber TL, Chen J: Principles of nuclear cardiology imaging. In: Dilsizian V, Narula J, Braunwald E, ed. *Atlas of Nuclear Cardiology*, 3rd ed. Philadelphia: Current Medicine; 2009:1-36.
74. Bocher M, Blevins IM, Tsukerman L, Shrem Y, Kovalski G, Volokh L. A fast cardiac gamma camera with dynamic SPECT capabilities: design, system validation and future potential. *European journal of nuclear medicine and molecular imaging* 2010;37:1887-902.
75. Deprez K, Pato LR, Vandenberghe S, Van Holen R. Characterization of a SPECT pinhole collimator for optimal detector usage (the lofthole). *Physics in medicine and biology* 2013;58:859-85.
76. Brookerman VA, Bauer TJ. Collimator performance for scintillation camera systems. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine* 1973;14:21-5.
77. Bardfeld PA, Rudin S. Use of the magnifying or converging collimator in brain scanning. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine* 1973;14:834-6.
78. Muehlelehner G. Effect of crystal thickness on scintillation camera performance. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine* 1979;20:992-3.
79. Lette J, Tatum JL, Fraser S, et al. Safety of dipyridamole testing in 73,806 patients: the multicenter dipyridamole safety study. *J Nucl Cardiol*. 1995;2: 3-17.
80. Bonow RO. Identification of viable myocardium. *Circulation* 1996; 94:2674-80.
81. Haas F, Haehnel CJ, Picker W, Nekolla S, Martinoff S, Meisner H, et al. Preoperative positron emission tomographic viability

- assessment and perioperative and postoperative risk in patients with advanced ischemic heart disease. *J Am Coll Cardiol* 1997; 30:1693–700.
82. Senior R, Kaul S, Raval U, Lahiri A. Impact of revascularization and myocardial viability determined by nitrate-enhanced Tc-99m sestamibi and Tl-201 imaging on mortality and functional outcome in ischemic cardiomyopathy. *J Nucl Cardiol* 2002; 9:454.
 83. Klocke FJ, Baird MG, Lorell BH et al. ACC/AHA/ASNC guidelines for clinical use of cardiac radionuclide imaging – executive summary: a report of American College of Cardiology/ American Heart Association Task Force on practice guidelines (ACC/AHA/ASNC Committee to revise the 1995 guidelines for the clinical use of cardiac radionuclide imaging). *J Am Coll Cardiol* 2003; 42: 1318-33.
 84. Lette J, Tatum JL, Fraser S et al. Safety of dipyridamole testing in 73,806 patients: the multicenter dipyridamole safety study. *J Nucl Cardiol* 1995; 2: 3-17.
 85. Buus NH, Bottcher M, Hermansen F et al. Influence of nitric oxide synthase and adrenergic inhibition on adenosine-induced myocardial hyperemia. *Circulation* 2001; 104: 2305-10.
 86. Rossen JD, Quillen JE, Lopez, AG et al. Comparison of coronary vasodilation with intravenous dipyridamole and adenosine. *J AM Coll Cardiol* 1991; 18: 485-91.
 87. Iskandrian AS, Verani MS, Heo J. Pharmacologic stress testing: mechanism of action, hemodynamic responses, and results in detection of coronary artery disease. *J Nucl Cardiol* 1994; 1: 94-111.
 88. Andrea De Lorenzo, Ronaldo S. L. Lima, Reduced Heart Rate Response to Dipyridamole as a Marker of Left Ventricular Dysfunction in Diabetic Patients Undergoing Myocardial Perfusion Scintigraphy. *Clin Nucl Med* 2009;34: 275–8.
 89. Annalina Hatutale, Mariza Vorster, Alfred Otoo Ankrah, et al. Association of hemodynamic response during dipyridamole stress testing with 99mTc-MIBI SPET myocardial perfusion image findings. *Hell J Nucl Med* 2013; 16(3): 181-185
 90. Shishir Mathur, Anuj R. Shah, Alan W. Ahlberg: Blunted heart rate response as a predictor of cardiac death in patients undergoing vasodilator stress technetium-99m sestamibi gated SPECT myocardial perfusion imaging. *J Nucl Cardiol* 2010;17:617–24.

91. Greenland P, Daviglius ML, Dyer AR, et al. Resting heart rate is a risk factor for cardiovascular and noncardiovascular mortality: the Chicago Heart Association Detection Project in Industry. *Am J Epidemiol* 1999;149:853–62.
92. Jensen MT, Marott JL, Allin KH, et al. Resting heart rate is associated with cardiovascular and all-cause mortality after adjusting for inflammatory markers: the Copenhagen City Heart Study. *Eur J Prev Cardiol* 2012;19:102–8.
93. Verrier RL, Tan A. Heart rate, autonomic markers, and cardiac mortality. *Heart Rhythm* 2009;6:S68–75.
94. Jensen MT, Marott JL, Lange P, et al. Resting heart rate is a predictor of mortality in chronic obstructive pulmonary disease. *Eur Respir J*. 2012 Nov 8.
95. Palatini P. Heart rate as an independent risk factor for cardiovascular disease: current evidence and basic mechanisms. *Drugs* 2007;67(Suppl 2):3–13.
96. Beere PA, Glagov S, Zarins CK. Retarding effect of lowered heart rate on coronary atherosclerosis. *Science* 1984;226:180–2.
97. Gorur GD, Ciftci EA, Kozdag G et al. Reduced heart rate response to dipyridamole in patients undergoing myocardial perfusion SPECT. *Annals of nuclear medicine* 2012;26:609-15.
98. Lee K, Yoon JK, Lee MG, et al. Dipyridamole myocardial SPECT with low heart rate response indicates cardiac autonomic dysfunction in patients with diabetes. *J Nucl Cardiol*. 2001;8:129 – 135.
99. American Diabetes Association: Diagnosis and classification of diabetes mellitus. *Diabetes Care* 2010 33(Suppl 1):S62, 2010.
100. Preis SR, Hwang SJ, Coady S, et al: Trends in all-cause and cardiovascular disease mortality among women and men with and without diabetes mellitus in the Framingham Heart Study, 1950 to 2005. *Circulation* 119:1728, 2009.
101. Numerow L, Lucas JR, Dae, MW Botvinik EH. The paradoxical hypertensive systolic blood pressure response to dipyridamole infusion – what are its etiology and implications? *J Am Coll Cardiol* 1995; 25: 173A.
102. Pirat B, Khoury DS, Hartley CJ, et al: A novel feature-tracking echocardiographic method for the quantitation of regional myocardial function: Validation in an animal model of ischemia-reperfusion. *J Am Coll Cardiol* 51:651, 2008.

103. McMurray JJ, Adamopoulos S, Anker SD, et al: ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. *Eur Heart J* 33:1787, 2012.
104. Kim YH, Lee KH, Chang HJ, et al. Depressed heart rate response to vasodilator stress for myocardial SPECT predicts mortality in patients after myocardial infarction. *Int J Cardiovasc Imaging*. 2006;22:663– 670.
105. Clark AL, Coats AJ. Chronotropic incompetence in chronic heart failure. *Int J Cardiol*. 1995;49:225–231.
106. Cerqueira MD, Weissman NJ, Dilsizian V, et al. Standardized myocardial segmentation and nomenclature for tomographic imaging of the heart: a statement for healthcare professionals from the Cardiac Imaging Committee of the Council on Clinical Cardiology of the American Heart Association. *Circulation*. 2002;105:539–42.

الملخص العربي

يعتبر معدل نبض القلب مرآة للعمليات الفسيولوجية المترابطة بين الجهاز العصبي المركزي والطرفي وبين الردود العصبية المنعكسة.

ان استجابة نبض القلب للضغوط الفسيولوجية قد يكون غير طبيعي وذلك قد يكون نتيجة اختلال عمليات الايض نتيجة داء السكري او الفشل الكلوي واعتلال عضلة القلب والقصور بالشرايين التاجية.

هدف البحث:

يهدف البحث لفحص ما اذا كان هناك علاقة بين معدل تسارع نبض القلب والعلامات الحوية للمريض ، كفاءة عضلة القلب ، نسبة الخلل بتشبع عضلة القلب باستخدام مادة التكنيشيوم السيستامبي بالتصوير المقطعي احادي الفوتون.

حالات البحث:

اشتمل البحث على 40 مريض جاؤو لعمل تصوير مقطعي احادي الفوتون باستخدام مادة التكوكنيشيوم السيستامبي

مجموعة (1): وشملت 13 مريض وكانت استجابتهم لتسارع نبض القلب طبيعي باستخدام مادة الدايبيريдамول.

مجموعة (2): وشملت 27 مريض وكانت استجابة معدل تسارع نبض القلب غير طبيعية واقل من الطبيعي باستخدام مادة الدايبيريдамول

وقد خضع المرضى الى اخذ التاريخ الطبي الكامل، والفحص البدني ، رسم القلب ، ونبض القلب وضغط الدم كل دقيقة اثناء حقن الدايبيريдамول ، فحص اشعة الموجات فوق الصوتية على القلب وفحص نتيجة القسطرة التشخيصية على الشرايين التاجية.

نتائج البحث:

بقسمة معدل نبض القلب بعد استخدام الدايبيريдамول على معدل نبض القلب قبل الفحص وجد ان المرضى الذين نسبتهم اقل من 1.2 وجد انهم يعانون اكثر من المجموعة الاخرى بضعف كفاءة عضلة القلب ، وان نبض القلب لهم قبل الفحص كان مرتفعا عن غيرهم من المجموعة الاخرى ، كما ان نسبة الارتواء لعضلة القلب بمادة التكنيشيوم اقل في هذه المجموعة والجدير بالذكر ان هذه المجموعة اكثر من غيرها لوجود قصور بالشريان التاجي الدائري.

وهذه الدراسة متوافقة مع الدراسات الاخرى المشابهة

استجابة نبض القلب لمادة الدايبيريдамول وعلاقتها
بارتواء وكفاءة عضلة القلب باستخدام مادة التكنيشيوم
سيستامبي بالتصوير المقطعي احادي الفوتون

رسالة

مقدمة الى كلية الطب – جامعة الإسكندرية

إيفاءً جزئياً لشروط الحصول على درجة

الماجستير فى أمراض القلب والأوعية الدموية

مقدمة من

احمد محمد فتحى حسن عبده عنتر

بكالوريوس الطب والجراحة ، جامعة طنطا

2015

المشرفون

الأستاذ الدكتور / احمد ابراهيم عبد العاطي
أستاذ أمراض القلب والأوعية الدموية
كلية الطب
جامعة الإسكندرية

الأستاذ الدكتور / عمرو ثناء الدين زكي
أستاذ أمراض القلب والأوعية الدموية
كلية الطب
جامعة الإسكندرية

الدكتور / محمد ابراهيم لطفي
أستاذ مساعد أمراض القلب والأوعية الدموية
كلية الطب
جامعة الإسكندرية

استجابة نبض القلب لمادة الدايبيريдамول وعلاقتها
بارتواء وكفاءة عضلة القلب باستخدام مادة التكنيشيوم
سيستامبي بالتصوير المقطعي احادي الفوتون

مقدمة من

احمد محمد فتحى حسن عبده عنتر

للحصول على درجة

الماجستير فى أمراض القلب والأوعية الدموية

موافقون

.....

لجنة المناقشة والحكم على الرسالة

أ.د/ عبد الفتاح السيد خليف

أستاذ القلب والأوعية الدموية

كلية الطب

جامعة الإسكندرية

.....

أ.د/ أحمد ابراهيم عبد العاطي

أستاذ القلب والأوعية الدموية

كلية الطب

جامعة الإسكندرية

.....

أ.د/ جميلة محمد علي نصر

أستاذ القلب والأوعية الدموية

كلية الطب

جامعة قناة السويس

لجنة الإشراف

الأستاذ الدكتور / احمد ابراهيم عبد العاطي

.....
أستاذ أمراض القلب والأوعية الدموية
كلية الطب
جامعة الإسكندرية

الأستاذ الدكتور / عمرو ثناء الدين زكي

.....
أستاذ أمراض القلب والأوعية الدموية
كلية الطب
جامعة الإسكندرية

الدكتور / محمد ابراهيم لطفي

.....
أستاذ مساعد أمراض القلب والأوعية الدموية
كلية الطب
جامعة الإسكندرية