

II. CLINICAL PROBLEMS

EARLY VELOERGOMETRIC TEST AND ATRIAL PACING TEST IN PATIENTS WITH UNSTABLE ANGINA PECTORIS

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Distinguishing of patients with unstable angina pectoris (UAP) into groups of patients at high and low risk of myocardial infarction (MI) and with lethal outcome is of importance for approach differentiation. In this respect, early physical loading test is of proved value [8,13]. However, physical exercise test can not be applied in some patients [9,11].

The aim of this study is to assess the informative value of atrial pacing test and to compare it with that of dosaged veloergometric physical loading in UAP patients.

MATERIAL AND METHODS

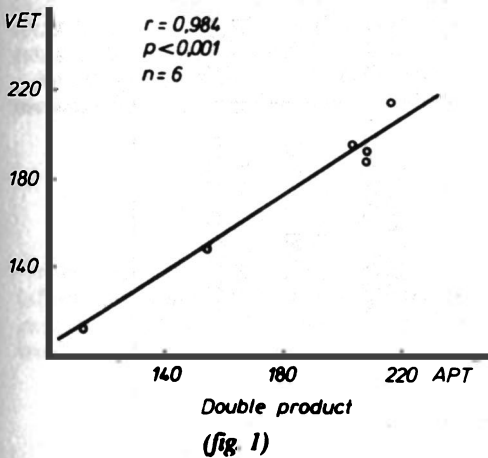
Our trial covered 11 patients (9 males and 2 females) aged between 36 and 66 years with mean age of 53.9 years. These were 9 UAP patients, one patient with neurovegetative dystonia and sinusoidal bradycardia, and one patient with IInd stage arterial hypertension and an intermittent SA-blockade. Diagnosis of UAP was made according to WHO modified criteria [6]. One UAP patient was a previous MI and 6 patients - an arterial hypertension. UAP patients were treated according to contemporary concepts [7]. A veloergometric test and an atrial pacing test was carried out for two consecutive days (between the 3rd and 7th day after clinical stabilization). Examinations were carried out on the background of therapy administered. On the corresponding days of examinations drugs were given to patients after the performance of the exercise test and of the atrial pacing test. Veloergometric test initiated by loading of 25 W and this loading increased step by step after the method recommended by WHO [1]. Atrial pacing test was performed with a bipolar electrode introduced in the right atrium through the right subclavian or femoral vein. Pacing was realized by means of portable pacemaker of the "MEDTRONIC" firm, 5375 model. One started with 10 beats per minute above the patient's heart rate and then increased to 20 beats of each step [2,4,9]. Every step was of 2 min duration. Electrocardiogram was recorded on 6-channel ECC NEK-4 prior to test at 12 leads and during the pacing and restitution period at the end of every minute at 6 precordial leads (V₁₋₆) with velocity of moving band of 50 mm/sec. Arterial pressure was measured after Korotkov's method prior to, during pacing at the end of every step as well as during the restitution period at the end of every minute. Both veloergometric and atrial pacing tests were considered positive when ischemic ECG-changes appeared (horizontal ST-segment depression > 0.1 mV with time duration > 0.08 sec at one or more leads) and/or in case of angina pectoris attack [8,13]. In case of good tolerance, physical exercise was continued till repudiation (maximal loading) but pacing - till appearance of heart rate of 170-180 per minute and/or of atrioventricular conduction disorder. Both tests were carried out under conditions of readiness for cardio-pulmonary reanimation in full capacity. Consequently, three UAP patients were directly examined.

RESULTS AND DISCUSSION

Atrial pacing test was performed in all patients. Physical exercise test could not be carried out in two UAP patients because of their inability to pedal. It was stopped in one patient because a ventricular bigenemia was provoked.

Both tests are negative in patients without UAP. They have been carried out to the moment of repudiation due to tiredness and of the appearance of IInd degree AV-blockade of Wenckebach's type.

Physical exercise test is positive in 6 UAP patients. It has been stopped because of ischemic ECG changes combined with angina pectoris in 3 patients. Loading has been stopped at 50W without any ischemic ECG-changes and without angina pectoris due to ventricular bigenemia with the seventh UAP patient.



Atrial pacing test is positive in all 9 UAP patients. It has been stopped because of ischemic ECG-changes which are combined with angina pectoris in two of three aforementioned cases. Double product at which ischemic ECG-changes appear during veloergometric and atrial pacing tests does not differ significantly ($p > 0.10$) (table 1). There exists an extraordinarily strong correlation between individual values of double product from both tests ($r = + 0.984$; $p < 0.001$) (fig.1). One minute after cessation of physical loading heart rate ($p < 0.01$), arterial pressure ($p > 0.05$) and double product ($p < 0.01$) are higher than initial values (table 1). One minute after cessation of atrial pacing mean values of these parameters do not differ from the initial ones ($p > 0.10$). Therefore, mean values of

heart rate ($p < 0.01$), arterial pressure ($p > 0.05$) and double product ($p < 0.01$) are higher one minute after physical loading than these one minute after atrial stimulation (table 1).

Ischemic ECG-changes disappear at the average after 2.8 ± 3.2 min (between 1 and 9 min) after cessation of atrial pacing and after 5.7 ± 3.1 min (between 4 and 12 min) after stopped veloergometric test. In case of already normalized ECG double product or oxygen consumption, respectively, remains significantly higher after veloergometric test (119.9 ± 24.0) than that after atrial pacing (87.3 ± 17.9) ($p < 0.01$).

Of the three catheterized patients, one has a three-vessel disease (he limites with a double product of 112 and 114.8), one has a double-vessel disease (he limites with a double product of 203 and 196) and one has an one-vessel disease (he limites with a double product of 216 and 217).

Atrial pacing test and early veloergometric test both possess an equal information value about ischemic heart disease presence and the degree of coronary lesion. Practically, ischemic ECG-changes in UAP patients are induced at one and the same double product value. Similar data are reported by other authors, too [2-5,9,10]. There are investigations demonstrating the greater information value and thus the greater diagnostic value of atrial pacing test as its specificity overcomes that of physical loading test [2,4]. According to our own data and to these reported by other investigators [2-4,9], both atrial pacing and physical loading tests can provide information about the number of affected coronary vessels, too. According to literature data [3-9] and to our own results, atrial pacing has the advantage that immediately after its cessation oxygen consumption level (double product) sharply decreases down to the initial one while after physical loading it decreases slowly and gradually. It explains why ischemic ECG-changes persist for a

Table 1
Heart rate, arterial pressure and double product in veloergometric test and atrial pacing test in UAP patients

Tests / n patients	Indexes	Initial values	In ST-depression > 0.1mV	1 min after stopping the test	when ECG is normalized
Veloergometric test n = 6	Heart rate	65.0 +/-13.5	107.2 +/-20.5 t = 4.211 p < 0,01	97.5 +/-12.6 t = 4.31 p < 0,01	83.2 +/-11.4 t = 2.524 p > 0.05
	Arterial pressure	134.2 +/-19.6	166.7 +/-32.0 t = 2.121 p > 0.05	160.8 +/-25.0 t = 2.052 p > 0.05	144.2 +/-22.4 t = 0.826 p > 0.10
	Double product	85.9 +/-19.1	177.2 +/-37.6 t = 5.302 p < 0,01	156.1 +/-26.1 t = 5.318 p < 0,01	119.9 +/-24.0 t = 2.715 p < 0,05
Atrial pacing test n = 9	Heart rate	60.6 +/-5.4	138.8 +/-25.7 t = 8.937 p < 0,001	62.4 +/-5.8 t = 0.682 p > 0.10	63.2 +/-16.3 t = 0.875 p > 0.10
	Atrial pressure	136.2 +/-17.2	137.4/-19.3 t = 0.140 p > 0.10	141.4 +/-18.7 t = 0.614 p > 0.10	137.3 +/-16.3 t = 0.139 p > 0.10
	Double product	82.5/13.0	189.1 +/-34.1 t = 8.759 p < 0,001	88.0 +/-14.4 t = 0.851 p > 0.10	87.3 +/-17.9 t = 0.650 p > 0.10

Note: Reliability is calculated towards initial values

longer time after physical loading than these after atrial pacing. That is why atrial pacing test has an advantage in those UAP patients who are not indicated for dangerous physical loading because of difficultly controlled clinical symptoms. Safety of atrial pacing test enables some authors [10] to perform it even during the acute UAP stage in order to evaluate the severity of coronary insufficiency.

The possibility to perform the atrial pacing test in patients with insufficient physical training or with some defect, with very high arterial pressure, ectopic ventricular activity and heart failure [9,11] presents another essential advantage of this test in comparison with the physical exercise test. In concordance with other investigations [2-4,9], our own results show that there is an insignificant increase of arterial pressure (not in all patients) and this fact is of little significance for oxygen consumption enhancement when atrial pacing is concerned. Atrial pacing does not provoke ectopic ventricular activity. On the contrary, physical loading can manifest such an activity and thus result in its cessation [2,9]. Adrenergic reaction during physical loading can alter the end part of ventricular complexes and to make their interpretation rather difficult [9]. In other cases, ECG-recordings are unstable and inappropriate for reading [9]. Electrocardiographic recordings are of good quality in cases with atrial pacing [2,9]. Angina pectoris is sometimes of extracardiac nature in physical loading which is not observed in atrial pacing [4,9].

An advantage of the atrial pacing test in our method used is presented by the fact that this investigation is an invasive one. It can be overcome by means of esophageal atrial pacing [4,5].

CONCLUSION

Atrial pacing test presents an easily performable method for selective cardiac loading. Its informative value does not differ from that of the veloergometric test. It can be, therefore, considered an alternative of the early physical loading test when the latter is contraindicated or inapplicable in UAP patients.

REFERENCES

1. ВОЗ - Серия технических докладов, No 338, Женева, 1978, 38 с.- 2. Воронков, Л.Г. *Клин. мед.*, 1984, No 3, 60-63.- 3. Карпов, Р.С., Г.В. Ларимова. *Кардиология*, 1987, No 11, 119-122.- 4. Лякишев, А.А., С.Г. Козлов, А.А. Гросу, Т.В. Куликова, Б.А. Сидоренко. *Кардиология*, 1984, No 10, 19-23.- 5. Навицкас, Р.С., Ш.Ю. Киндурис, В.П. Шилейкис. *Кардиология*, 1986, No 11, 43-46.- 6. Пенков, Н. Проблемы при нестабильна ангина пекторис. Канд. дис. Варна, 1981.- 7. Пенков, Н., Х. Капонов. *Вътр. болести*, 1983, No 2, 74-76.- 8. Пенков, Н. *Вътр. болести*, 1988, No 3, 7-12.- 9. Сыркин, А.Л., М.Д. Князев, Ю.А. Бунин, В.Д. Вахляев. *Кардиология*, 1979, No 4, 11-17.- 10. Тошук, В.К., А.Д. Яновский. *Врач. дело*, 1985, No 10, 50-53.- 11. Яновский, Г.В., Л.Г. Воронков, А.Г. Белоножко. *Тер. арх.*, 1986, No 5, 15-17.- 12. Bahler, R.C., C.A. Macleod. *Circulation*, 43, 1971, No 3, 407-419.- 13. Butman, S.M. *Primary Cardiol.*, 12, 1986, No 9, 15-22.

РАННИЙ ВЕЛОЭРГОМЕТРИЧЕСКИЙ ТЕСТ И ТЕСТ С ПРДСЕРДОЙ СТИМУЛЯЦИЕЙ У БОЛЬНЫХ НЕСТАБИЛЬНОЙ АНГИНОЙ ПЕКТОРИС

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РЕЗЮМЕ

Было проведено сопоставление информативной ценности теста с физической нагрузкой при помощи велоэргометра и теста для установления нагрузки посредством трансвенозной предсердной стимуляции. Исследование проводилось у 9 больных нестабильной ангиной пекторис после стойкого клинического улучшения их состояния и у двух сердечно здоровых лиц. Оба теста у всех больных показали положительные стоимости (ST - депрессия > 0.1 мV с длительностью 80 ms после точки J), а у здоровых лиц - тесты показали отрицательные стоимости. Стоимости двойного произведения, при которых индуцируется ишемические ЭКГ-изменения, показывают исключительно высокую корреляцию ($r = + 0.984$, $p < 0.001$).

Авторами делается заключение, что тест с предсердной стимуляцией у больных ишемической болезнью сердца можно использовать в случаях, не позволяющих велоэргометрической нагрузки.