Peri-operative Evaluation by Holter in Elderly Patients Submitted to Prostatectomy

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Summary

Background: Male patients, aged over 65 years and with no history of heart disease, need the following tests as a preoperative evaluation: blood count, electrocardiogram and X-ray of the chest.

Objectives: To verify the presence of ischemic and heart rate changes and the impact of the anesthetic procedure on these patients. Also to verify, in this population, the value of continuous ambulatory monitoring as a preoperative evaluation, a procedure that is not recommended by current guidelines.

Methods: In this protocol, we used continuous ambulatory monitoring (Holter System), in the perioperative period of 30 patients, aged over 65 years, who underwent transurethral resection of the prostate under spinal anesthesia.

Results: In the preoperative and transoperative evaluations, frequent complex ventricular and supraventricular arrhythmias were observed, and also ischemic changes. In the transoperative recording, the patients who had ischemic episodes were the same ones who showed total ischemic burden of more than 60 minutes in the preoperative recording.

Conclusion: Ambulatory monitoring is not regarded as an appropriate procedure for the screening of myocardial ischemia, due to the characteristics and technical limitations of the method, especially in populations with a low prevalence of coronary disease. In this cross-sectional and observational study, we concluded that the Holter recordings provided additional information which could not be obtained by conventional electrocardiogram. (Arq Bras Cardiol 2009; 93(3) : 381-388)

Key words: Perioperative care; arrhythmias, cardiac; aged; prostatectomy.

Introduction

The ageing of the population and the advances in surgical techniques have determined that elderly patients with associated diseases are now subjected to surgical interventions that were formerly contraindicated. In order to reduce morbidity and mortality, a careful monitoring is crucial in the perioperative period.

The existing classifications for stratification of risk do not purport to suspend the surgeries, but to help the surgeon decide with the patient and his family if the risk / benefit ratio is favorable to the intervention.

Among the factors that influence the rates of perioperative morbidity, there are those which are dependent on the patient's clinical condition, and others that are related to the surgical/anesthetic procedure itself: type of surgery, type of anesthesia, nature of surgery and surgery time[1]. The factors dependent on the clinical condition of the patient are assessed through detailed medical history and physical examination. Additional tests are conducted for the confirmation of any abnormalities, but they should be conducted judiciously in order to avoid unnecessary expenditure of funds.

Objective

The objective of this study was to assess the occurrence of myocardial ischemia and complex arrhythmias in elderly male patients with no history of heart disease, during the pre-, intra- and immediately post-operative periods (up to the patient's discharge from the post-anesthetic recovery room) of surgery for transurethral resection of the prostate under spinal anesthesia, and to compare the impact of the anesthetic-surgical procedure on the cardiac rhythm of these patients.

An additional objective was to establish the value of preoperative continuous ambulatory monitoring for patients considered to be at low risk for coronary disease, a procedure that is not recommended by current guidelines[2].

Methods

The study was approved by the research ethics committee of the School of Medicine of the University

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of São Paulo, and the patients signed a free informed consent. This was a prospective study involving thirty male patients, aged over 65 years, of the department of urology at Santa Casa de Campo Grande Hospital, who would be submitted to transurethral resection of the prostate under spinal anesthesia, and in whom it was possible to conduct ambulatory preoperative electrocardiographic monitoring (preoperative Holter). The following inclusion criteria were used for the selection: male patients, aged 65 years or over, ASA I and II (risk classification of the American Society of Anesthesiology), with no history of coronary artery disease (medical history or electrocardiographic evidence of no prior myocardial infarction myocardial), symptoms of angina, coronary artery bypass surgery or coronary angioplasty.

Exclusion criteria comprised all patients who presented electrocardiogram conditions that hindered or even prevented proper analysis of the ST segment, such as left bundle branch block, left ventricular hypertrophy with secondary changes in ventricular repolarization (strain), extensive electrically inactive areas and the use of medications such as digitalis and antiarrhythmics.

The preoperative evaluation included the following tests: blood count, serum potassium, chest X-ray, conventional 12 lead electrocardiogram (ECG), and glucose for diabetics.

The ambulatory electrocardiographic monitoring followed the standards recommended by the guidelines of the American College of Cardiology and the American Heart Association[3], and the following devices were used:

1) Holter recording device: Dynamis recorder, model 2100, manufactured by Cardio Sistemas Com. Ind. LTDA.

2) Holter recording analyzer: DMI analyzer, model Hospital, manufactured by BURDICK Inc., with the software ALT V5.08B.

On the day before surgery, the patients were Holter monitored for a period of 24 hours. This evaluation was called first preoperative Holter recording. An hour before the scheduled time for the beginning of surgery, the Holter recorder was installed again, with the electrodes positioned exactly in the same location of the preoperative control recording (MC5 and MC2), thus ensuring an identical ECG pattern in both exams. The recording was interrupted at the time of discharge from the recovery room, so it did not last 24 hours. However, it allowed comparisons between the preoperative and transoperative periods.

In the surgery room, the patients were monitored on a cardioscope in DII lead and with non-invasive blood pressure measurements.

The spinal anesthesia was performed with 15 mg hyperbaric bupivacaine 0.5%. There was no sedation during surgery. The hypotension (a reduction in blood pressure by more than 20% from the values measured immediately prior to spinal anesthesia) was treated with etilefrine. Oxygen (2 l/min) was administered through a nasal catheter, during the entire surgical procedure.

Non-parametric tests were used for statistical analysis: Wilcoxon test and the Kruskal Wallis test. Results at the level of 5% were considered significant.

Results

The average age of the patients who participated in the protocol was 67.7 years: the minimum age was 65 years and the maximum age was 86 years.

We observed the following distribution of patients according to risk factors for heart disease: Ten patients (33%) with high blood pressure; eight patients (26.6%) with smoking habit; and two patients (6.6%) with diabetes. Four patients had two risk factors. The patients who reported hypertension had normal blood pressure (controlled with diuretics and angiotensin-converting enzyme inhibitors), those who reported being diabetic (n = 2) were using oral hypoglycemic agents, and both had normal fasting plasma glucose levels.

Table 1 provides information on the history and the results of preoperative laboratory tests. Two patients had low potassium levels in the preoperative period (K + = 3.2 and 3.0 mEq / l). The replacement was done on the day before surgery, and normalization of the values was achieved. In reference to hemoglobin and hematocrit, two patients had values below the level considered satisfactory for elective surgery (Hb <10 mg / dl). The surgical-anesthetic procedure was not suspended, and a precautionary reserve of blood derivatives was provided, to be used if a transfusion was needed. No patient had radiographic changes consistent with heart disease. In the electrocardiogram, sinus rhythm was observed in all patients. Two patients had supraventricular premature beats, and one patient had ventricular premature beats. One patient had an electrocardiogram compatible with right bundle-branch block.

Preoperative monitoring results are shown in Table 2. The complex arrhythmias in the preoperative period are shown in Table 3.

Four patients (13.3%) had ventricular tachycardia. Sixteen patients (53.3%) had supraventricular tachycardia. Ventricular and supraventricular premature beats were considered frequent when present in an average number of more than 10/hours in 24 hours or more than 30 in a single period of 60 minutes. Eleven patients (36.6%) had frequent ventricular premature beats, and five patients (16.6%) had frequent supraventricular premature beats. Seven patients (23.3%) had ventricular paired premature beats.

The preoperative ischemic episodes are shown in Table 4, with their characteristics of amplitude (mm), length (min.), heart rate (bpm) and total ischemic burden (min.).

Six patients (20%) had ST-segment depression. One patient had eight ischemic episodes during the preoperative recording, but he was not the same patient who had the highest total ischemic burden (115.9 minutes). Figure 1 shows that 46% of preoperative ischemic events occurred with heart rates between 50 and 80 beats per minute.

Transoperative monitoring results are shown in Table 5. The complex arrhythmias are shown in Table 6.

One patient (3.3%) had ventricular tachycardia. Five patients (16.6%) had supraventricular tachycardia. Nine patients (30%) had frequent ventricular premature beats, and five patients (16.6%) had frequent supraventricular premature beats. Eight patients (26.6%) had ventricular paired premature beats.

Table 1 - **Information obtained through preoperative laboratory tests and history in patients undergoing transurethral resection of prostate**

	Age	Laboratory tests				Other history data		
Record	years	K^+	Hb/Ht	ECG*	XR†	High blood pressure	DM ‡	Smoking habit
1	65	4.4	13.8 / 43	SR	nl	-	-	-
2	66	4.2	14.2 / 45	SR	nl	yes	-	yes
3	67	4.0	13.2 / 41	SR	nl	-	-	-
4	68	3.2	12.8 / 39	SR	nl	-	-	yes
5	72	3.8	14.2 / 44	SR	nl	yes	-	-
6	65	3.8	13.8 / 48	SR	nl	-	-	-
7	76	4.6	14.5 / 44	SR	nl	-	-	yes
8	68	3.9	15.1 / 45	SR	nl	-	-	-
9	75	3.5	14.2 / 43	SR	nl	yes	-	-
10	65	4.4	14.2 / 43	SR	nl	-	-	-
11	65	5.0	15.8 / 46	SR	nl	-	-	-
12	67	4.4	13.6 / 42	SR	nl	yes	-	-
13	67	4.2	12.0 / 38	SR	nl	yes	-	yes
14	86	4.0	12.3 / 38	SR	nl	-	-	yes
15	86	3.7	12.5 / 37	SR	nl	-	-	-
16	66	4.0	15.3 / 45	SR	nl	-	-	-
17	65	4.4	10.8 / 34	SR	nl	-	-	-
18	71	4.0	14.0 / 43	SR	nl	-	-	yes
19	65	4.6	11.5 / 37	SR	nl	-	-	-
20	70	4.0	9.6 / 29	SR	nl	-	-	-
21	67	3.7	12.5 / 37	SR+EV	nl	yes	-	-
22	84	4.7	10.7 / 34	SR	nl	yes	-	-
23	71	3.6	14.2 / 44	SR	nl		-	-
24	73	4.8	10.6 / 33	SR+ESV	nl	-	-	-
25	78	4.5	13.2 / 41	SR+ESV	nl	yes	-	-
26	68	3.0	13.7 / 40	SR	nl	yes	-	yes
27	65	4.3	13.6 / 41	SR	nl	yes	yes	-
28	65	3.8	9.1 / 29	SR	nl	-	yes	-
29	65	4.1	12.7 / 39	SR+BD	nl	-	-	yes
30	65	3.7	10.9 / 35	SR	nl	-	-	-

** SR - sinus rhythm, ESV - supraventricular premature beats, EV - ventricular premature beats, RB - right bundle-branch block ; † - no changes that indicate heart disease ; ‡ DM - diabetes mellitus.*

The transoperative ischemic episodes are presented in Table 7. Two patients (6.6%) had ST-segment depression. The patient who had the largest number of ischemic episodes (eight episodes) was also the one who had the highest total ischemic burden (215.2 minutes). Figure 1 shows that 90% of the transoperative ischemic events occurred with heart rates between 50 and 80 beats per minute.

Discussion

The most frequent electrocardiogram changes found in elderly patients are: sinus bradycardia, sinus pause, bradytachycardia syndrome and diffuse changes in ventricular repolarization. The functional disorders of the sinus node are responsible for up to 52% of the pacemaker implants in that population[4]. The arrhythmias are also prevalent, especially ventricular and atrial fibrillation, which affects up to 80% of the population aged over 65 years[5-7]. The degree of risk of these arrhythmias is closely related to the presence of ventricular dysfunction and/or myocardial ischemia[8].

Holter monitoring is used for various purposes, including the detection and quantification of myocardial ischemia, the study of autonomic modulation of the heart by variations in

Table 2 - Results of 24-hour preoperative holter monitoring of patients undergoing transurethral resection of the prostate

	Preoperative arrythmias					
Patient	Ventricular Premature Beats			Supraventricular Premature Beats		ST-segment Changes
Record	Single	Paired	Cluster	Single	Clusters	Depression*
1	4	0	0	1	0	-
2	3598	7	1	2139	8	Yes
3	23	0	0	23	2	-
4	393	0	0	66	2	Yes
5	12	0	0	2	0	-
6	13	1	0	50	3	Yes
7	422	3	1	81	3	-
8	2	0	0	42	2	-
9	1642	0	0	11	1	-
10	1055	7	0	954	4	-
11	432	0	0	49	1	-
12	1	0	0	6	0	Yes
13	4	0	0	17	2	Yes
14	14	0	0	100	2	-
15	189	0	0	1672	6	-
16	53	0	1	13	0	-
17	2	0	0	25	0	-
18	162	0	1	1	0	-
19	129	0	0	46	2	-
20	2	0	0	22	0	-
21	128	0	0	38	0	-
22	1 465	13	0	1249	10	-
23	7	0	0	10	0	-
24	55	0	0	208	4	-
25	2 033	37	0	25	0	-
26	242	0	0	1	0	-
27	268	2	0	10	0	-
28	1	0	0	1	0	-
29	188	0	0	298	13	Yes
30	0	0	0	1	0	-

** - No ST depression or sinus pauses were observed.*

the duration of cardiac cycles (VRR), and the prediction of future cardiac events, particularly sudden cardiac death; this method is also used to evaluate antiarrhythmic, anti-ischemic therapeutic procedures, classical artificial cardiac pacing and implantable defibrillators.

The presence of ventricular premature beats documented during the monitoring preoperative followed a trend consistent with what is described in the literature about their benignity and their low prognostic value in determining perioperative complications. However, percentages (13.3%) of non-sustained ventricular tachycardia higher than those found in the literature (0 to 4%) were observed[9]. The episodes of non-sustained ventricular tachycardia were isolated in all four patients, and consisted of 3, 4, 6 and 19 complexes. The patient who had the longest non-sustained ventricular tachycardia in the preoperative recording also showed an ST depression with the duration of 33.4 minutes. He had a favorable clinical course, without complications during the intra- and post-operative periods. All Holter monitoring data, both preoperative and transoperative, were obtained later. The patients at greatest risk were not identified prior to surgery and no prophylactic measures were taken to reduce the complications. We have no information on how they evolved in the long term.

In this work, during the preoperative monitoring (Table 3), we observed that five patients (16.6%) had frequent isolated atrial premature beats, sixteen patients (53.3%) had atrial premature beats in clusters with more than three beats, and eight patients (26.6%) had atrial premature beats in clusters with more than five beats (non-sustained supraventricular tachycardia - NSSVT). These data show similarities with the percentages that are described in the literature (10 to 30%). The longest episode of NSSVT was composed of 16 beats with a heart rate of 150 beats per minute. It is noteworthy that supraventricular arrhythmias indicate atrial instability and proneness to atrial fibrillation, but these complications were

Table 3 - Summary of supraventricular and ventricular arrhythmias considered complex, found during the 24-hour preoperative Holter monitoring of patients undergoing transurethral resection of prostate

Types of arrythmias	Total	Observation (patients' report)
Ventricular Tachicardia	4	2,7,16,18
Supraventricular Tachicardia	16	2,3,4,6,7,8,9,10,11,13, 14,15,19, 22,24,29
Frequent Ventricular Premature Beats *	11	2,4,7,9,10,11,15,22, 25,26,27
Frequent Supraventricular Premature Beats *	5	2,10,15,22,29
Ventricular Paired Premature Beats	7	2,6,7,10,22,25,27

** - Ventricular and supraventricular prematuressistolia were considered frequent when present in the average number of more than 10/hour in 24 hours or more than 30 in a single period of 60 minutes.*

Table 4 - Analysis of the results of st segment changes in the 24-hour preoperative holter monitoring of patients undergoing transurethral resection of the prostate

Patient	Number of ST depression episodes	ST depression (mm)	Duration of depression (min)	Heart rate (bpm)	Total ischemic load (min)
2	1	-1.6	33.4	90	33.4
4	3	-1.8	1.9	113	33.2
		-1.8	1.1	98	
		-1.7	30.1	125	
6	4	-1.8	9.5	77	35.9
		-2.2	8.6	78	
		-1.9	5.2	79	
		-2.0	12.5	82	
12	2	-1.9	21.2	63	115.9
		-1.8	94.7	56	
13	8	-1.9	5.2	83	83.2
		-2.5	8.4	86	
		-2.2	18.9	92	
		-1.9	3.2	85	
		-1.8	9.8	80	
		-1.9	28.6	75	
		-1.9	4.5	75	
		-1.6	4.2	73	
29	1	-1.9	10.0	82	10.0

not observed in the patients in our study.

Two sinus pauses with duration of 2.8 and 2.0 seconds were identified during the transoperative recording, corresponding to the period in which the patient was in the recovery room after anesthesia.

It is described in the literature that in Holter monitoring of normal patients, ST-segment changes (silent ischemia) can be observed in up to 39% of the patients[10-15]. In this study, we found six patients (20%) with silent myocardial ischemia in pre-operative monitoring (Table 4) and two patients (6.6%) in transoperative monitoring (Table 7).

The patients in our study were healthy and without suspicion of cardiovascular disease suggested by history, clinical examination, chest X-ray or standard ECG, and we found in the preoperative monitoring a significant number of patients with ST-segment changes. We found no complications during our work, perhaps because the patients were apparently free of heart disease and underwent that small surgery at small risk, with subarachnoid block anesthesia. In addition, they were followed up for a very short period of time and we had no information on how they evolved in the following months, so we cannot affirm that the findings of silent ischemia in these cases have prognostic value.

Unlike other methods of investigation, the Holter system does not employ exercise or pharmacological stress to lead to

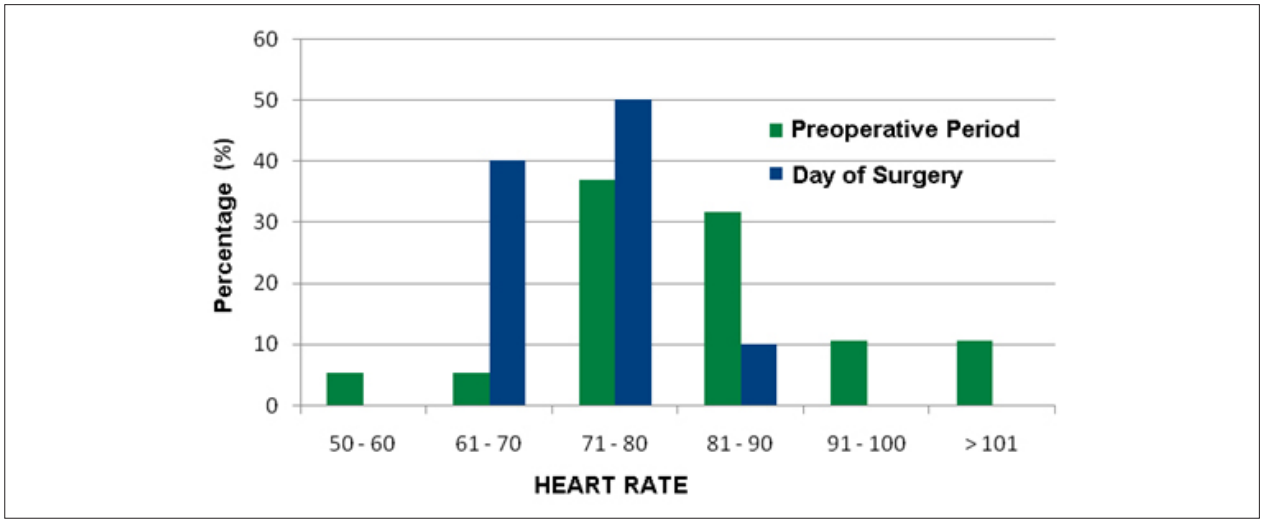

Figure 1 - Distribution of ischemic episodes, according to heart rate (bpm) and the evaluated moments.

Table 5 - Results of transoperative monitoring of patients undergoing transurethral resection of the prostate

ARRHYTHMIAS – transoperative recording							
	Ventricular premature beat			Supraventricular premature beat		ST-segment change	Sinus pause
Record	Single	Paired	Cluster	Single	Cluster	ST-Depression	Duration
1	0	0	0	27	0	-	-
2	1 462	0	0	79	1	-	-
3	17	0	0	1	0	-	-
4	58	0	0	8	1	-	-
5	0	0	0	0	0	-	2.8
6	0	0	0	5	0	-	-
7	195	4	0	430	2	-	-
8	0	0	0	0	0	-	-
9	2 051	0	0	1	0	-	-
10	594	19	0	497	0	-	-
11	97	2	0	8	0	-	-
12	0	0	0	0	0	Sim	-
13	0	0	0	0	0	Sim	-
14	2	0	0	12	0	-	-
15	20	0	0	401	1	-	-
16	43	0	1	1	0	-	-
17	1	0	0	1	0	-	-
18	7	0	0	0	0	-	-
19	0	0	0	6	0	-	-
20	1	0	0	63	0	-	-
21	57	0	0	1	1	-	-
22	371	8	0	233	0	-	-
23	1	0	0	5	0	-	-
24	2 434	18	0	3 597	6	-	-
25	818	67	0	16	0	-	-
26	171	1	0	1	0	-	-
27	138	1	0	3	0	-	-
28	3	0	0	0	0	-	-
29	46	0	0	27	0	-	-
30	0	0	0	6	0	-	-

myocardial ischemia, so it detects and quantifies a spontaneous ischemic condition, in the patient's daily routine[16].

In this study, the spontaneous ischemic events observed in the Holter began with and maintained heart rate levels equal to those of non-ischemic periods or showed mild elevations, between 5 to 15% from the initial heart rates. We observed, preoperatively, seven ischemic episodes (36.9%) with heart rates ranging between 70 to 80 bpm, and five ischemic episodes (31.5%) with heart rates raging between 80 and 90 bpm. During the transoperative recording, 90% of the episodes of silent ischemia occurred at frequencies below 80 bpm (Figure 1).

In patients with silent myocardial ischemia, multiple episodes are generally observed in one day and often with prolonged duration (10 to 25 minutes)[16].

Tables 4 and 7 summarize the characteristics of the ischemic episodes found in the preoperative recordings and in the recordings of the day of the surgery. During the preoperative recording, eleven episodes lasted less than 10 minutes and eight episodes were longer. During the transoperative

Table 6 - Summary of ventricular and supraventricular arrhythmias that were considered complex during transoperative holter recordings of patients undergoing transurethral resection of the prostate

Types of arrhythmia	Total of patients	Observation (patients' report)
Ventricular Tachycardia	1	16
Supraventricular Tachycardia	5	2,4,7,15,21
Frequent Ventricular Premature Beats*	9	2,7,9,10,22,24,25,26,27
Frequent Supraventricular Premature Beats*	5	7,10,15,22,24
Paired Ventricular Premature Beats	8	7,10,11,22,24,25,26,27

** - Ventricular and supraventricular premature beats were considered frequent when present in an average number of more than 10/hour in 24 hours or more than 30 in a single period of 60 minutes.*

recording, one episode lasted less than 10 minutes and all others (nine episodes) had a longer duration.

KENNEDY and WIENS[17] consider the finding of preoperative total ischemic burden greater than 60 minutes indicative of a patient at high risk for coronary events.

The patients who presented total ischemic burden greater than 60 minutes in the preoperative recording had repeated episodes of ischemia during the recording in the day of surgery. It is noteworthy that the transoperative recordings lasted about six hours and, therefore, the total ischemic burden in this examination is the sum of ischemic episodes over a period shorter than the preoperative recording, less than what is recommended in the definition of ischemic load.

The intra-operative ischemic episodes were not identified by the anesthesiologist, perhaps because of an inadequate monitoring system for analysis of the ST segment, or because of artifacts caused by the electric scalpel during the prostatic resection. Both patients had a favorable clinical course without complications. If these episodes had been identified, measures could have been taken to improve coronary blood flow and oxygen supply to the myocardium.

The following are considered as perioperative complications: myocardial infarction; arrhythmias that are difficult to control; pulmonary edema; heart failure; angina and death related to any cardiac event. The type of surgery is clearly related to the incidence of cardiovascular complications. Intrathoracic and abdominal procedures entail greater risk than do peripheral surgeries. Among all surgeries, intra-abdominal aortic aneurysmectomy is the one that determines the highest morbidity. The complications do not seem to be related to the duration of surgery and anesthesia, but mainly to the occurrence of prolonged hypotension, translocation of fluids affecting lung oxygenation and transport of oxygen in the post-operative period[18].

The knowledge of the changes caused by anesthesia and surgery is important to the understanding of the great demand imposed on the heart and the necessary measures to minimize possible complications. On the induction of general anesthesia, depending on the medications used and the patient's clinical conditions, there may be hypotension caused by vasodilation and myocardial depression. During the laryngoscopy and intubation there is an adrenergic reaction that culminates with tachycardia and elevation of the blood pressure, which can reach very high values in hypertensive patients. In this aspect, regional anesthesia has many advantages, as it does not determine the occurrence of undesirable adrenergic reactions[19]. However, depending on the extent of the sympathetic block, hypotension, bradycardia and decreased cardiac output may occur, which can trigger complications such as myocardial and cerebral ischemia[20].

Many factors are involved in the choice of general or regional anesthesia, including the experience of the anesthesiologist, the location and extent of the intervention and the clinical condition of the patient. The main goal of anesthesia is to maintain hemodynamic conditions within the largest possible stability.

The use of spinal anesthesia for prostatectomy and transurethral resection of the prostate as a preferential anesthetic technique, is due to several factors: easier

Table 7 - Results of st-segment changes analysis in transoperative recording of patients undergoing transurethral resection of the prostate

		ST-segment changes – transoperative recording			
Patient	Number of ST-segment depression episodes	ST-segment Depression (mm)	Duration of depression (min)	Heart rate (bpm)	Total ischemic load (min)
12	2	-2,1	42,0	75	81,9
		-2,1	39,9	69	
13	8	-1,8	20,9	79	215,2
		-1,8	28,6	76	
		-1,7	21,6	76	
		-1,9	21,8	83	
		-2,5	64,2	77	
		-1,9	42,4	67	
		-1,7	10,8	68	
		-1,7	4,5	68	

implementation technique, virtual absence of systemic effects of the local anesthetics used, lower volume of operative bleeding and lower incidence of thromboembolic events after surgery. The maintenance of consciousness during anesthesia is also advantageous in patients undergoing such surgeries since it facilitates the identification of episodes of cerebral and/or myocardial ischemia, and in the specific case of transurethral resection of the prostate, in the diagnosis of serious surgical complications such as water intoxication and piercing of the prostate capsule or the bladder.

Of the six patients who had silent ischemia preoperatively, only two of them repeated the episodes during the recording of the day of surgery. We noticed that one of them had 115.9 minutes of ischemia in 24 hours, and that during the recording of the day of surgery, he repeated the ischemia for a total of 81.9 minutes (now in a period of less than 24 hours). The other patient had 83.2 and 215.2 minutes, respectively. We cannot attribute the worsening of total ischemic burden in these two patients to surgical anesthetic procedures, as the ischemic episodes were already present before the arrival of the patient to the operating room.

The anesthetic-surgical team must always be vigilant and have access to all resources needed for the treatment of possible complications, even in a population considered to be at low-risk and in small surgeries.

Conclusions

In this protocol, the Holter monitoring of male patients aged 65 years or older, with no cardiovascular symptoms and with normal electrocardiogram, revealed different types of cardiac arrhythmias, from rare to frequent, as well as episodes of silent ischemia.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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