THE MOTOR CHRONAXIE IN PATIENTS WITH MALIGNANT AND BENIGN TUMORS OR WITH OTHER DISEASES

M. E. Timoshechkina

From the Institute of Experimental Pathology and Therayp of Cancer (Director — Corresponding Member AMN SSSR Prof. N. N. Blokhin) of the AMN SSSR, Moscow

(Received May 30, 1958. Presented by Active Member Acad. Med. Sci. USSR, V. N. Chernigovskii)

Having observed changes in the motor chronaxie in experiments on animals during growth of a malignant tumor, and having successfully employed these changes as a diagnostic test [1], we have verified our observations in the clinical field. The chronaxie of the flexors and extensors of the right wrist was measured. In all, 450 persons were examined, 190 of whom were donors. The values obtained for the chronaxie and the rheobase in these donors differed in no way from the physiological standards (Table 1).

TABLE 1

Chronaxie and Rheobase in Donors at the Moscow Regional Blood Transfusion Station (mean values according to age groups)

Group	Flexors (median n.)		Extensors (ulnar and radial nn.)	
	Rheobase	Chronaxie	Rheobase	Chronaxie
I				
From 18 to 25 years	41.6	0.39	34.7	0.47
II				
From 25 to 40 years	40.5	0.34	28.7	0.64
III				
40 years and over	39.9	0.30	30.8	0.54

168 patients were examined, suffering from other diseases, including diseases of the heart, lungs, gastrointestinal tract, skin, endocrine and nervous systems. The mean values of the chronaxie and rheobase in this group of patients, who acted as controls, showed no essential difference from those in the healthy subjects (Table 2).

Attention is drawn to the fact that within this group there were characteristic features. For example, in patients with acute disorders of the cardiac rhythm no clear response to stimulation could be detected, and the readings were extremely fluid, varying from small to large figures and back again. In patients with acute inflammatory conditions, a reduction in the chronaxie was observed, and in patients with chronic inflammatory conditions it was increased. In some cases the value of the subordination index exceeded three.

TABLE 2

The Chronaxie and Rheobase in Patients with Other Diseases (mean results)

Groups of patients with other diseases	Flexors (median n.)		Extensors (ulnar and radial nn.)	
	Rheobase	Chronaxie	Rheobase	Chronaxie
I (Diseases of the cardiovascular system)	39.91	0.34	41.28	0.60
II (Diseases of the respiratory organs)	45.94	0.31	44.55	0.43
III (Diseases of the gastrointestinal tract)	40.61	0.28	38.56	0.71

TABLE 3

The Chronaxie and Rheobase in Patients with Malignant Tumors in Various Situations

Patients' surname	Age, in years	Diagnosis	Duration of disease (in years)	Chronaxie values				Bourguignon's coefficient	Notes
				flexors		extensors			
				rheobase	chronaxie	rheobase	chronaxie		
B-n	35	Recurrence of sarcoma of the soft tissue of the head	2	47,5	0,09	40,0	1,08	+12	The ratio is shown as positive when the chronaxie of the extensors exceeded that of the flexors, and negative when the chronaxie of the flexors exceeded that of the extensors
M-v	51	Carcinoma of the stomach	—	47,5	1,18	50,0	0,33	—3,6	
K-v	53	Carcinoma of the stomach with omentum metastasis	3	55,0	0,80	52,5	0,2	—4	
G-ch	42	Carcinoma of the breast with metastases in the lymphatic glands	—	29,0	0,57	26,5	0,12	—4,6	
A-n	62	Carcinoma of the stomach	1	60,0	0,19	63,0	1,08	+5,6	
V-va	42	Carcinoma of the breast	—	52,5	0,24	24,0	0,89	+3,7	
B-n	42	Carcinoma of the stomach with metastases in the pancreas and omentum	1	60,0	0,09	40,0	0,57	+6,3	
M-r	51	Carcinoma of the breast	—	38,5	0,17	20,0	0,94	+5,5	
K-va	26	Angiosarcoma of the soft tissues of the face	4	63,0	0,14	75,0	0,04	—3,5	
Yu-n	62	Melanoma of the leg	—	76,0	0,08	58,0	0,24	+3	
K-i	26	Stage III lymphogranulomatosis	1	39,5	0,33	33,0	1,03	+3,1	
Sh-va	26	Stage III lymphogranulomatosis	1	17,5	0,14	27,5	0,61	+4,3	
F-v	63	Stage II lymphogranulomatosis	—	49,5	0,14	27,5	0,81	+5,7	
P-kh	16	Stage II lymphogranulomatosis	—	35,5	0,35	27,5	0,61	+1,7	

TABLE 4

The Chronaxie and Rheobase in Patients with Benign Tumors

Patients surname	Age, in years	Diagnosis	Duration of disease (in years)	Chronaxie values				Bourguignon's coefficient
				flexors		extensors		
				rheobase	chronaxie	rheobase	chronaxie	
N-va	32	Hemangioma of left half of face	32	29,5	0,17	29,0	0,28	+1,6
P-v	43	Telangioectatic neurofibromatosis	1	40,0	0,14	35,0	0,38	+2,7
M-va	38	Polyposis of the stomach	15	88,0	0,21	48,0	0,42	+2
V-va	64	Endometritis	—	32,5	0,33	35,0	0,42	+1,2
Zh-va	34	Fibrocystic disease of the breast	2	38,0	0,14	35,5	0,30	+2
K-va	26	Fibroma of the anterior abdominal wall	—	37,0	0,38	27,5	0,66	+1,7
L-aya	43	Fibrocystic disease of the breast	8	25,5	0,32	32,0	0,66	+2
B-va	52	Hemangioma of the skin of face	52	26,5	0,26	31,0	0,52	+2
I-v	53	Hemangio-endothelioma of the left thight	—	35,0	0,80	27,5	1,08	+1,3
K-na	34	Fibrocystic disease of the breast	—	31,5	0,27	28,5	0,28	1

The patients with neoplastic disease formed a group of 92 persons, the main sites of the tumors being the stomach, breast, skin, soft tissues of the limbs and the lymphatic glands. There were 79 patients with malignant tumors and 13 with benign. Among the patients with malignant tumors were some admitted for the first time and as yet untreated, and others readmitted. In the untreated patients the chronaxie and the subordination index were sharply altered, usually being increased; often the relationships between the values of the chronaxie were distorted. The changes in the chronaxie and the subordination index were independent of the site of the tumor (Table 3).

In patients with benign tumors the flexor and extensor chronaxies and their relation to each other were close to normal (Table 4).

In the group of patients with malignant tumors and treated by drugs, by surgery or by radiotherapy, the values of the chronaxie were close to normal; in cases where the widespread nature of the disease precluded any attempt at radical operation or in which drug or radiation treatment was unsuccessful, the chronaxie readings showed quantitative changes which were similar to the pattern of these readings in patients with untreated malignant tumors (Table 5).

Thus the presence of a malignant tumor in the body is accompanied by functional changes in the nervous system, easily recorded at the periphery by the method of chronaximetry, independently of the site of the disease. After the surgical removal of the malignant tumor or after other effective treatment, the chronaxie and the subordination index return to normal.

We discovered changes in the chronaxie, leading to an increase in the subordination index or to its distortion, not only in patients with malignant tumors but also in several patients with other diseases. There is thus no possibility of using the results of chronaximetry as a diagnostic test of cancer, in spite of the fact that these results are of definite interest in assessing the functional state of the nervous system and the general condition of the patient.

SUMMARY

Peculiar quantitative characteristics were noted in the motor chronaxia in experiments on animals with the presence of malignant tumors. Using these data of chronaxia as a diagnostic test, the authors subjected their observations to verification in clinical conditions. Studies were conducted on 450 patients, including those with the presence of a malignant tumor, benign tumor, cases with various internal diseases and the group of healthy donors. It appeared that in patients with malignant tumors there was a shift of the cronaxia values in the direction of their increase and pronounced disturbance of the interrelationship of chronaxia registered from the flexors and

TABLE 5

The Chronaxie and Rheobase in Patients with Benign Tumors

Patient's surname	Age, in years	Diagnosis	Duration of disease (in years)	Chronaxie values				Bourguignon's coefficient
				flexors		extensors		
				rheobase	chronaxie	rheobase	chronaxie	
P-na-N-n	58	Carcinoma of the breast	—	34,0	0,80	39,5	0,56	—1,4
F-e	58	The same	3	55,0	0,35	42,5	0,61	+1,7
S-va	36	The same (with metastases in the lymphatic glands)	—	42,5	0,12	38,0	0,40	+3,3
R-v	76	Carcinoma of the stomach	1	41,5	0,56	35,0	0,56	1
F-v	55	" "	1	31,5	0,56	31,5	0,71	+1,3
K-na	63	Malignant polyp of the stomach	1	35,0	0,35	27,5	0,71	+2
S-v	49	Carcinoma of the esophagus	11	44,0	0,14	31,0	1,83	+13
K-va	45	Carcinoma of the stomach	1	47,5	0,26	48,0	0,47	+1,8
Shch-v	56	The same (with metastases in the omentum)	—	42,5	0,14	34,0	1,13	+8,1
M-va	55	Malignant polyp of the stomach	—	32,5	0,14	37,5	0,28	+2
F-o	27	A typical form of lympho-granulomatosis	—	55,0	0,47	30,0	0,42	—1,1
L-n	22	Stage III lymphogranulo-matosis	2	40,0	0,24	30,0	0,14	—1,7
P-v	33	Mediastinal form of lymphogranulomatosis	2	41,0	0,42	32,0	0,47	+1,1
K-v	18	Stage IV lymphogranulo-matosis	2	47,5	0,19	45,0	0,19	1
G-na	56	The same	5	48,5	0,24	37,5	Generalized response	
R-v	23	Stage II lymphogranulo-matosis	5	47,5	0,18	40,0	0,06	—3
N-v	26	The same	—	39,5	0,75	40,0	0,56	—1,3
Z-na	21	Stage III lymphogranulo-matosis	—	30,0	0,19	30,0	3,96	+20,8
D-n	38	The same	—	37,5	0,94	31,5	0,94	1

extensors of the right hand. The changes in chronaxia were registered irrespective of the localization of the tumor. There were no significant quantitative changes in chronaxia in presence of a benign tumor. After removal of or treatment of the malignant tumor the chronaxia normalizes. Similar changes in the chronaxia and in the subordination index were registered both in patients with malignant tumors, and in those with skin diseases (psoriasis) and diseases of the thyroid, gland, stomach and duodenum. Thus, the possibility of employment of chronaxia as criteria for the diagnosis of malignant tumors is rejected. However, it still retains its value as an auxiliary test, when combined with other methods of clinica observation, in evaluation of the general condition of the patient.

LITERATURE CITED

[1] M. E. Timoshechkina, Proceedings of a Scientific Meeting on the Problem: "The Nervous System in Malignant Disease", and Related Problems, 65-68, (Kiev, 1955). [In Russian].