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## Clinical application of sialic acid (II) Sialic acid contents in cerebro-spinal fluid of patients suffering from the disease of the central nervous system

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# Clinical application of sialic acid (II) Sialic acid contents in cerebro-spinal fluid of patients suffering from the disease of the central nervous system\*

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## Abstract

It is well known that human serum contains some sialic acid and its contents increase markedly in the blood serum of the patients bearing malignant tumors. Recently YAMAKAWA<sup>2</sup>, BHOM<sup>3</sup>, SAITO<sup>4</sup> and YUI<sup>5</sup> observed the sialic acid contents in the blood sera from the patients of various diseases and clarified that its contents increase not only in the sera from the cases bearing malignant tumors but also in those of rheumatic or tuberculous diseases. BOHM<sup>6</sup> et al. measured the sialic acid contents in the cerebrospinal fluid of several diseases and ascertained that its contents increase in the cerebrospinal fluid from the cases of inflammatory diseases. In connection with these works we have observed the sialic acid contents in the cerebrospinal fluid of the patients suffering from the diseases of central nervous system, prior to the surgical operation, and revealed the markedly increased contents in the sialic acid in the patients bearing tumors of the nervous system. In this paper the data are reported in detail.

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**CLINICAL APPLICATION OF SIALIC ACID (II)**  
**SIALIC ACID CONTENTS IN CEREBRO-SPINAL FLUID**  
**OF PATIENTS SUFFERING FROM THE DISEASES**  
**OF THE CENTRAL NERVOUS SYSTEM**

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It is well known that human serum contains some sialic acid and its contents increase markedly in the blood serum of the patients bearing malignant tumors. Recently YAMAKAWA<sup>2</sup>, BHÖM<sup>3</sup>, SAITO<sup>4</sup> and YUI<sup>5</sup> observed the sialic acid contents in the blood sera from the patients of various diseases and clarified that its contents increase not only in the sera from the cases bearing malignant tumors but also in those of rheumatic or tuberculous diseases. BÖHM<sup>6</sup> et al. measured the sialic acid contents in the cerebrospinal fluid of several diseases and ascertained that its contents increase in the cerebrospinal fluid from the cases of inflammatory diseases. In connection with these works we have observed the sialic acid contents in the cerebrospinal fluid of the patients suffering from the diseases of central nervous system, prior to the surgical operation, and revealed the markedly increased contents in the sialic acid in the patients bearing tumors of the nervous system. In this paper the data are reported in detail.

**MATERIALS AND METHODS**

Sixty patients (Tables 1—3) admitted in our surgical clinic have been observed. The patients are classified into three groups, i. e., the first, of arachnoiditis (20 cases); the second, of cerebrospinal tumor (20 cases); and the third, of various diseases (20 cases) other than cerebrospinal diseases including appendicitis, adhesive disturbance of intestine, gastric and duodenal ulcers, pylorus stenosis, etc. For the measurement of sialic acid, the method devised by YAMAKAWA, SUZUKI and SAITO<sup>2</sup> was used as described in detail in our first report<sup>5</sup>, but instead of 0.05 ml of sera, 1.0 ml of supernatant of cerebrospinal fluid centrifuged at 2,000 rpm for

15 min. was employed. For each estimation measurements were made 3 times and their average value was taken as the value for the patient.

## RESULTS

Among three groups, it has been found that the sialic acid contents of cerebrospinal fluid in 17 cases of arachnoiditis of various origins have ranged between 0.22 and 0.55 mg%, 0.31 mg% in average (Table 1). No

Table 1. Sialic Acid Contents of Cerebro-Spinal Fluid in the Patients with Arachnoiditis of Various Origins

No.	Name	Age	Sex	Diagnosis	Content of Sialic Acid mg/dl
1	M. O.	28	♀	arachnoiditis optochiasmaticus	0.22
2	S. I.	21	♂	"	0.25
3	K. S.	43	♀	"	0.26
4	H. S.	47	♀	cerebralis	0.26
5	M. M.	20	♂	"	0.27
6	K. F.	32	♀	"	0.28
7	Y. H.	32	♂	"	0.33
8	S. S.	29	♀	" adhesiva	0.26
9	M. K.	31	♂	basilaris	0.26
10	M. M.	41	♀	cysterna	0.55
11	H. S.	48	♀	cerebrospinalis	0.55
12	T. N.	62	♂	"	0.32
13	M. N.	31	♀	spinalis	0.23
14	S. Y.	48	♀	"	0.27
15	Y. Y.	48	♀	" adhesiva	0.32
16	Y. Y.	36	♀	limbalis	0.36
17	K. S.	25	♂	"	0.34
18	H. H.	31	♀	cystica	0.27
19	Y. F.	17	♀	epilepsy	0.22
20	A. N.	21	♂	paralysis of the N. facialis	0.32
average					0.31

differences have been found by the varied localizations of arachnoiditis. In 20 cases of cerebrospinal tumor the values ranged between 0.58 and 0.85 mg%, 0.72 mg% in average (Table 2). These values are comparatively high and remarkable, almost twice as high as those of the normal. Concerning the diseases having no disturbance in the nervous system, the

Table 2. Sialic Acid Contents of Cerebro-Spinal Fluid in the Patients Bearing Various Tumors or Cancer

No.	Name	Age	Sex	Diagnosis	Content of Sialic Acid mg/dl
1	T. K.	42	♀	spinal cord tumor	0.60
2	K. N.	54	♂	"	0.72
3	M. O.	46	♂	"	0.79
4	K. K.	58	♀	"	0.74
5	H. Y.	45	♂	"	0.75
6	Y. F.	51	♀	"	0.78
7	Y. O.	38	♂	brain tumor glioma	0.78
8	I. Y.	22	♂	"	0.80
9	M. F.	47	♂	"	0.85
10	F. M.	40	♀	"	0.80
11	K. Y.	43	♀	"	0.65
12	I. Y.	26	♀	"	0.64
13	K. N.	28	♂	"	0.84
14	N. S.	26	♀	"	0.78
15	S. K.	28	♀	"	0.60
16	A. M.	32	♀	"	0.68
17	Y. F.	22	♀	"	0.68
18	Y. S.	52	♂	acoustic neurinoma	0.58
19	F. Y.	58	♂	"	0.64
20	T. K.	56	♂	"	0.62
average					0.72

sialic acid contents are found to be ranged between 0.24 and 0.43 mg %, 0.30 mg % in average (Table 3).

#### COMMENTS

Recently YUI et al. reported on sialic acid contents of human blood sera in various diseases revealing that the sialic acid increases markedly to 90 to 170 mg % in the sera of patients bearing malignant tumors, while in the normal ones they range from 50 to 100 mg %<sup>5</sup>. In the present study we found that in cerebrospinal fluid of the patients bearing tumors in brain or in spinal cord the contents of sialic acid increase remarkably, as much as twice those of the patients suffering from the arachnoiditis and those of the diseases of the organs other than the nervous system. In the preceding part we reported that the sialic acid content increased slightly in the blood sera in the cases of epilepsy and arachnoiditis, but the present study re-

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Table 3. Sialic Acid Contents of Cerebrospinal Fluid in the Patients Having no Change in Nervous System

No.	Name	Age	Sex	Diagnosis	Content of Sialic Acid mg/dl
1	Y. T.	14	♀	Appendicitis acuta	0.25
2	R. I.	24	♀	"	0.28
3	S. S.	52	♂	Adhesive disturbance of intestine	0.24
4	T. Y.	36	♂	"	0.26
5	N. O.	36	♂	benign pylorus stenosis	0.38
6	M. T.	32	♂	gastric ulcer	0.43
7	K. M.	59	♂	"	0.36
8	T. K.	42	♀	"	0.26
9	M. A.	45	♂	duodenal ulcer	0.28
10	T. K.	40	♂	"	0.37
11	N. S.	29	♂	Fistula ani	0.27
12	M. S.	26	♀	"	0.28
13	S. M.	17	♂	Prolapsus ani	0.32
14	Y. Y.	18	♀	internal hemorrhoid	0.28
15	H. H.	17	♀	"	0.33
16	J. M.	22	♂	lumbalgia	0.30
17	M. T.	26	♂	"	0.28
18	K. H.	29	♀	"	0.26
19	E. T.	47	♀	Purpura Werlhofi	0.28
20	M. I.	15	♀	Hippel-Lindau's disease	0.28
average					0.30

vealed that in the cerebrospinal fluid no significant change could be found in the contents of sialic acid in the cases of arachnoiditis.

As is well known, since the reports of BÖHM and BAUMEISTER<sup>6</sup> in 1956, besides the patents bearing cerebrospinal tumor, the sialic acid contents of cerebrospinal fluid increases in the cases of severe inflammatory diseases such as meningococcal or tuberculous meningitis showing the values many times higher than in normal ones. Besides these the sialic acid content in cerebrospinal fluid increases also in the cases of multiple sclerosis, myelitis, poliomyelitis, viral and pneumococcal meningitis (ROSS and BÖHM<sup>7</sup>, 1957). On such meningitis we have no experience, and we can not say anything definitely on this point, but it seems to be that besides the patients bearing tumors of the nervous system, in the cases of severe inflammatory diseases of the nervous system a marked increase in sialic acid contents can be resulted.

In our observation no examination have been carried out on the normal

persons but there could be recognized no characteristic changes in sialic acid contents in the patients of gastric ulcer and others having no symptom of the disturbance of the nervous system and the values from these patients will serve as control. These values are found to be in the range set by BÖHM et al.<sup>6</sup> as the normal value, 0.14 to 0.48 mg%, 0.37 mg% in average, for neuramic acid a derivative of sialic acid, in cerebrospinal fluid.

#### CONCLUSIONS

1. The sialic acid contents in the cerebrospinal fluid of the patients suffering from diseases of the central nervous system have been observed by comparing those in the patients having no disturbances of the central nervous system.

2. In the cases of arachnoiditis of various origins the sialic acid content has ranged from 0.22 to 0.55 mg%, 0.31 mg% in average, consequently almost at the normal level.

3. In the cases bearing tumors in the brain or spinal cord the values are found to be markedly increased, ranging from 0.58 to 0.85 mg%, and 0.72 mg% in average.

4. In the patients suffering from gastric ulcer, appendicitis, etc. and without any symptoms of the disturbance in the central nervous system, the values show no abnormalities, to be ranged in the normal level: 0.24 to 0.43 mg%, and 0.30 mg% in average.

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