there are some, even if not many, cases in which such a procedure seemed effective.

Meningioma

- 1) In 133 cases of meningioma there are at least 21 cases (16%) of malignant type.
- 2) Survival for more than 5 years is very often even in cases of incomplete removal. In these cases it would be wise to make angiography after the operation to see exactly the extent of the remaining tumor.
- 3) In carotid angiography it is shown that feeding arteries of meningiomas are derived to greater extent from internal carotid than from external. Surgeons should be aware of such artery or arteries before attacking the tumor.
- 4) Preoperative attacks of convulsions often disappear or markedly decrease after operation.

Acoustic neurinoma

In our experiences extracapsular total extirpation of the tumor is accompanied neither by higher mortality nor by better neurological states soon or late after operation.

Hypophyseal adenoma

- 1) Even after grossly complete curettage of the tumor the upward shift of anterior cerebral artery in angiography returns usually not remarkably.
- 2) Grade 1 and 2 of hypothalamic extension were divided according to the changes in iodized oil ventriculography, carotid angiography and neurological states. Immediate operation mortality is highest (50%) in grade 2 cases and lowest (10%) in non-extension cases.

Pineal tumors

Mortality of extirpation of pineal tumors is lowest in teratomas and highest in gliomas. Therefore, preoperative differentiation of gliomas from teratomas or pinealomas is desired. In this connection some characteristic changes in iodized oil ventriculography, carotid angiography and neurological states are suggested.

H2. A Statistical Observation of Intracranial Tumors.

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This report consists of statistics on 1546 cases of intracranial tumors (neoplastic tumors: 1354, non-neoplastic tumors :192) which were experienced in our department until December, 1960 (Table 1).

Figure 1 shows age and sex distribution of 1354 cases of neoplastic tumors. There is a slight preponderance of males over females (approximately 1.3 : 1). Of these, cases below the age of 15 years are seen in 17%, the sex ratio being also 1.3 : 1 (male : female). Age distribution of these cases divided into supra-

Fig. 1 Intracranial Neoplasms (1354 Cases)

Fig. 2 Intracranial Neoplasms (1354 Cases)

Fig. 3 Medulloblastoma (60 Cases)

Fig. 4 Glioblastoma (107 Cases)

Fig. 5 Astrocytoma (119 Cases)

Fig. 6 Pinealoma (19 Cases)

Fig. 7 Neurinoma (176 Cases)

Fig. 8 Meningioma (201 Cases)

Fig. 9 Pituitary Adenoma (159 Cases)

Fig. 10 Craniopharyngioma (97 Cases)

Fig. 11 Metastatic Tumors (52 Cases)

	Our series (1961)	All Japan (1957)	Zülch (1957)	Olivecrona (1955)	Cushing (1932)
Glioma	25.7%	32.2%	42.8%	46.8%	42.6%
Meningioma	13.1	15.9	18.0	19.2	13.4
Neurinoma	11.8	12.1	7.6	8.0	8.7
Pituitary adenoma	11.0	11.0	8.0	8.5	17.8
Congenital tumors (Craniopharyngioma)	8.6 (6.3)	9.6 (7.2)	4.8 (2.5)	2.7 (1.7)	5.6 (4.6)
Vascular tumors	6.8	4.0	3.8	9.4	2.0
Granuloma & Abscess	4.4	3.1	0.8	1.0	2.2
Metastatic tumors	3.3	4.3	4.0	3.4	4.2
Primary sarcoma	1.0	0.7	2.7	—	0.7
Papilloma of choroid plexus	0.7	0.5	0.5	0.3	0.6
Total cases of tumors	1546	3312	6000	5250	2023

Table 2. Principal intracranial tumors

and infra-tentorial tumors is shown in Figure 2. The cross-point of the curves is located slightly above the age of 10 years.

Tables 2 and 3 indicate incidence of principal tumors and glioma types in our series and others¹⁾²⁾. The relatively low incidence of the glioma in our series is possibly due to the fact that we excluded those cases of deep subcortical tumors of which biopsy could not be done. If the latter is included, the glioma incidence becomes 36%. This is still low as compared to those in European and American statistics. The granuloma and abscess are of higher incidence than those in European-American series. In the last 5 years, however, the incidence has been markedly reduced (about 1.1%). Among gliomas pinealoma is definitely or higher incidence (4 or 5 times as high as those in European-American series), although we excluded all pineal tumors of which biopsy was not performed.

	Our series (1961)	All Japan (1957)	Zülch (1957)	Cushing (1932)
Glioma, total	397	997	2569	862
Neuroepithelioma	0 %	0.1 %	0 %	0.2 %
Medulloblastoma	15.3	10.7	8.9	10.0
Glioblastoma	26.9	19.3	28.7	24.1
Astroblastoma	2.5	2.4	—	4.1
Astrocytoma	30.0	26.4	14.8	29.6
Oligodendroglioma	6.1	6.3	19.1	3.1
Spongioblastoma polare	4.8	4.9	16.3	3.7
Ependymoma	9.3	12.3	10.1	2.9
Pinealoma	4.8	9.3	1.0	1.6
Pituicytoma	0.5	—	—	—
Ganglioneuroma	0	0.3	1.1	0.4
Unclassified	—	7.7	—	20.3

Table 3. Incidence of glioma types

Figures 3-11 demonstrate age and sex distribution of principal intracranial neoplasms. Generally speaking, clinically malignant tumors are more frequently seen in males and clinically benign ones in females.

Table 4 grossly summarizes locations of intracranial tumors. Cerebral tumors, that is, supratentorial tumors except for pituitary and pineal tumors are most frequently seen (44%). Cerebello-pontine angle tumors are of higher incidence than cerebellar tumors in our series. Figure 12 shows locations of

	Our series	Cushing	Zülch
Cerebral	44 %	46 %	52 %
Pituitary	25	26	11.8
Cerebellar	12	16	16.2
Cerebellopontine angle	15	10	9.5
Brain stem	3	1.1	7.3
Skull	1	0.9	—

Table 4. Locations of Intracranial Tumors

Fig. 12 Location of Meningiomas (201 Cases)

meningiomas. Parasagittal and falx meningiomas occupy about 40% of the total.

The operative mortality in 1411 operative cases is 15%. That of 718 cases in the last 5 years is definitely lower (8.9%) than that of 693 cases before 5 years (21.2%). This remarkable decrease of mortality in the last 5 years is probably due to developments in anesthesia.

The follow-up is indicated by the survival rate. The x -year survival rate of the cases operated before n years is shown by $(\text{cases survived } x \text{ years or more}) \times 100 / (\text{cases operated before } n \text{ years}) - (\text{the operative deaths})$. The lowest curve

Fig. 13 Survival rate of operated cases of intracranial tumors.

in Figure 13 illustrates 1, 2, 3, 4 and 5-year survival rates of the cases operated before 5 years, the 5-year survival rate being 48%. The upper traces demonstrate chronological survival rates of the cases operated before 4, 3, 2, and 1 years respectively. The traces are shifting upward every year, though to a limited extent; that is, the survival rate is gradually increasing year after year³⁾. This 5-year survival rate (48%) is by far better than that of cases with stomach or breast cancers.

How these survival cases are living is an important problem. This was investigated by inquiring letters with 363 answers. According to them, 41.3% of the survival cases are back to their former occupations, and 19.3% are capable of doing domestic works, though they are not fully satisfied with their recovery. In short, about 60% of survival cases are spending useful lives. These results are very encouraging and will be and should be improved in the nearest future by developments in surgical techniques, in radiation- and chemo-therapies.

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