METASTATIC TUMORS OF THE BRAIN
A FOLLOW-UP STUDY OF 195 PATIENTS WITH
NEUROSURGICAL CONSIDERATIONS
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Ever since the first case was reported by Schraut in 1853, the problem of cerebral metastases has been a subject of special study by neurologists and histopathologists. However, apart from a few more comprehensive studies, other papers consider the subject within the general problem of tumors, or in connection with cancer of single organs, or report isolated cases.

Frequency. The present work is a clinical study of 195 patients with cerebral metastases verified surgically, microscopically or by necropsy, who were admitted to the Neurosurgical Clinic, Bucharest, between 1935 and 1958. They represent 0.51 per cent of 38,510 patients admitted for various neurosurgical diseases and 6.7 per cent of 2,901 patients with expanding intracranial processes.

The more comprehensive statistics published previously give similar figures: Meagher and Eisenhardt19 3 per cent; Cushing9 3.2 per cent; Baker6 17.9 per cent; Puech et al.27 7.1 per cent; Livingston et al.17 4.1 per cent; Nersesyants20 5.6 per cent; Störtebecker32 3.5 per cent; Papo and Tritapepe23 6.3 per cent.

As to the comparative frequency of cerebral gliomata and metastases, few relevant data can be found in the literature. Petit-Dutaillis et al.25 in a study covering a 5-year period, found 493 gliomata and 107 cerebral metastases (21.9 per cent). In our own series there were 980 cerebral gliomata and 195 brain metastases (19.8 per cent) over a 22-year period.

Age and Sex. Fig. 1 shows that in 145 (74.5 per cent) of our patients the disease occurred between the ages of 40 and 60 years. The extreme ages were 18 years and 80 years respectively. The disease was observed more commonly in males (120, or 61.7 per

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cent) than in females (76, or 38.3 per cent). This is because of the higher frequency of metastases of pulmonary origin among males.

**Primary Site.** In our series of 195 cases the origin of cerebral metastases was as follows:

<table>
<thead>
<tr>
<th>Primary Focus</th>
<th>No. of Cases</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>75</td>
<td>38.1</td>
</tr>
<tr>
<td>Breast</td>
<td>44</td>
<td>22.6</td>
</tr>
<tr>
<td>Kidney</td>
<td>16</td>
<td>8.2</td>
</tr>
<tr>
<td>Skin</td>
<td>12</td>
<td>6.2</td>
</tr>
<tr>
<td>Digestive tract</td>
<td>7</td>
<td>3.6</td>
</tr>
<tr>
<td>Ovary</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>Uterus</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>Skeleton</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Thyroid gland</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>Lymphatic system</td>
<td>2</td>
<td>1.1</td>
</tr>
<tr>
<td>Muscles</td>
<td>1</td>
<td>0.55</td>
</tr>
<tr>
<td>Adrenals</td>
<td>1</td>
<td>0.55</td>
</tr>
<tr>
<td>Prostate</td>
<td>1</td>
<td>0.55</td>
</tr>
<tr>
<td>Unknown</td>
<td>28</td>
<td>11.8</td>
</tr>
</tbody>
</table>

**Location of Metastases.** In 109 cases (56 per cent) the lesions were solitary, in 57 (29.1 per cent) they were multiple and in 29 cases (14.9 per cent) their number could not be ascertained. The 109 cases of solitary metastases were located as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>No. of Cases</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal lobe</td>
<td>55</td>
<td>50.05</td>
</tr>
<tr>
<td>Temporal lobe</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Parietal lobe</td>
<td>18</td>
<td>18.6</td>
</tr>
<tr>
<td>Occipital lobe</td>
<td>4</td>
<td>3.66</td>
</tr>
<tr>
<td>Cerebellum</td>
<td>16</td>
<td>14.7</td>
</tr>
<tr>
<td>Hypophysis</td>
<td>2</td>
<td>1.82</td>
</tr>
<tr>
<td>Medulla oblongata</td>
<td>1</td>
<td>0.91</td>
</tr>
<tr>
<td>Dura mater</td>
<td>1</td>
<td>0.91</td>
</tr>
</tbody>
</table>

**Onset of Intracranial Signs.** The onset may be sudden, affecting the patient in full health, or it may be slower and gradual, but generally not exceeding 1 year. Thus in our series the duration of onset was as follows:

<table>
<thead>
<tr>
<th>Duration of Onset</th>
<th>No. of Patients</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sudden (under 1 mo.)</td>
<td>36</td>
<td>18.5</td>
</tr>
<tr>
<td>1-3 mos.</td>
<td>84</td>
<td>43</td>
</tr>
<tr>
<td>3-6 mos.</td>
<td>29</td>
<td>14.9</td>
</tr>
<tr>
<td>Up to 1 yr.</td>
<td>18</td>
<td>9.2</td>
</tr>
<tr>
<td>1-2 yrs.</td>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>Over 2 yrs.</td>
<td>4</td>
<td>2.2</td>
</tr>
<tr>
<td>Unknown</td>
<td>16</td>
<td>8.2</td>
</tr>
</tbody>
</table>

The shortest period was 7 days in a case of cerebral metastasis of undetermined origin, and the longest was 6 years in a case of cerebral metastasis of mammary origin. Most authors agree that in 60–90 per cent of cerebral metastases the period of onset does not exceed 6 months.\(^6,10,12,23\)

During the period of onset the neurological signs are sometimes associated with those caused by the primary tumor. Some of the primary visceral tumors give rise to early and characteristic clinical manifestations (tumors
of the breast, female genital system, skin, and skeleton), thereby greatly facilitating the neurological diagnosis. In other cases, however, the clinical manifestations are delayed, nonspecific and even unapparent (pleuropulmonary, renal, prostatic, hepatic tumors, etc.), thus rendering the diagnosis of cerebral metastases difficult.

In our series, 48 of 75 (64 per cent) tumors of the lung, 2 of 44 tumors of the breast (4.55 per cent), 3 of 16 tumors of the kidney (12.5 per cent), 1 of 4 ovarian tumors (25 per cent), and 1 tumor of the lymphatic system (50 per cent) were not detected until the time of admission to the Neurosurgical Clinic, as their signs were obscured by the more apparent neurological signs. Moreover, 13 (17.3 per cent) pulmonary tumors, 2 (12.5 per cent) renal tumors, 1 hypernephroma (100 per cent) and 1 ovarian tumor (25 per cent) were not detected until necropsy. This shows that only 14 (18.7 per cent) of tumors of the lung were detected prior to admission. In 45 to 100 per cent of the cases, cerebral metastases of pulmonary origin are revealed by neuropsychic symptoms only, while pulmonary signs are either absent or nonspecific. This is because of the fact that development of metastases in the nervous system may take place at a time when the tumor in the lung is clinically and roentgenologically unapparent and the fact that the more striking neurological signs (aphasia, hemiparesis) may obscure the pulmonary signs.

*Interval Between Primary Operation and Cerebral Metastasis.* Another important aspect of the onset of cerebral metastases is the interval elapsing from the operation for, or detection of, the primary tumor until the occurrence of neurological signs. In studying 75 cases of our series (38.5 per cent) in which this interval could be determined, we found the following:

Of 32 cases of metastases from tumors of the breast, in 9 (28.1 per cent) the interval was 3–12 months and in 23 (71.9 per cent) it was over 2 years; the longest interval was 6 years. Willis, Störtebecker, and Papo and Tri-tapepe each reported 1 such case, and Willis described another case in which the interval was nearly 15 years. Most authors found that in more than 50 per cent of cases of cerebral metastases of mammary origin the neurological onset took place 16 months after operation for the primary tumor.

Of 12 cases of bronchogenic metastases, in 9 (75 per cent) this interval was from 6 to 12 months, in 2 (16.6 per cent) it was over 1 year and only in 1 case (8.4 per cent) did it extend beyond 2 years.

Of 13 cases of metastases of cutaneous origin (melanosarcomata or melanocarcinomata), in 7 (53.8 per cent) this interval was 6–12 months, in 4 (30.8 per cent) it was 2–3 years, while in 2 (15.4 per cent) it exceeded 5 years.

Of 3 cases of metastases from tumors of the digestive system, in 1 (33.33 per cent) the interval was 1 year, in 1 (33.33 per cent) it was 2 years, and in 1 (33.33 per cent) it exceeded 5 years.

Of 8 metastases of renal origin, in 2 (25 per cent) the interval was 6 and 12 months, in 5 (62.5 per cent) it was 3–5 years and in 1 (12.5 per cent) it was
6 years. In the remaining cases of metastases having other origins, the figures are not relevant.

These facts show that tumors of the breast and skin, as well as hypernephromata undergo a rapid course in their local phase and metastasize early to the central nervous system, but the cerebral metastases have a rather prolonged evolution before they give rise to neurological signs. On the other hand, cancers of the lung undergo a very slow course in their local phase; they do not metastasize to the nervous system until a late stage, but the course of the cerebral metastases is very rapid.

The interval between the operation for the primary tumor and the neurological onset is conditioned by still other factors. Thus with epithelial cancers this interval is shorter than with sarcomata. On the other hand, there are even certain types of epitheliomata—such as melanoblastomata of the skin—that very rapidly give rise to the onset of neurological symptoms. Finally, in cases of primary tumors with hematogenous propagation, the interval is far shorter than in cases of tumors with lymphatic propagation.

**CLINICAL PICTURE**

In 25 cases (12.56 per cent), apart from the neurological and visceral signs in the period of onset, we also recorded loss of body weight exceeding 10 kg., associated with fever.

The initial signs were: psychic disorders (aside from those of intracranial hypertension) in 35 cases (18 per cent), high intracranial pressure in 46 (23.6 per cent), convulsive seizures in 49 (25 per cent), a varied degree of motor weakness in 30 (15.4 per cent), disorders of speech in 24 (12.4 per cent), cerebellar disorders in 9 (4.6 per cent), and meningeal signs in 2 (1 per cent).

By the time of admission the proportion of major initial neurological signs was somewhat modified. Thus the syndrome of high intracranial pressure was present in 87 patients (44.6 per cent), epileptic seizures in 56 (28.7 per cent), psychic disorders in 42 (21.5 per cent), disorders of speech in 38 (19.5 per cent), varied degrees of motor deficiency in 71 (36.4 per cent), and a cerebellar syndrome in 16 (8.2 per cent).

**ANALYSIS OF CLINICAL SYMPTOMS**

As in cases of primary tumors of the brain, headache is the earliest and most frequent symptom. However, it is much less likely to be associated with nausea and vomiting, possibly because of the fact that the course of cerebral metastases is more rapid. The early and extremely severe headache of sudden onset in these cases may be distinguished from the headache of slower development that occurs in intracranial hypertension. It may or may not be associated with neurological phenomena, which may subside partially or even completely during the ensuing weeks or months. Possibly it is brought about by the initial dissemination of neoplastic cells into the brain.34 These two forms of headache may often succeed one another directly without any free interval separating them. The seat of the headache and that of the metas-
tases was exactly the same in 63 (72 per cent) out of 82 cases in which this relation was recorded. 

Choked disc was noted in 87 cases (44.6 per cent). Data in the literature indicate that it sets in at a very advanced stage of the cerebrometastatic syndrome and may even remain absent.\textsuperscript{6,12,25,29,30} The number of metastases had no significant effect upon the frequency of papilledema in our series. 

In 39 (44.9 per cent) of the patients with choked disc there was a rather characteristic ophthalmologic appearance, with extensive recent hemorrhages both in the papilla and around it, resembling those observed in patients with thrombosis of the central vein of the retina; this finding is rarely observed in cases of primary tumors of the brain. Lasco et al.,\textsuperscript{15} in a comparative study of this condition in patients with cerebral metastases or other expanding intracranial processes, called it hemorrhagic papilledema. 

A meningeal syndrome was present in 117 cases (60 per cent). Meningeal signs are apt to set in at an early stage, and this might suggest that the metastases have come into contact with the meninges,\textsuperscript{4} or they may occur later, when they are caused by high intracranial pressure or by pressure cones, with resultant damage of the brain stem. 

Focal Neurological Syndrome. Epileptic seizures were recorded in 56 (28.7 per cent) of the cases at the time of admission, and in 49 patients (25 per cent) such seizures were the initial symptom. Epilepsy in patients with cerebral metastases presents certain particular characteristics which may help to differentiate it from epilepsy associated with primary tumors of the brain or from genuine epilepsy. They are as follows: unilateral Jacksonian seizures—21 patients (37 per cent); Jacksonian seizures followed by falling and loss of consciousness—18 patients (32 per cent); a state of continuous Jacksonian seizures—8 patients (14.4 per cent) and grand mal subintrant seizures—9 patients (16.9 per cent). Most often the Jacksonian seizures occurred in salvos of 2-3-5 each, usually followed by motor deficiency which subsided during the next days, but which sometimes persisted. A new series of seizures aggravates the motor deficiency, which may even progress to total hemiplegia; the latter state is produced not only by postictal exhaustion, but also by the histological lesions which the seizure is liable to cause around and within the tumor (edema, hemorrhage, sudden development of cysts). In other cases the Jacksonian seizure was followed by loss of consciousness, but only 3 patients with cerebral metastases had “oil-spot” generalization as in cases of primary tumors of the brain. Grand mal subintrant seizures (an important presumptive sign), alternate bascule Jacksonian seizures or subintrant Jacksonian fits indicated the presence of multiple metastases. 

The case history of 12 patients disclosed a hemiparesis of sudden onset without a premonitory convulsive fit, who recovered within a few days. 

Motor weakness was manifested either by hemiparesis with a tendency towards hypertonia or by flaccid hemiplegia. In some cases, motor weakness sets in slowly and gradually, it being induced by progressive infiltration of the fibres of the corticospinal tract. In other cases it sets in after iterative
fits, sometimes separated by transitory periods of subsidence; in such instances it is caused by postictal exhaustion.

These two eventualities are observed particularly in the course of the disease. A special category, however, is comprised of some cases that belong to the so-called acute cerebrometastatic syndrome in which the motor weakness sets in suddenly in a normal state of health, with the same severity as in cerebral hemorrhage or acute softening of the brain. The pathogenesis of such lesions may be related either to the cerebral hemorrhage occurring at the same time as the initial metastatic dissemination (hemorrhagic form of cerebral metastases) or to hemorrhage occurring within an already developed metastasis. These two latter aspects were more frequent in the initial stage of the disease. Finally, bilateral pyramidal signs may occur at the terminal stage, as they are caused by the presence of pressure cones and the consequent lesions in the brain stem.

The other neurological disorders do not differ from those occurring in other intracranial expanding processes.

Psychic Disturbances. Psychic disorders are almost always present. In our cases, they formed the initial symptom in 35 patients (18 per cent) and in 42 (21.5 per cent) they were present at the time of admission. Sometimes, and this is emphasized, they are the dominant feature in the clinical picture, while the neurological signs are less severe or altogether nonspecific, as in 6 of our cases. The most frequent psychic disorders were simple or delirious confusional states, hallucinatory or amnestic states, temporospatial disorientation, depressive states, etc.

The pathogenesis of such psychic disorders is variable. In some cases they are undoubtedly caused by the location of the tumor (frontal, or temporal lobes, etc.). In other cases they are the result of the edema of the brain that accompanies the growth of the metastases, as proved by the fact that the disorders may be improved or even subside according to the severity of brain swelling; this is an additional factor enhancing the possibility of this condition being mistaken for a psychiatric disease. In other instances, psychic disorders, and particularly those occurring at an advanced stage, are caused by intracranial hypertension or by hydrocephalus.

VALUE OF NEURORADIOLOGIC METHODS OF INVESTIGATION

Percutaneous cerebral angiography was performed in 58 cases (29.8 per cent). In 26 patients (45 per cent), the arteriogram offered no characteristic appearance enabling differentiation from other intracranial expanding processes. In 9 (15.5 per cent) patients with multiple and small metastases, there was a perfectly normal arteriogram. In 11 (19 per cent) patients the injection of the tumor had the same appearance as in cases of glioblastoma multiforme. Finally, in 12 patients (20.5 per cent) we obtained a clear delimitation of the tumor, comparable to the one reported by Lindgren. Deep phlebography yielded no characteristic pattern. In our opinion, the observations of Bonnal
et al.,7 claiming the existence of a characteristic appearance in cases of glandular metastases, are hardly convincing.

As compared with patients with primary tumor of the brain, angiography was tolerated better in those with cerebral metastases. Thus in 3 patients only did we notice an aggravation of their clinical symptoms after angiography.

We performed ventriculography in 126 patients (73.25 per cent) and generally it yielded the most conclusive findings. Unfortunately, the presence of cerebral edema may cause misleading alterations in the ventriculogram. Thus, in 6 cases (4.75 per cent) the displacement of the ventricular system was caused by edema, and the metastasis, which was very small, was located in some remote area. This is why in such cases the surgical exploration was negative, and the metastases were found only at necropsy.

In 19 cases (15.1 per cent) ventriculography showed the existence of multiple supratentorial metastases subsequently verified by surgery or necropsy. From this point of view, ventriculography is obviously preferable to arteriography which only exceptionally reveals multiple metastases.

In 6 cases (4.75 per cent) of the so-called encephalitic form of cerebral metastases, the existence of numerous but small bilateral supratentorial metastases had not caused changes of the ventricular system; the tumors were not detected until necropsy.

In 26 cases (23 per cent) of supra- and subtentorial multiple metastases, ventriculography revealed a more complex appearance. We observed a more or less marked hydrocephalus, either symmetrical or slightly asymmetrical, associated with displacement of the whole ventricular system to one side. This appearance is the result of multiple metastases, one of which is supratentorial, thus displacing the system, and the other in the posterior fossa, giving rise to hydrocephalus.21 In such cases, the roentgenographic appearance differs according to the rapidity of growth of the supra- or subtentorial metastases.

Should one of the cerebral hemispheres be the seat of a large metastasis causing slow displacement of the ventricular system, and should the metastasis located in the posterior fossa eventually undergo a rapid development and give rise to early hydrocephalus, the resulting appearance is the one shown in Fig. 2.

If, however, the displacement of the ventricular system is moderate but the hydrocephalus is very marked, the latter may obscure the former, thereby resulting in an appearance identical to that observed in any case of subtentorial tumor that blocks the flow of the cerebrospinal fluid. This is clearly illustrated by the following case.

St. P., aged 42 years, was operated upon in January 1953, when four small metastases originating in a melanosarcoma of the left thigh were removed from the left rolandic operculum. The ventriculogram at that time is shown in Fig. 3.

In April 1954 he was readmitted for major disturbances caused by high intra-
craniocerebral pressure and impaired general condition. Ventriculography now disclosed a
marked hydrocephalus which was slightly asymmetrical but without any displacement
of the ventricular system (Fig. 4). The latter could not be considered as a
consequence of the removal of metastases at the first operation, since at necropsy
many other small metastases were found in the left hemisphere. We therefore
reached the conclusion that the hydrocephalus obscured the displacement of the
ventricular system through a purely mechanical process, namely, the eccentric
pressure exerted by the dilated ventricles upon the cerebral parenchyma was greater
than the pressure exerted by the supratentorial metastatic tumors upon the ven-
tricular walls, thus making the displacement unapparent.

Suboccipital pneumoencephalography was performed in 22 patients (12.8
per cent) without intracranial hypertension, in whom the diagnosis of metastatic
lesions was not certain. The appearance was conclusive in no more
than 13 cases (59 per cent) and 2 patients had a fatal outcome following this
examination.

Our experience with fractional encephalography is as yet too limited for
any conclusions.

ELECTROENCEPHALOGRAPHY

Electroencephalography was used in 36 patients (17.9 per cent). The
alterations of the alpha rhythm were superposable on those observed in
cases of primary tumor of the brain. We obtained focal alterations in 18
cases (51.5 per cent) and diffuse changes in 17 cases (48.5 per cent).

LABORATORY EXAMINATIONS

In 85 patients (43.5 per cent) blood counts revealed variable alterations
caused by the nature and site of the primary tumors. The erythrocyte sedi-
mentation rate was increased above 30 mm. at the end of 1 hour in 145
patients (74.5 per cent). Although it has no absolute value, an increased
erthrocyte sedimentation rate in a patient exhibiting rapidly advancing
neurological signs is nevertheless an important presumption for the existence
of a cerebral metastasis.

CLINICAL FORMS OF CEREBRAL METASTASES

In the remittent form the remission concerns psychic disorders mainly
and to a lesser degree neurological signs; its course may extend over many
months. On the other hand, there are some psychic disorders (confusion,
delirium, dysmnesic manifestations, hallucinations) which may far more
readily subside than others (disturbances of reasoning, moriatic behavior,
alterations in personality, etc.). We identified this form in 52 cases (26.6
per cent).

We may rightly assume that the morphopathological substratum of this
form lies in edema of the brain, which may undergo variations in its intensity
and extension, thereby determining such periods of remission. In the early
stages of metastatic dissemination in the brain, edema is constantly asso-
ciated with small hemorrhagic and necrotic foci produced by this process
(infarctus d’arrêt). Later on these lesions may subside, the edema become less extensive and there is an apparent tendency towards normalization; however, sooner or later there is onset of focal disturbances and signs of high intracranial pressure caused this time by the growth of the metastasis itself and by the edema that accompanies it both around the lesion and in areas at distance (secondary edema).

The acute form is characterized by the sudden onset, in an otherwise perfectly normal person, of hemiplegia associated or not with aphasia; in other cases the patient may suddenly become comatose and die before the metastasis has had time to grow.

In our series the acute form was encountered in 125 cases (61.5 per cent).

These aspects of the acute form are exceedingly important from the viewpoint of differential diagnosis since the common diagnoses in such cases are: cerebral hemorrhage, acute cerebral softening, encephalitis, etc.

The onset of severe psychic disorders, which are liable to subside later on, may be explained by the rapid development of cerebral edema. At other times hemorrhage around the tumors or even at distance may be the substratum of this form.

Such local complications of metastatic lesions may occur either at an early stage, when they are associated with the onset of the metastatic process, or at an advanced stage, several months or years after seeding of the brain. These two stages may be separated by a period that is entirely symptom-free, or marked by discrete or nonspecific neurological disturbances (usually headache, paresthesias, etc.).

In other cases the sudden onset is caused by rapid formation of a cyst or by development of a pressure cone.

The fulminating form, lasting a few days, was described in a case of metastatic melanoma of the brain; death is caused by a massive intracerebral and subarachnoid hemorrhage. In our series, 1 case of multiple metastatic melanoma can be considered as belonging to this group.

The encephalitic form is very infrequent: 4 cases out of 106 (Madow and Alpers), 5 cases out of 57 (Globus and Meltzer) and 1 case out of 27 (King and Ford). In our own series we found only 6 (3.8 per cent) indubitable cases out of 195 cerebral metastases.

The clinical picture is nonspecific, consisting of diffuse neuropsychic signs related to the cerebral hemispheres, cerebellum and even to the brain stem. The syndrome of intracranial hypertension gives rise to a papillary edema (dissociated syndrome). Localizing signs are absent.

**EVOLUTION OF METASTASES AND POSTOPERATIVE RESULTS**

In our series 25 patients (11.8 per cent) were not operated upon. Of these, 19 (82.5 per cent) who could be followed, did not survive for more than 6 months; this duration has been reported by others. In our series 172 patients were operated upon irrespective of the number of metastases (88.25 per cent). Of these, 66 (38.4 per cent) died during the first 3 weeks after op-
operation. A similar percentage was mentioned by Störtebecker\textsuperscript{32} (24.8 per cent) and by Papo and Tritapepe\textsuperscript{23} (16.3 per cent).

Another group of 89 (51.75 per cent) patients survived for up to 6 months after being operated upon, but after this interval they returned to our clinic with new signs of metastases and died after undergoing a second operation, or else they died at home with symptoms of intracranial hypertension. Other authors reported similar results: Livingston \textit{et al.}\textsuperscript{17} mentioned an average survival of 8 months, Petit-Dutaillis \textit{et al.}\textsuperscript{25} recorded 73 out of 88 patients (38.7 per cent) who survived for 6 months; and Papo and Tritapepe\textsuperscript{23} 69 out of 153 (45 per cent) whose survival did not exceed 6 months.

Two patients (1.15 per cent) lived 12 months after being operated upon; finally, there were 4 patients (2.3 per cent) with solitary metastases who survived from 1 to 6.5 years. Considered from the viewpoint of the seat of the primary tumor, the latter group was distributed as follows: 2 patients with metastases of mammary origin survived 2 and 2.8 years respectively; 1 with hypernephroma, 3 years; and 1 with bronchogenic metastases, 6.5 years. All these patients led a satisfactory family life throughout the period of observation, but their social activity was very limited. Our own cases and those published by other writers\textsuperscript{1,5,11,21,23,25,28,32} enable us to set up the following conclusions: the longest survivals were in cases of mammary, pulmonary, hypernephromatous, thyroid and melanotic metastases.

Finally, 11 patients could not be followed up after operation.

Apart from these considerations it is our opinion that a solitary metastasis should be subjected to surgical management for other reasons:

(a) There are cases in which a visceral tumor is associated with a primary tumor of the brain that may be mistaken for a metastasis, and in which the operation may result in the total subsidence of symptoms and a more prolonged survival.

(b) In cases of cerebral metastatic melanoblastoma surgery is imperative whenever the condition of the patient permits it, because except in desperate cases of malignant melanoma, we may meet with the benign forms described by Arnvig and Christensen\textsuperscript{5,8} in which survival exceeds 1 year and may at times even last as long as 4 years.\textsuperscript{28}

(c) Finally, in the most desperate cases surgical management has a merely palliative effect, prolonging survival under more bearable conditions.

In cases of multiple metastases most authors are of the opinion that radical surgery is altogether useless.

In our attempt at establishing a correlation between the preoperative clinical picture and the duration of survival we have reached certain conclusions which are very near to the percentages found by Livingston \textit{et al.}\textsuperscript{17} It seems that the less the patient’s general condition and function of the primarily involved organ are altered, the longer is the duration of survival. The more rapid the course of the cerebral metastases, the shorter will be the survival. In this respect, metastases of mammary origin afford a longer survival than pulmonary metastases, which undergo a very rapid course.
The syndrome of intracranial hypertension is an aggravating factor in the vital prognosis of patients operated upon. Intracranial hypertension implies the presence of cerebral edema, and this is the most frequent cause of postoperative deaths.

These facts show that even though the therapeutic results are generally discouraging, there may be fortunate patients with a longer survival and this is the main reason for which surgery is advisable.

SUMMARY

This paper is a clinical study of 195 patients with verified metastatic tumors of the brain, who were admitted to the Neurosurgical Clinic of Bucharest between 1935 and 1958 out of a total number of 2,901 patients with other expanding intracranial processes.

The pathological, clinical, roentgenological and laboratory findings are discussed together with the data found in the pertinent literature.

The results obtained by surgery are analyzed in comparison with those observed in patients not operated upon.

REFERENCES

19. 

20. 


