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Indication for Surgery in Spontaneous Intracerebral Hematomas

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Summary. Indication for surgical treatment of spontaneous supratentorial intracerebral hemorrhage is discussed on the basis of 68 consecutively observed cases.

The course of the symptoms is as important as the condition itself at the time of operation and location of the hematoma. These factors are considered together to form vital and relative indications for surgery which have different significance in the groups with vascular and tumour course (Table 4). This grouping indirectly also signifies the location of the hematoma. Some patients are already excluded from such an evaluation on a clinical basis (Table 3).

The results will depend not only on the surgical treatment, but also on the selection of groups suitable for such treatment.

Key-Words: Cerebral Hemorrhage — Intracerebral Hematomas.

Zusammenfassung. Die Indikation für die chirurgische Behandlung spontaner intracerebraler Blutungen der Großhirnhemisphäre wird anhand von 68 fortlaufend beobachteten Fällen besprochen.

Für die chirurgische Indikation ist die Verlaufsbeobachtung der Symptome ebenso wichtig wie der Patientenzustand bei der Operation und die Hämatomlokalisation. Diese 3 Faktoren werden zusammen berücksichtigt, um vitale und relative Indikationen für den Eingriff in den beiden Gruppen mit einem Gefäßinsult entsprechenden und einem tumorähnlichen Verlauf in ihrer Bedeutung zu klären (Tab. 4). Diese Gruppierung ist auch von indirekter Bedeutung für die Lokalisation der Blutung. Einige Patienten sind nach klinischen Befunden von dieser Bewertung auszunehmen (Tab. 3).

Die Ergebnisse sind nicht nur von dem chirurgischen Eingriff, sondern auch von der Selektion geeigneter Patienten für die Hämatomentfernung abhängig.

Schlüsselwörter: Hirnblutung — Intracerebrale Hämatome.

Among causes of "cerebral apoplexy" intracerebral hemorrhage accounts for 20—25%, subarachnoidal bleeding for 5—10%, the rest being due to ischemic lesions (Sahs *et al.*, 1966; Riishede, 1967).

Among the numerous possible causes of intracerebral hematomas only a few occur relatively often (cf. Table 1). The different selection of

cases in series studied from different aspects may also be reflected in Table 1. The frequency of the various causes in "clinical materials" may also vary and be related to the extent of the angiographical examinations.

Table 1. *Spontaneous intracerebral hematomas. Causes in relation to selection in various materials*

Cases No.	Material	Percentage of						
		Art. aneur	Art.-ven. malf.	Cryptic micro-ang.	Art. hyper-tens.	Blood dyscr.	Tumor	Other etiol.
111	Neuro-surgical[a]	30	29	20	21			
151	Int. med.[b]	37	11		37	3	2	10
225	Autospy[c]	20	3		60	13	1	3

[a] Krayenbühl and Weber (1965); [b] Odom *et al.* (1966); [c] Mutlu *et al.* (1963).

Clinical management of "spontaneous intracerebral hematomas" particularly regarding surgical treatment has often been discussed on basis of retrospective studies, often including conclusions from autopsy findings. In the present series of such hematomas the indication for surgery has been based only on the clinical and roentgenological factors known before operation and autopsy. Accurate methodology in selection and evaluation of such factors is then of great help for the clinician.

Methods

Clinical Classification

Vascular Course. Peracute and acute onset with fully developed clinical picture within half an hour respectively some hours up to one or two days.

Tumor Course. Varying degree of symptoms with fluctuating course but usually slow impairment if observed long enough.

Type of onset of symptoms within the group with "vascular course" is more useful for diagnosis. The subsequent course of lasting or of progressive impairment of symptoms, particularly of the consciousness, is of basic importance for prognosis and treatment; it may reflect a pathogenetic difference: early direct involvement of the midbrain, brain stem, etc., or later occurring displacement from distant expansive masses.

Selection of Cases for Surgical Evaluation (cf. Table 3)

Diagnostic procedures were sometimes performed in patients up to 75 years of age to rule out easily accessible extracerebral intracranial conditions while intracerebral lobar hematomas were considered operable in patients less than 65—70 years old.—Patients "in extremis" at time of evaluation for surgery were not admitted to the clinic.

No Indication for Surgery

Surgery was regarded of no value in patients spontaneously improving or in cases where angiography, performed for diagnostic reasons, showed small expansive lesions or lateral dislocation of lenticulostriate arteries, indicating involvement of "basal ganglia".

In this group the nature of the lesion was established by the disappearance of the expansivity at repeated angiographies or by encephalography with filling of a cavity in a formerly expansive lesion.

Indication for Surgery

Vital Indication for Surgery. Rapidly increasing neurological deficit with impairment of consciousness, particularly when anisochoria and brain stem signs also occur.

Relative Indication for Surgery. Slowly progressive focal neurological deficit; only slight improvement, remaining drowsiness; suspicion of a tumour.

Locations of hematomas, established roentgenologically, will influence the management: "lobar" hematomas are more likely to be operable than so-called "central" hematomas.—Hematomas in the *frontal* lobes show features different from those in the trigonum area. This area is mostly involved in the occipital, temporal and parietal hematomas, considered together as the *trigonum* group and often with a hematoma extending into the lateral ventricle without involvement of the basal ganglia. Most of our hemorrhages classified as *intraventricular hemorrhages* originated from such trigonum hemorrhages. The smaller group in "*basal ganglia*" could also bleed intraventricularly but originated in these central structures.

Results

Results are presented in relation to indication for operation and to location of hematoma. In general the occurrence of coma increases the mortality, while location of the hematoma influences morbidity due to focal neurological deficit. Follow-up, as seen in Fig. 1, is time-related to mortality and onset of the disease (follow-up time).

Late results were estimated by means of questionnaires. Thus, results in terms of grading of specific neurological deficit such as dysphasia, various paresis, mental defect, etc., could not be evaluated here. "Working ability" was more easily estimated and was related to neurological deficit and to employment possibilities. "Independent" means mainly independence as regards ADL and includes wheelchair and ambulatory patients.

Own Material

68 patients over the last 15 years had intracerebral and three intracerebellar hematomas, the last group not considered here. Cases of arterial saccular or arteriovenous malformations revealed angiographically were excluded. The incidence in various ages of the patients, of operations, occurrence of location of the hematomas and number of hypertensives are presented in Table 2.

Table 3 shows the number of patients with and without indication for surgery.

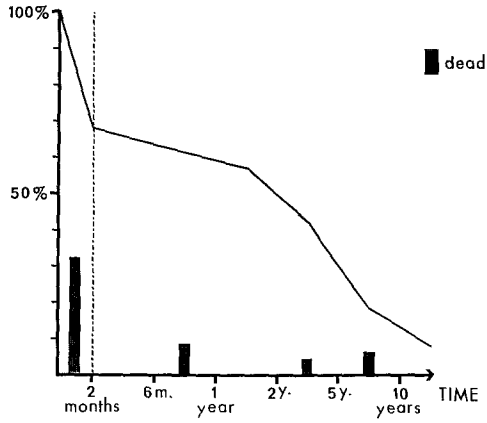

Fig. 1. Time of follow-up of surgical material (47 cases—100%). The decrease during the first year is only due to mortality (presented as percentage of the material)

Table 2. *Supratentorial intracerebral hematomas. Total series. Age—Location—Hypertension*

Age	No.	Op.	Trigon.	Front.	Basal ggl. and Capsular	Intra-ventr.	Hypert.
1—40	16	13	9	2	1	4	3
41—60	42	25	23	2	10	7	37
61—80	10	6	7	1	2		8
No.	68	44	39	5	13	11	
Hypert.			27	3	11	7	48

1 patient younger than 20 years, 3 patients more than 70 years old.

Table 3

Clinical evaluation	No indication for surgery		Indication for surgery			
			Vital			Relative
	Improved	In extremis	Not op.	Early op. < 2 days	Late op.	Operated
Total no.	21	—	3	16	15	13
Dead < 2 m.	0	—	3	9	2	1

No Indication for Surgery

21 cases with focal symptoms, 7 of them with temporary unconsciousness, improved without operation. They all showed a vascular course. Lumbar puncture in 6 cases revealed bloody CSF. Capsular hematomas were revealed in 4 cases; in 5 patients the expansive lesion was found in one of the frontal lobes and in the remaining 12 in the trigonum area.

Indication for Surgery

Three patients rapidly deteriorated and died just before planned angiography and operation could be performed. In two cases with previous anticoagulant treatment respectively blood dyscrasia, burrholes had excluded extracerebral hematomas. In the former case autopsy revealed an exclusively lobar hematoma and hemorrhages in the basal ganglia were found in the other two.

Table 4. *Operated series. Indication for operation — Results*

Course	Indication	No. of patients	Death within 2 months[a]	Full time work	Part time work	Independent	Bedridden
"Vascular"	Vital (Op. within 2 days)	29 (16)	10 (9)	2 (1)	6 (1)	6 (2)	5 (3)
	Relative	7		1	4	2	
"Tumour"	Vital	2	1				1
	Relative	6	1	5			
No.		44	12	18		8	6

[a] All dead already within 2 weeks. In the surgical material 3 other patients died before operation.

Operated Series (Table 4)

Early Results

Vascular Course. 29 patients were operated with vital indication for surgery; of 16 cases operated within 2 days, nine died. Relative indication for surgery was present in 7 cases.

Tumour Course. The patients showed a better prognosis when operated on before brain stem symptoms developed. In this group progress of focal neurological deficit or choked discs were an indication for operation as well as suspicion of a tumour. It is, of course, possible that some of the patients could have improved without operative treatment.— However, vital indication in this group was present in 2 cases; one of

them with a lobar hematoma died just after operation due to a second hemorrhage (in the brain stem). In 5 cases of 6 with relative indication for surgery prognosis was good.

Location of the hemorrhage: the influence on early mortality is seen in Table 5.

Table 5. *Intracerebral hematomas. Total series. Location—Follow up*

Location	No. of cases	Dead within 2 months[a]	Full time work	Part time work	Inde-pendent	Bed-ridden
Basal ganglia	4 (2)	4 (2)				
Capsular	9 (5)	2 (2)	2	2	2	1
Intraventr. hemorrh. from lobar hem.	11 (10)	3 (3)	5	1	1	1
Lobar hematomas	44 (27)	6 (5)	11	13	8	6

Number of operated cases within brackets.

[a] All dead within 2 weeks after onset.

In all operations (osteoplastic craniotomy) there was good access to the hemorrhagic cavity and the preoperative angiographically shown location was always confirmed. In case of hemorrhage and blood clots into the lateral ventricle a catheter drainage for one or two days in the cavity was of value (Thompson *et al.*, 1947).

"Deaths within 2 months" in the surgical material occurred already within the first 2 weeks; it was usually due to the damage already caused by the primary hemorrhage. Recurrent hematomas caused early death within 2 days in 3 cases and occurred somewhat later in 5 patients, 2 of which were successfully reoperated. Pulmonary edema or gastro-intestinal hemorrhages were the contributory causes of death in 5 cases.

Late Results

Working ability of surviving patients seems to be best among the cases with tumour-course and relative indication for operation (Table 4) as well as among those with lobar hematomas (Table 5); younger patients are also more capable of full or part-time work (Table 6).

In connection with child birth three women had lobar and intra-ventricular hemorrhage with vascular course and vital indication for surgery. One patient operated within 2 days had signs of decerebration and was bedridden postoperatively, the second is "independent" and the third works part-time.

A few patients with the expected less favourable factors, vascular course with vital indication for operation within 2 days, capsular hemorrhages and old age may also have good working ability (Tables 4—6). However, of 7 patients with evidence of "decerebration" at time of operation in the vascular group with vital indication only four survived more than 2 months and one is fully employed.

Table 6. *Intracerebral hematomas. Total series. Age—Follow up*

Age	No. of cases	Dead within 2 months	Full time work	Part time work	Independent	Bedridden
1—40	16	2 12%	5 69%	6	2	1
41—60	42	10 24%	11 48%	9	6	6
61—80	10	3 30%	2 30%	1	3	1
Total no.	68	15 22%	18 50%	16	11	8

Discussion

When evaluating results of treatment, the part of the case material where indication for surgery is present should not be compared with the rest of the material. Obviously, in the surgical material must be included also the not operated cases with indication for surgery at admittance to the hospital, but where delay of intended operation or complications within the "preoperative" period may add to resulting mortality and morbidity. Such patients do not belong to a material with indication for "conservative" treatment.

In recent reports indication for surgery has been tabulated after type of onset or condition of the patient at time of operation particularly concerning consciousness (Böhmer and Wetter, 1965; Böhmer, 1969; Cook *et al.*, 1965; Cuatico *et al.*, 1965; Luyendijk and Schoen, 1964; Odom *et al.*, 1966; Pia, 1959; v. d. Ark and Kahn, 1968). However, the course of the condition seems more important. The most serious symptom "unconsciousness" has different significance for surgical indication when appearing with and without a latency as is the case also with pupillary abnormalities. In fact delay of unconsciousness and anisochoria may increase the probability of good postoperative results. In this respect spontaneous lobar hematomas are similar to the focal posttraumatic

expansive contusions and hematomas, considered as a clinical entity (Lindgren, 1960), with similar significance for surgical evaluation as extracerebral hematomas.

One of the most thorough investigations reported must be commented upon in this connection. McKissock *et al.* (1961) think that the tabulation of the anatomical site of hematomas is misleading and the critical factor appears to be the nature and degree of brain destruction. It may be difficult to determine the origin of a hemorrhage but the location of destruction or of separation of fibres must be important both for resulting mortality and morbidity.—Their most surprising finding may be the higher surgical mortality in temporal lobe hematomas with little or no "midline" displacement (called "no displacement" group) and in particular in women. Of course, the brain stem can be involved or displaced in this group as well as in the displacement group and among the operated hypertensive women many were in stupor and coma compared with the conservatively treated group.

Indication for operation is present in temporal lobe hematomas with secondary distortion effects on the brain stem and the clinical course may be more informative of indication for surgery then the magnitude of displacement of midline vessels.

The general opinion that operations performed within the first one-two days are combined with very high mortality, means in our terms that surgery with earlier vital indication to a great degree is performed on patients with a vascular course and with centrally located hemorrhages in this period.

The selection and particularly the presentation of patients in the literature vary considerably, making comparisons inadequate in many respects. Surgical intervention is recommended in lobar and many capsular hemorrhages. However, the factors presented here directly related to the course of the condition must be considered in order to evaluate the indication for surgery and the prognosis.

During the last 10 years the formerly negative attitude to surgery in hemorrhages with intraventricular extension has changed. Postoperative drainage may decrease the postoperative reaction in such hemorrhages. Postoperative accumulation of clots has been rare in our material (cf. Luessenhop *et al.*, 1967).

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