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Chronic Subdural Haematomas Treated by Enlarged Burr-Hole Craniotomy and Closed System Drainage Retrospective Study of 120 Patients[1]

By

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With 2 Figures

Summary

In a retrospective study 143 chronic subdural haematomas in 120 patients were analysed. 64% of patients were 60 years or older. All haematomas were operated on by slightly enlarged burr-hole craniotomy and closed system drainage for three days postoperatively.

A history of trauma was present in 63%. Most frequent symptoms in the older patients were mental changes and impaired consciousness.

Postoperative mortality (within one month after surgery) was 4%. After a follow-up period of up to 2.5 years after surgery, 69% were neurologically normal, 20% had only minor complaints or slight deficits. Postoperative CT scans showed a gradual re-expansion of the compressed brain during the 2–3 weeks following haematoma removal.

Keywords: Chronic subdural haematoma; surgery; craniotomy; clinical results; computerized tomography.

Introduction

Chronic subdural haematomas are not infrequently found after minor head injuries, especially in older patients. Different methods

[1] The results were in part presented at the 34th Meeting of the German Neurosurgical Society, Mannheim, April 27–30, 1983.

of therapy have been proposed: from conservative treatment [1,2,6,9,23] to large craniotomy with resection of the haematoma's membranes [7,19,28].

This report deals with a retrospective analysis of 120 patients operated on by slightly enlarged burr-hole craniotomy, fenestration of the neomembranes and consecutive closed system subdural drainage.

Material

120 patients, 41 women (34%) and 79 men (66%) with 143 subdural haematomas were analysed.

43 patients (36%) were younger than 60 years, and 77 (64%) were 60 years and older. The mean age was 63 years.

21 patients (18%) had bilateral haematomas on admission, two further patients were operated on a second time three weeks and two months later, respectively when a chronic subdural haematoma had developed on the contralateral side. One of them remained hospitalized in the Neurosurgical Department during the entire time. The other was re-admitted after secondary clinical impairment and is thus considered as a new case.

Clinical History and Findings

75 patients (63%) had a history of head trauma, most of them (48/75) of a minor and 21/75 of a major degree. In six patients the nature of the trauma remained unknown.

Seven patients were known to be chronic alcoholics, six had significant cardiovascular diseases, two were under anticoagulant therapy, and two suffered from leukemia. Two patients were reported to have had transitory ischaemic attacks during the past one or two years.

The most frequent symptoms (Table 1) reported in the older age group were mental changes or disturbances of consciousness (55%), followed by neurological deficits (46%), such as motor and speech problems, and headaches (42%). On the other hand, headache and neurological deficits were the predominant symptoms (46% each) in the younger age group. Here, mental changes or impaired consciousness were encountered less frequently (21%).

Clinical findings at the time of admission were graded according to the scale used by Markwalder *et al.* [14]:

∅: Patient neurologically normal.

1: Patient alert and orientated; mild symptoms such as headache; absent or mild neurological deficit, such as reflex asymmetry.

2: Patient drowsy or disorientated with variable neurological deficits such as hemiparesis.

3: Patient stuporous but responding appropriately to noxious stimuli; severe focal signs, such as hemiplegia.

4: Patient comatose with absent motor responses to painful stimuli; decerebrate or decorticate posturing.

The majority of patients belonged to group 2 (62%), followed by groups 1 (16%), 3 (9%) and 4 (4%). 7% were neurologically normal. Although expected, there was no relationship between the seriously impaired level of consciousness (groups 3 and 4) and the duration of symptoms prior to admission. This time varied from several hours to two months.

Method of Surgery

All patients, except those who were already intubated or had to be intubated for respiratory insufficiency when entering our department, were operated on under local anaesthesia.

Following a 6–7 cm skin incision, a craniotomy of 3–3.5 cm in diameter was made, then a cruciform incision of the dura mater and opening of the haematoma's external neomembrane. Evacuation of the haematoma was carried out and its cavity was rinsed with physiological saline. After fenestration of the haematoma's internal neomembrane and after attaching the dura to the skull by some sutures, we inserted a 10-French silicone catheter into the haematoma cavity and connected it to a sterile urine bag without suction. This bag was suspended at about 50 cm below the patient's head. The dura was approximated by some single sutures and the skin incision was closed.

The patients did not receive specific medication such as steroids during the postoperative period. They were allowed to sit up and to walk as soon as possible. During these activities, the drainage was closed intermittently. The system was removed three days after surgery.

Operative Findings

Only four haematomas were without neomembranes. The haematomas were always liquified, often contained blood clots in addition and sometimes showed signs of organization. Among 48 patients sufficiently documented in the surgical protocol, the brain

expanded during surgery in 22 and was inert in 26 cases. In the younger age group, the proportion of those with signs of brain expansion was higher than in the older patients.

Postoperative Course

No patient required secondary large craniotomy and removal of the neomembranes due to lack of brain expansion or continuous bleeding from these membranes. The time of hospitalization rarely exceeded one week. The patients then were referred to the home clinic. 84 patients were followed for periods up to 2.5 years.

Postoperative mortality (within one month following surgery) was 4% (n = 5). One patient showed signs of decerebration when admitted and died two days postoperatively. On admission, the remaining four belonged to the clinical grade 2 and were older than 60 years. One of them died five days postoperatively following a massive deep intracerebral haemorrhage on the side of the previous haematoma; another patient in very bad general condition with leukemia, cardiac insufficiency and bronchopneumonia died after eight days. The two remaining patients succumbed nine days and one month after surgery respectively, in their home hospital for unknown reasons, after an initial clinical improvement.

Local complications were seen in three cases and consisted of epidural haematomas which were evacuated in two cases (Fig. 1). In the third patient, the small clot resolved spontaneously.

Following surgery, most of the surviving and sufficiently documented 114 patients improved (Table 1, 2). This improvement usually started early after operation, but was even more distinct after a longer follow-up period (Table 2). This improvement is documented by a shift of the neurological states towards lower clinical grades. Whereas at the time of admission only 8% were neurological normal (grade ∅), 40% of the surviving and documented patients fell into this category during the early, and 69% during the late postoperative phase. 89% of the 84 patients followed up for periods up to 2.5 years were finally either symptom-free and without deficit (grade ∅) or had only minor symptoms which did not impair their activities (grade 1). Separate analysis of the younger and the older patients shows a better prognosis during the early as well as the later postoperative period in those patients younger than 60 years. During the early phase 81% of them belonged to grades ∅ and 1, as compared to 69% of the older

Fig. 1. (W. S., 16 years.) Right frontal epidural haematoma following placement of an epidural pressure transducer after removal of a right chronic subdural haematoma

Table 1. *Clinical Results Early (Within One Week) After Evacuation of Chronic Subdural Haematomas.* For clinical grades see text. High proportion of asymptomatic patients (grade ∅) and those with only mild symptoms and/or signs (grade 1)

Grade	Pre-operative	Postoperative (early)						
		∅	1	2	3	4	Dead	Unknown
∅	9 (8%)	8	1					
1	20 (16%)	12	7	1				
2	75 (62%)	26	27	18			3	1
3	11 (9%)		2	8			1	
4	5 (4%)		1	1		2	1	
Unknown	1 (1%)							1
		46 (40%)*	38 (33%)*	28 (25%)*		2 (2%)*		

Percentages in brackets.

* Percentages of the surviving and sufficiently documented patients only (114 = 100%).

Table 2. *Clinical Results Late (up to 2.5 Years) After Evacuation of Chronic Subdural Haematomas.* For clinical grades see text. Even higher proportion of asymptomatic (grade ∅) and patients with minor symptoms and/or signs (grade 1) than in the early postoperative period

Grade	Pre-operative	Postoperative (late)						
		∅	1	2	3	4	Dead	Unknown
∅	9 (8%)	4	1					4
1	20 (16%)	11	5	1				3
2	75 (62%)	39	9	6			7	14
3	11 (9%)	3	2	1			2	3
4	5 (4%)	1				1	1	2
Unknown	1 (1%)							1
		58 (69%)*	27 (20%)*	8 (10%)*		1 (1%)*		

* Percentages of the surviving and sufficiently documented patients only (84 = 100%).

patients; during the later phase 96% as compared with 86% of the older age group.

The early clinical improvement was also distinct in those 14 surviving patients who had advanced neurological signs and seriously impaired consciousness on admission (grades 3 and 4). Only one of these 14 remained in grade 4, all the others improved.

During the later postoperative phase five patients died, four for unknown reasons, one from myocardial infarction.

CT scans were performed in 89 patients during the early and in 57 patients during the late postoperative period. Up to two to three weeks after surgery some subdural effusion and various amounts of air were present in the haematoma cavity in almost all cases. Compared with the preoperative findings, this space had decreased in diameter, the midline shift was less, and the compressed ventricles started to regain their previous shape (Fig. 2).

In the CT scans done beyond two to three weeks following surgery, the brain usually had expanded and the subdural "space" disappeared in the majority of cases (Fig. 2). Subdural effusions at that time (three of the younger and five of the older patients) were

only small (about 1/2 cm) except in one patient. He had large bilateral subdural effusions but refused another operation.

Discussion

Although successful conservative treatment of chronic subdural haematoma has been reported[1,2,6,9,13,23], it is now widely accepted that the treatment of choice is surgical evacuation. Various surgical

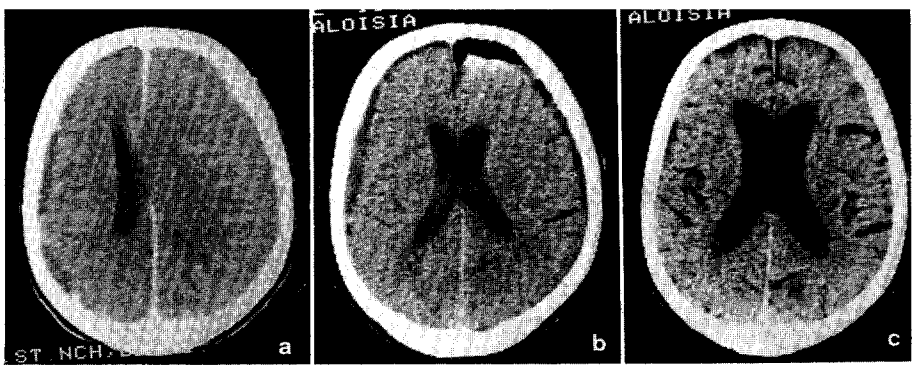

Fig. 2. (M. A., 72 years.) Bilateral chronic subdural haematoma. CT on admission shows isodense haematoma over the right and hypodense haematoma over the left hemisphere (a). CT controls three days (b) and nine months (c) after surgery revealed gradual brain expansion

techniques have been described: trephination with a spinal needle[18], twist drill craniotomy[20,25,26], burr-hole craniotomy[4,5,8,11,12,14–16,21], burr-hole craniotomy with small osteoclastic enlargement[17,22], and large craniotomy with removal of the neomembranes[7,19,28]. Our technique resembles that of Moringlane *et al.*[17]: a slightly enlarged burr-hole craniotomy with circumscribed resection of the external and internal membranes. According to the good postoperative results observed by Loew[12] and Markwalder *et al.*[14] it may be superfluous to resect the membranes. Horrax (loc. cit. McKenzie[15]) reported a patient in whom the neomembranes had disappeared three months after burr-hole evacuation of a chronic subdural haematoma. This was observed during a secondary craniotomy.

The insertion of a subdural closed system drainage without or with only minor suction is widely recommended[3,12,14,17,24–27]. We use this drainage routinely for three days following surgery.

The postoperative intrathecal or intraventricular injection of physiological saline or Ringer's solution as emphasized by Lalonde *et al.*[10] and Robinson[21] in order to achieve expansion of the compressed and (after evacuation of the haematoma) often inert brain is unnecessary. Postoperative CT scans show that the brain gradually expands during the 2–3 weeks after surgery, only in exceptional cases at an earlier time. These results confirm the observations of Markwalder *et al.*[14] and Moringlane *et al.*[17] and refute the assumption of McKenzie[15] that the brain has probably re-expanded 48 hours after removal of the haematoma.

A review of the literature shows that the postoperative mortality after burr-hole craniotomy of chronic subdural haematomas varies considerably: from no mortality[5,8,10,12] to 23%[22,26]. From our 120 patients 5 (4%) died within one month following surgery: one presented with signs of decerebration on admission; one developed a deep intracerebral haematoma, and one succumbed from his underlying diseases (leukemia, cardiac insufficiency, bronchopneumonia). After initial clinical improvement the other two died in another hospital from unknown reasons. We doubt if these fatalities could have been avoided except in the first patient, who might have been saved if admitted earlier.

The functional outcome of the surviving patients corresponds to that reported by Loew[12] and Markwalder *et al.*[14]. We applied his system of clinical grading which allows a comparison between the pre- and postoperative states of the patients. The results of these authors and our personal results are better than those of McKissock *et al.*[16], Svien *et al.*[24] and Taarnhøj[25], possibly due to the earlier diagnosis of a haematoma by Computerized Tomography nowadays.

89% of the 84 patients examined up to 2.5 year postoperatively had absent or only minor complaints or clinical signs compared with 24% preoperatively.

We may, therefore, conclude that the slightly enlarged burr-hole craniotomy under local anaesthesia with fenestration of the neomembranes and closed system subdural drainage is a safe and efficient technique for the treatment of chronic subdural haematomas. Regarding the equally favorable functional results reported by Loew[12] following burr-hole trephination without fenestration of the internal neomembrane and with consecutive subdural drainage, this simpler method may even be sufficient in patients with chronic subdural haematomas. As has been stated by other authors[12,14,17,18], however, the large craniotomy with removal

of the neomembranes should be reserved for those patients with lack of brain expansion and continuous bleeding from the membranes.

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