

Primary Intracranial Arachnoid Cyst in the Elderly: a Survey on 39 Cases

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Summary

Thirty-nine cases of primary intracranial arachnoid cyst in the elderly, including one case of our own, were analyzed. Clinical characteristics in these patients were as follows. (1) The number of patients decreased with age, but there were no differences according to sex. (2) Clinical manifestations were similar to those of chronic subdural haematoma or normal pressure hydrocephalus including dementia, urinary incontinence, and hemiparesis. General symptoms such as headache and seizures were also present. (3) Surgery was performed in most patients with generally good outcome regardless of operative procedures (capsular resection vs. shunt). (4) In some cases of advanced age, disease manifestation may have been due to slight head injuries.

Our own case is described as an example.

Keywords: Primary intracranial arachnoid cyst; elderly; clinical analysis; management; outcome.

Introduction

Symptoms of primary intracranial arachnoid cyst usually develop at an early age and are rarely seen in the elderly^{1,13,14,27}. There are few reports which present aged patients with primary arachnoid cyst unaccompanied by apparent head injuries, intracranial infection or brain tumour^{7,8,9,12,31}. No general survey has yet been conducted regarding primary intracranial arachnoid cyst in the elderly, especially as related to its clinical characteristics, the mechanism of onset at an older age, management or outcome. Therefore, we collected and analyzed data in 39 cases with 38 cases taken from literature and adding one case of our own.

Materials and Methods

Data on 38 patients aged 60 years or over with primary intracranial arachnoid cyst were gathered from the literature^{1–4,6–8,10–12,15–26,28,30–33}. The data of these 38 patients were analyzed together with one personal case. A summary of all cases is shown in Table 1. Our own case is presented as an example.

Results

Sex and Age at Onset

The age of patients at the onset of symptoms varied from 60 to 90 years. There were fewer patients in the higher age groups with 24 cases developing in the 7th decade of life, 11 cases in the 8th decade, 3 cases in the 9th decade and one case in the 10th decade. No differences could be seen according to sex with 19 males and 16 females; no data on sex was available for 4 cases.

Cyst Location

Out of these 39 elderly patients with arachnoid cyst, the affected site had been recorded in 34 cases. There were 17 on the left side, 6 on the right side and 4 midline, indicating a predominance of left side occurrences. According to the reports, the lesion was located in the supratentorial region in 24 cases and in the infratentorial region in 10 cases, with the most frequently reported location being in the middle cranial fossa (14 cases, 41%).

Clinical Manifestations (Table 2)

In all 39 cases which were 60 years or over, the most frequent symptoms were dementia^{7,15,16,22,31,33}, hemiparesis^{7,10,12,17,19,28}, ataxia^{6,7,8,11,19}, urinary incontinence^{7,16,31} and gait disturbance^{11,16,31}.

Management and Prognosis (Table 3)

Methods of management were reported in 27 cases, out of which 23 (85%) underwent treatment by surgery. Details of the operative procedure were described in 21 patients, with resection of the capsule being the most frequently performed technique in 15 patients (71%),

Table 1. Summary of 39 Cases of Primary Intracranial Arachnoid Cyst in the Elderly

Case	Author	Age	Sex	Location	Symptoms	Management	Prognosis
1	Ayer JB ⁴ (1908)	85	M	l	—	—	—
2	Starkman SP <i>et al.</i> ³⁰ (1958)	72	M	l-T	none	(autopsy)	—
3	Holst S ¹⁵ (1965)	90	M	l-T	D	(autopsy)	—
4	Anderson FM <i>et al.</i> ¹ (1966)	61	F	l-T	H, proptosis	cystectomy	improved
5	Ghatak NR <i>et al.</i> ¹⁰ (1971)	72	F	l-P	H, seizure, dysphasia	(autopsy)	—
6	Little JR <i>et al.</i> ²⁰ (1973)	66	M	—	—	—	improved
7	Dyck P <i>et al.</i> ⁸ (1977)	61	F	r-T	headache, ataxia personality change	cystectomy	improved
8	Handa H <i>et al.</i> ¹¹ (1977)	63	M	l-CP angle	GD, ataxia, hypalgesia hearing disturbance	cystectomy	—
9	LaCour F <i>et al.</i> ¹⁸ (1978)	64	F	l-T	personality change	cystectomy	—
10	Leo JS <i>et al.</i> ¹⁹ (1979)	60	F	intrasellar	visual disturbance	cystectomy	deterio- rated
11	Leo JS <i>et al.</i> ¹⁹ (1979)	60	M	r-post.fossa	ataxia, enlarged head	V-P shunt	improved
12	Leo JS <i>et al.</i> ¹⁹ (1979)	64	M	r-post.fossa	H, ataxia	cystectomy	improved
13	Anderson FM <i>et al.</i> ² (1979)	60	—	l-T	proptosis, facial pain	—	—
14	Anderson FM <i>et al.</i> ² (1979)	67	—	T	headache	—	—
15	Mori K <i>et al.</i> ²⁴ (1979)	61	M	CP angle	—	—	—
16	Tsuda T <i>et al.</i> ³¹ (1980)	68	F	l-F	D, GD, UI	cystectomy	improved
17	Tsuda T <i>et al.</i> ³² (1981)	70	M	l-T	headache	operation	improved
18	Tsuda T <i>et al.</i> ³² (1981)	63	M	bifrontal	convulsion	operation	improved
19	Martuza RL <i>et al.</i> ²³ (1981)	61	M	l-T	vomiting, facial pain	none	—
20	Markwalder T-M <i>et al.</i> ²² (1981)	65	M	l-T	D, headache	cystectomy	improved
21	Auer LM <i>et al.</i> ³ (1981)	63	—	—	—	—	—
22	Harada H <i>et al.</i> ¹² (1983)	74	F	r-convexity	H, sensory & visual disturbance, agnosia	cystectomy	improved
23	Cilluffo JM <i>et al.</i> ⁶ (1983)	63	M	post. fossa	ataxia, vertigo	V-P shunt	unchanged
24	Korosue K <i>et al.</i> ¹⁶ (1983)	67	F	4th-vent.	D, GD, UI	cystectomy, V-P shunt	improved
25	Lodrini S <i>et al.</i> ²¹ (1985)	70	—	—	—	—	—
26	Clavel M <i>et al.</i> ⁷ (1985)	67	M	l-F	D, H, UI	cystectomy	improved
27	Clavel M <i>et al.</i> ⁷ (1985)	69	F	post. fossa	D, UI, ataxia	cystectomy	improved
28	Nakagawa Y <i>et al.</i> ²⁵ (1985)	85	F	CP angle	—	(autopsy)	—
29	Nakawaga Y <i>et al.</i> ²⁵ (1985)	71	M	T	—	cystectomy	—
30	Kurokawa Y <i>et al.</i> ¹⁷ (1986)	65	F	r-T	H	C-P shunt	improved
31	Wiener SN <i>et al.</i> ³³ (1987)	80	M	l-CP angle	D	none	—
32	Wiener SN <i>et al.</i> ³³ (1987)	77	M	l-paravent.	syncope	none	unchanged
33	Wiener SN <i>et al.</i> ³³ (1987)	61	F	l-CP angle	headache	shunt	unchanged
34	Wiener SN <i>et al.</i> ³³ (1987)	74	F	convexity	seizure	explorative craniotomy	improved
35	Nakagawa Y <i>et al.</i> ²⁶ (1988)	75	F	—	none	(autopsy)	—
36	Nakagawa Y <i>et al.</i> ²⁶ (1988)	71	F	r-T	convulsion, sensory disturbance	cystectomy	improved
37	Sakai N <i>et al.</i> ²⁸ (1989)	61	M	supraseilar	visual disturbance	cystectomy	—
38	Sakai N <i>et al.</i> ²⁸ (1989)	67	M	l-T	H	none	—
39	our case	76	F	l-convexity	D, H, headache	cystectomy	improved

l: left, r: right, F: frontal, P: parietal, T: temporal, D: dementia, H: hemiparesis, UI: urinary incontinence, GD: gait disturbance, V-P: ventriculo-peritoneal, C-P: cysto-peritoneal.

followed by shunt in 4 patients (19%). Conservative treatment was carried out in 4 (15%) out of the 27 patients. Improvement of symptoms was reported for 16 (76%) out of 21 patients treated by surgery, but no

improvements were seen for the 4 cases treated conservatively. No significant differences in results were observed between patients treated by resection of the capsule and those treated by shunt operation.

Table 2. *Clinical Manifestations in 39 Elderly Patients with Primary Intracranial Arachnoid Cyst*

	No. of cases
Dementia	8
Hemiparesis	7
Ataxia	6
Headache	6
Urinary incontinence	4
Seizure	4
Gait disturbance	3
Sensory disturbance	3
Visual disturbance	3
Personality change	2
Proptosis	2
Facial pain	2
Vertigo	1
Agnosia	1
Hearing disturbance	1
Syncope	1
Enlarged head	1
Dysphasia	1
Vomiting	1
None	2
Unknown	8

Case Report

In the Spring of 1987, a 76-year-old female began noticing gradual weakening of the right extremities and difficulties when performing calculations. While working out in a field on December 11 of the same year, she fell and sustained a contusion to the head. She visited a local hospital the following day because of persistent headache which had developed after the fall. CT scan of the head showed a cystic lesion in the left frontal region.

Upon admission to our department on December 17, she exhibited symptoms of mild disorientation, mild dementia, marked dyscalculia and right hemiparesis. Physical examinations and laboratory analyses were normal. On spinal tap an opening pressure of 140 mm of water revealed clear, watery CSF with no abnormalities.

Plain X-ray film of the head revealed no bone deformities or thinning. Cerebral angiography showed a space-occupying lesion but

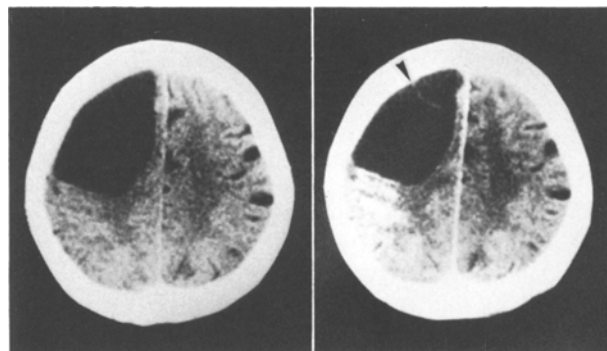


Fig. 1. Plain CT (left) and contrast CT (right) showing a large cystic lesion in the left frontal lobe. In contrast CT, linear shadow (arrow) in the cyst probably corresponds to veins in the cyst wall

no tumour staining. Plain CT revealed a cystic lesion in the left frontal lobe. No enhancement could be seen by contrast CT except for linear shadows indicating hanging veins in the cyst (Fig. 1). With CT cisternography, no communication could be observed between the cyst and the subarachnoid space. T₁-weighted MRI (IR 2050/500) revealed atrophy of the left frontal lobe as a result of marked compression by the cyst and disappearance of the structures of the cerebral sulci and gyri (Fig. 2).

On the basis of these findings, a pre-operative diagnosis of arachnoid cyst was made. Therefore, a small craniotomy (3.5 cm in diameter) was performed under local anaesthesia. A cyst with arachnoid-like membranes filled with slightly xanthochromic fluid was found compressing the brain. Hanging veins in the cyst were connecting the brain surface and the dura matter (Fig. 3). Part of the outer membrane of the cyst and the inner membrane (arachnoid membrane) around the hanging veins were resected. Communication was also made between the cyst and the subarachnoid space.

Histology showed that the thin outer membrane of the cyst was composed of interstitial tissue covered with a layer of elongated cells resembling arachnoid cells (Fig. 4). Analysis of the fluid in the cyst revealed protein concentration of 5 mg/dl, Cl of 125 mEq/l and positive occult blood.

Her postoperative course was good. CT taken 2 months after the operation showed that the size of the arachnoid cyst had markedly reduced. Cerebral sulci were also visible again, and neurological disorders had faded. Another CT taken at 9 months postoperatively showed only a slight trace of the remaining cyst (Fig. 5).

Table 3. *Management and Prognosis of Primary Intracranial Arachnoid Cyst in 39 Elderly Patients (No. of cases)*

Management	Mode of operation	Prognosis			
		improved	unchanged	deteriorated	unknown
Surgery (23)	cystectomy (15)	10	0	1	4
	V-P or C-P shunt (4)	2	2	0	0
	cystectomy following shunt (1)	1	0	0	0
	explorative craniotomy (1)	1	0	0	0
	unknown (2)	2	0	0	0
Conservative (4)		0	1	0	3
Unknown (7)		1	0	0	6
(Autopsy) (5)					

V-P: ventriculo-peritoneal, C-P: cysto-peritoneal.

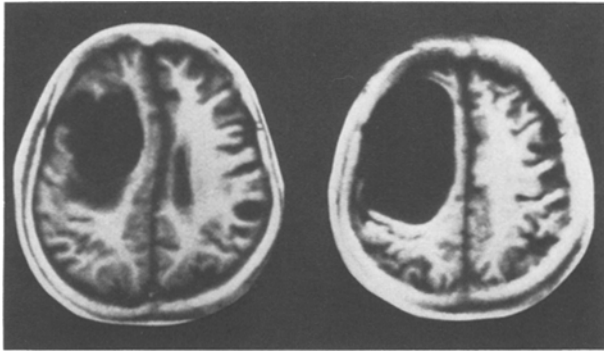


Fig. 2. T₁ weighted MRI showing marked compression of the frontal lobe by the cyst

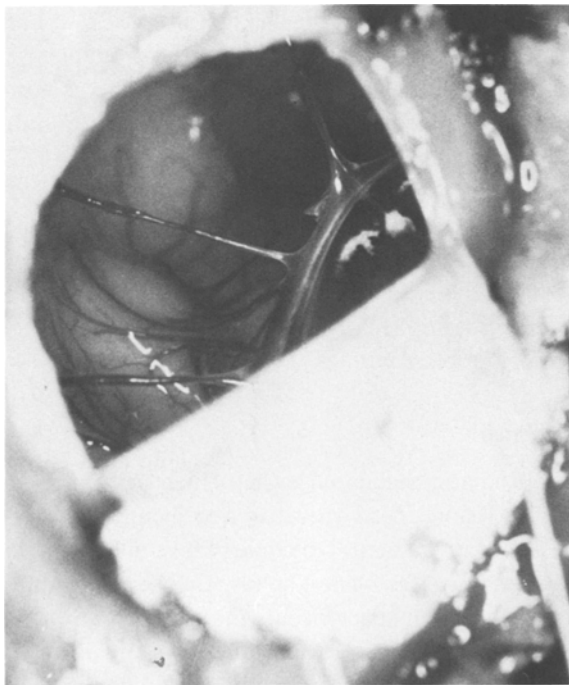


Fig. 3. Some hanging vein crossing the cyst corresponds to linear shadows in the contrast CT

Discussion

It is rare for primary intracranial arachnoid cysts to become symptomatic at ages of 60 years or older. Only 38 cases have been reported to date. Arachnoid cysts occur much more frequently in the young; however, with the advent of the usefulness of CT in diagnosing such cases as reported by Tsuda *et al.*³², the number of reports of elderly patients has also increased in recent years^{7, 8, 31}.

The reasons for the clinical symptoms accompanying such lesions are not yet fully understood; nor has the best form of management been established as to

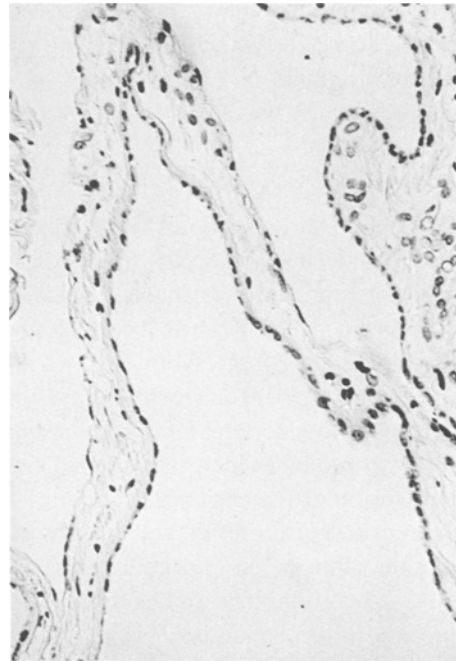


Fig. 4. Outer membrane of the cyst consisting of arachnoid tissue (H. E. stain, $\times 200$)

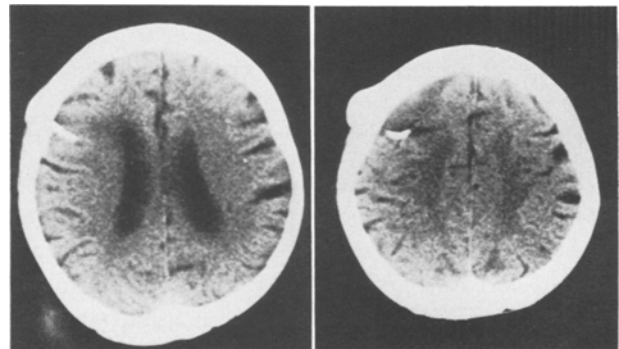


Fig. 5. CT taken 9 months postoperatively shows the cyst has disappeared almost completely and the frontal lobe has been restored

how to treat elderly patients. Therefore, we undertook this study to contribute further information in an attempt to clarify these points.

It appears that the number of cases with symptomatic arachnoid cyst tend to decrease with age; however, this observation may be due to a decrease in the population figure and therefore does not necessarily reflect a real decline in the occurrence of such cases.

Although there is a tendency for male predominance in young cases^{14, 17}, this gender factor is diminished in older patients where no difference can be seen according to sex.

Location of the arachnoid cyst and the affected side are similar for both the elderly and the young, suggesting that congenital factors may play a role in arachnoid cyst development in the elderly.

Clinical Manifestation

In general, an arachnoid cyst becomes symptomatic only when the cyst acts as a space-occupying lesion^{15, 30}. In such a state, it can produce various non-specific symptoms^{5, 9, 14, 19, 27, 30} depending on its location, size and space-occupying effect. Most symptoms which Mori *et al.*²⁴ regarded as typical for arachnoid cyst in the young do not apply to elderly cases. This is especially true for such symptoms as increases in head circumference or protrusion of the cranium at the site of the space-occupying cyst. Symptoms in the elderly more frequently resemble those of normal pressure hydrocephalus^{7, 16, 31} or chronic subdural haematoma²² as seen in our patient. Since dementia^{7, 15, 16, 22, 31, 33} is thought to be specific to elderly patients, the possibility of an arachnoid cyst should not be ruled out when examining an older person with symptoms of dementia. However, dementia may also be the reason why many patients cannot recall injuries that might be responsible for the onset of symptoms and could have helped the physician in suspecting the underlying disease.

Mechanism of Onset of the Symptoms in the Elderly

The aetiology of primary arachnoid cysts is considered to be the same in both the elderly and the young, since similarities were seen with regard to location and affected side. As a general rule, it has been shown that past histories of meningitis, intracranial haemorrhage or major head injury are unrelated to the aetiology of primary arachnoid cysts.

In the past, arachnoid cysts have often been detected incidentally by CT examination conducted for other reasons in asymptomatic patients. Arachnoid cysts found in such cases usually are limited in mass and are not expanding types of lesions, probably due to communication between the cyst and the subarachnoid space. However, certain mechanisms such as intracystic haemorrhage following a head injury may cause a latent cyst to become manifested. This was considered the course of development in the case in our experience. The following mechanisms are considered to be responsible for causing enlargement of an arachnoid cyst: (1) increases in osmotic pressure of the cyst fluid following bleeding, (2) secretion from the cyst wall, and/or (3) a ball-valve mechanism in the cyst wall^{8, 24}. In

a patient of advanced age, Tsuda *et al.*³¹ have suggested that bleeding into the cyst had contributed to the onset of symptoms since fluid of the cyst was xanthochromic. Hayashi *et al.*¹³ have suggested that head injuries may cause subarachnoid bleeding which in turn could result in a semi-closed pathway between the cyst and the subarachnoid space with cyst enlargement.

In our own case, symptoms indicative of an arachnoid cyst had already started to appear months before the accident but became intensified immediately after the fall. Since cyst fluid was xanthochromic with occult blood, it is likely that some bleeding into the cyst had occurred. CT cisternography demonstrated that the cyst had remained non-communicating from the time of the trauma until surgery. The fact that the cyst had already induced symptoms prior to the trauma may further support the supposition that the cyst was non-communicating from the very beginning with only slight enlargement throughout the clinical course. This labile balance decompensated immediately after the fall, probably due to bleeding into the cyst which caused elevation in the protein content of the cyst fluid and a subsequent increase in osmotic pressure. Damage to the veins crossing the cyst was considered the likely source of the bleeding.

Management

Symptomatic arachnoid cysts, which act as space-occupying lesions, need operative treatment, regardless of the age of the patient. No conservative management has proven any effectiveness so far. On the other hand, asymptomatic non space-occupying cysts do not need any management, apart from anticonvulsant medication if epilepsy resulted from the underlying brain malformation. But it could be speculated, that large cysts, even being asymptomatic, should be treated operatively, regarding the possible risk of a rupture of veins crossing the cyst even after a minor trauma.

The surgical methods can be classified into two groups: resection of the capsule^{14, 15, 24, 29, 31} and shunt^{24, 29}. By resecting the capsule, communication can be established between the cyst and the subarachnoid space. A cysto-peritoneal shunt is the most commonly performed shunt operation. Mori *et al.*²⁴ has reported similar results using both of these methods. However, Sekino *et al.*²⁹ favoured capsule resection as the first step of operative treatment.

This survey on elderly patients with intracranial arachnoid cysts allows no conclusion, as to which of the two operative methods is to be preferred and gives better

results. However, in our case we preferred capsule resection by small craniotomy under local anaesthesia, because we considered it to be less stressful than a shunt operation.

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