



# Conservative and surgical management strategies of intracranial arachnoid cysts: A single institution experience of 136 cases

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## Abstract

**Aim:** Intracranial arachnoid cysts develop from the arachnoid membrane between the membranes called pia mater and dura mater, located on the brain and cerebellum. The aim of this retrospective study is to reveal our clinic's approach to intracranial arachnoid cysts, which can be seen incidentally in all age groups, in the light of current literature.

**Materials and Methods:** In our study, we retrospectively analyzed the clinical and radiological findings of a total of 136 patients diagnosed with intracranial arachnoid cysts in both genders and all age groups between January 1, 2017 and December 31, 2023. The localization of the arachnoid cyst was examined in the electronic medical records of the patients who had brain tomography and magnetic resonance imaging during the said interval. The gender, age groups, symptoms, treatment approaches and prognoses of the patients were analyzed.

**Results:** The number of patients diagnosed with arachnoid cyst in our radiological examinations was 136. The prevalence was higher in men than in women; 94 patients were male (69.1%) and 42 patients were female (30.1%). 72 patients were 20 years of age or younger (52.9%). Among 136 patients, only 11 patients were found to have more than one arachnoid cyst in terms of localization (8.1%). In terms of localization, the most common locations were the middle fossa, 52 patients (38.2%). Retrocerebellar location was in 43 patients (31.6%), convex location was in 9 patients (6.6%), and anterior fossa location was in 32 patients (23.5%). Only 42 (30.9%) of 136 patients with radiologically detected arachnoid cysts had clinically significant symptoms. Other patients were detected incidentally during neuroradiological examinations performed for trauma or other reasons. During follow-up, an increase in the size of the cyst was observed in only 9 patients (6.6%). The number of patients operated on in our clinic was only 7 (5.1%). During the follow-up period of the remaining patients, only 3 patients had clinical improvement in their symptoms (2.2%).

**Conclusion:** Arachnoid cysts are frequently encountered incidentally in radiological intracranial imaging today, and their incidence increases in the first 20 years of life. While very few patients show clinically significant neurological symptoms, asymptomatic patients do not require surgical treatment. It is recommended that asymptomatic patients be protected from head trauma and periodic neurosurgery outpatient clinic follow-up.

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## Introduction

When we look at the literature, it can be seen that Richard Bright first reported medical cases involving intracranial arachnoid cysts in 1831 [1]. Intracranial arachnoid cysts are pathologies that occur in the space between the pia mater and dura mater in the brain and cerebellum. Arachnoid cysts have a composition similar to cerebrospinal fluid and originate from the arachnoid membrane. Neuroradiological studies have shown that they constitute 1-2% of all intracranial pathological masses. Arachnoid cysts are

more common in the middle and back part of the skull. Arachnoid cysts can grow spontaneously or shrink and disappear over time [2]. The contents of arachnoid cysts are similar to cerebrospinal fluid. Some of them may open into the subarachnoid space over time. Although it is frequently encountered in adulthood, it has been stated that most patients are diagnosed in the first twenty years of life [3]. There is no consensus among researchers about how arachnoid cyst forms. Some researchers suggest that after abnormal development of the arachnoid membrane, cerebrospinal fluid accumulates inside and forms a cyst [4]. On the other hand, there are authors who claim that not all arachnoid cysts are congenital, but arachnoid cysts can

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also be acquired and develop secondary to birth trauma [5]. Although arachnoid cysts are frequently seen on intracranial imaging, the prevalence and natural history of these cysts in adults have not been described in detail [6]. Today, there is still no class-1 evidence in the literature showing how arachnoid cysts should be treated.

In our study, the gender, age groups, symptoms, treatment approaches and prognoses of patients diagnosed with arachnoid cysts in our clinic were analyzed.

## Materials and Methods

Before the study, ethics committee approval was received from Ordu University Faculty of Medicine Ethics Committee with decision number 15 dated 26/04/2024. Our study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Our study was designed as a retrospective cross-sectional study and all patients fulfilling the inclusion criteria within the specified date range constituted the sample of the study. In our study, we retrospectively analyzed the clinical and radiological findings of a total of 136 patients diagnosed with intracranial arachnoid cysts in both genders and all age groups at Ordu University Faculty of Medicine Training and Research Hospital between January 1, 2017 and December 31, 2023. The localization of the arachnoid cyst was examined in the electronic medical records of the patients who had brain computed tomography and brain magnetic resonance imaging during the said period. The gender, age groups, symptoms and prognosis of the patients were analyzed.

### Statistical analysis

All calculations were performed with the statistical programme SPSS v28 (IBM Inc., Chicago, IL, USA). Frequency analyses of the data were performed and the results were given as number (n) and percentage (%).

## Results

In our study, the number of patients diagnosed with arachnoid cyst was 136. The prevalence was higher in men than

**Table 1.** Demographic characteristics of our patients.

		n	%
Gender	Male	94	69.1
	Female	42	30.9
Age	>20	64	47.1
	≤20	72	52.9
Arachnoid cyst location	>1	11	8.1
	≤1	125	91.9
Arachnoid cyst location	Middle fossa	52	38.3
	Retrocerebellar location	43	31.6
	Convex layout	9	6.6
	Anterior fossa location	32	23.5
Symptom	Clinically significant	42	30.9
	Not clinically significant	94	69.1
Increase in cyst size during follow-up	None	127	93.4
	Yes	9	6.6

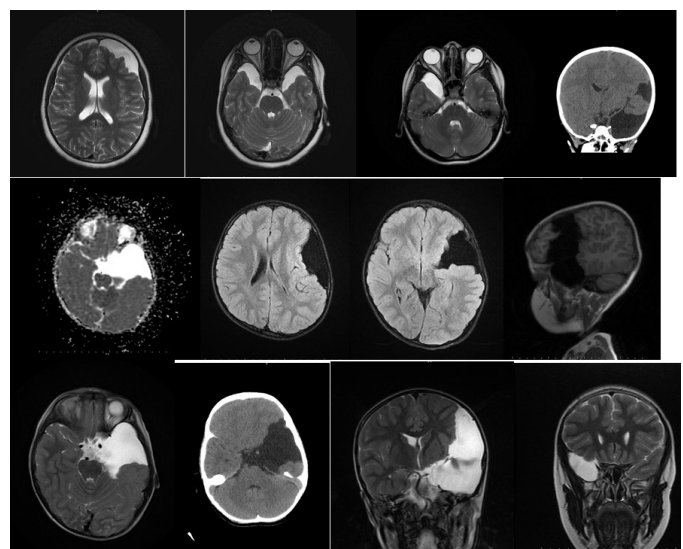
**Table 2.** Localizations of the arachnoid cysts.

	n	%
Middle fossa	52	38.3
Retrocerebellar location	43	31.6
Convex layout	9	6.6
Anterior fossa location	32	23.5

in women; 94 patients were male (69.1%) and 42 patients were female (30.1%). 72 patients were 20 years of age or younger (52.9%). Among 136 patients, only 11 patients were found to have more than one arachnoid cyst in terms of localization (8.1%). In terms of localization, the most common locations were the middle fossa, 52 patients (38.2%). Retrocerebellar location was in 43 patients (31.6%), convex location was in 9 patients (6.6%), and anterior fossa location was in 32 patients (23.5%) (Table 1-2). Only 42 (30.9%) of 136 patients with radiologically detected arachnoid cysts had clinically significant symptoms. Other patients were detected incidentally during neuroradiological examinations performed for trauma or other reasons. During follow-up, an increase in the size of the cyst was observed in only 9 patients (6.6%). The number of patients operated on in our clinic was only 7 (5.1%). During the follow-up period of the remaining patients, only 3 patients had clinical improvement in their symptoms (2.2%).

## Discussion

In our study, the number of patients diagnosed with arachnoid cyst was 136. The prevalence was higher in men than in women; 94 patients were male (69.1%) and 42 patients were female (30.1%). 72 patients were 20 years of age or younger (52.9%). Among 136 patients, only 11 patients were found to have more than one arachnoid cyst in terms of localization (8.1%). In a study by Al-Holou et al., the number of patients diagnosed with arachnoid cyst was 661. The prevalence was higher in men than in women



**Figure 1.** Magnetic resonance imaging (MRI) sections of our patients.

( $p < 0.0001$ ). More than one arachnoid cyst occurred in thirty patients. The most common locations were middle fossa (34%), retrocerebellar (33%), and convexity (14%) [6] Figure 1.

Jafrani R and colleagues stated in a study that arachnoid cysts may cause headaches and increased intracranial pressure. Of the 42 patients with clinically significant symptoms included in our study, 28 (66.6%) had headache [7]. Another study has also shown that arachnoid cyst can increase intracranial pressure, leading to neurological deficits. It was observed that neurological deficits developed in 2 (28.5) of the 7 patients operated by us [8]. While intracranial arachnoid cysts can be seen incidentally, they may cause clinical symptoms as a result of rupture of the cyst. Rupture of the cyst may occur after head trauma. Rupture of an arachnoid cyst after head trauma is rare. Cyst rupture was detected in one of our patients after head trauma. Therefore, it is important to avoid contact sports and head injuries [9]. Although intracranial arachnoid cysts are more common in pediatric patients, they are also rarely seen in the elderly, where they are asymptomatic and stable. In our study, 3 of our patients were over 60 years of age [10]. Rabiei et al. stated in their research that the complaints of some patients with arachnoid cysts did not have a specific aspect. In our study, it was observed that the complaints in 94 of 136 patients (69.1%) were not specific and significant [11]. In a study, it was reported that the ELP4 rs986527 polymorphism affected the frequency of clinical symptoms in patients with intracranial arachnoid cysts. ELP4 has also been implicated in the pathogenesis of intracranial arachnoid cysts [12]. Radiological examinations have shown that arachnoid cysts are more common in the middle cranial fossa and that this can be explained by meningeal developmental disorder. In our study, the most common location in terms of localization was the middle fossa, 52 patients (38.2%) [13]. Recently, it has been suggested by some researchers that arachnoid cysts may affect patients' cognition and emotional states. Affecting the local glymphatic system or possibly deteriorating cerebral blood perfusion, the local effects of cysts on the surrounding tissue are possible physiopathological mechanisms. For this reason, some researchers have discussed the indication of surgical treatment only as a result of mass effect and neurological deficit. Mood disorder was detected in one of our patients, and surgical treatment was not performed for this patient [14]. Intracranial arachnoid cysts may rarely rupture, leading to the development of subdural hygroma and high intracranial pressure. Although it has been stated in the past that surgical treatment was required for these patients, some researchers stated that most cases can resolve spontaneously. Spontaneous resolution was observed in 2 of our patients who were followed up and developed subdural hygroma [15]. Kural et al. reported that a 16-year-old patient with a left frontotemporal arachnoid cyst had vision loss and a visual field defect in the left eye during follow-up. The authors stated that sylvian arachnoid cysts, although asymptomatic for a long time, can suddenly cause severe unilateral visual impairment if they erode the lateral orbital wall [16]. It has been reported in the literature that an arachnoidal cyst located in the posterior fossa can

mimic Meniere's disease. Arachnoid cysts, which may be located infratentorially, may present with episodic hearing loss, auditory fullness, tinnitus and vertigo. Therefore, intracranial arachnoid cysts should be considered in the differential diagnosis of Meniere's disease. It has also been shown that surgical cyst decompression may be beneficial in patient treatment [17]. It has been stated that arachnoid cysts can also be seen in the quadrigeminal cistern and the condition may be accompanied by symptomatic obstructive hydrocephalus [18]. Spontaneous resolution of arachnoid cysts is rare in the posterior fossa. There are authors who state that a monitoring strategy can also be applied after obtaining informed consent for patients with mild neurological disorders. In our study, posterior fossa location was present in 43 patients (31.6%) and no patient received surgical treatment [19].

In our study, arachnoid cysts were more common in males and under 20 years of age. The number of patients with arachnoid cysts in more than one location was rare. The number of patients with clinically significant neurological symptoms was 30%. The remaining patients were detected incidentally during radiological examinations. Surgical treatment was performed in only 7 patients, and the neurological symptoms of these patients improved. It was found that both radiological and clinical follow-up of patients without significant neurological symptoms were sufficient. Arachnoid cysts are developmental structures that do not have a neoplastic character. Although there are different approaches in the literature, the most important parameter for surgery indication in our clinic is neurological deficit or progressive symptoms.

## Conclusion

Arachnoid cysts are non-neoplastic spaces filled with intracranial cerebrospinal fluid and lined with arachnoid membranes. Although arachnoid cysts are frequently encountered incidentally in radiological intracranial imaging today, their incidence increases, especially in the first 20 years of life. Today, there is still no class-1 evidence in the literature showing how arachnoid cysts should be treated. More than 90% of these lesions are asymptomatic and do not require surgical treatment. While very few patients show clinical symptoms, surgical treatment is not recommended for asymptomatic patients in our clinic. In symptomatic patients, surgical treatment is recommended only if there is neurological deficit. We recommend asymptomatic patients to be protected from head trauma and to have periodic neurosurgery outpatient clinic follow-up.

## Conflict of interest

The authors declare no conflict of interest regarding this article.

## Ethical approval

The study protocol was approved by the Ethics Committee of Ordu University Faculty of Medicine with the decision no: 15 dated 26/04/2024.

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