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INPLASY

# Subdural Hygroma Following Rupture of Middle Cranial Fossa Arachnoid Cysts: A Systematic Review and Pooled Analysis of 126 Patients

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**ADMINISTRATIVE INFORMATION**

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**Review Stage at time of this submission -** Completed but not published.

**Conflicts of interest -** None declared.

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**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 6 July 2026 and was last updated on 6 July 2026.

## INTRODUCTION

**Review question / Objective** To systematically review the published literature on subdural hygroma following rupture of middle cranial fossa arachnoid cysts and to summarize the demographic, clinical, radiological, management, and outcome characteristics of affected patients through pooled descriptive analysis.

**Rationale** Subdural hygroma following rupture of a middle cranial fossa arachnoid cyst is an uncommon but increasingly recognized complication. Because of its rarity, the available evidence consists almost exclusively of isolated case reports and small case series, resulting in considerable heterogeneity regarding clinical presentation, imaging findings, treatment strategies, and outcomes. Previous reviews have generally combined subdural hygromas with other complications, such as intracystic hemorrhage and subdural hematoma, without focusing specifically on this entity. Consequently, the natural history and optimal management remain incompletely defined. This systematic review was undertaken to synthesize the available evidence and provide a comprehensive pooled descriptive analysis of the demographic, clinical, radiological, therapeutic, and outcome characteristics of patients with subdural hygroma following rupture of middle cranial fossa arachnoid cysts, thereby helping to inform clinical decision-making and identify areas requiring further research.

**Condition being studied** Subdural hygroma following rupture of a middle cranial fossa (MCF) arachnoid cyst is a rare but clinically important complication of an otherwise benign intracranial lesion. Rupture may occur after minor head trauma or spontaneously, allowing cerebrospinal fluid (CSF) to enter the subdural space and produce symptoms related to increased intracranial pressure and mass effect. Clinical presentation ranges from headache, nausea, vomiting, papilledema, diplopia, and visual disturbances to altered consciousness in severe cases. Because of its rarity, evidence regarding the natural history,

optimal management, and long-term outcomes is limited, with the literature consisting predominantly of case reports and small case series. This review focuses specifically on subdural hygroma associated with rupture of MCF arachnoid cysts and summarizes the available evidence regarding patient characteristics, imaging findings, treatment strategies, and outcomes.

## METHODS

**Search strategy** A systematic literature search was conducted in PubMed and Google Scholar from database inception through September 30, 2025. The primary search terms were "arachnoid cyst" AND "subdural hygroma". No additional search filters were applied. Because of the large number of records retrieved from Google Scholar, screening was limited to the first 300 results, after preliminary assessment demonstrated no additional eligible studies beyond this threshold. Reference lists of all included articles were manually searched to identify additional relevant publications. Studies published in languages other than English were considered eligible and translated when necessary.
Case reports and case series reporting patients with subdural hygroma associated with rupture of a middle cranial fossa arachnoid cyst were included. Studies describing isolated subdural hematoma, intracystic hemorrhage without hygroma, postoperative hygroma, arachnoid cysts outside the middle cranial fossa, insufficient clinical or radiological information, or review articles without original patient data were excluded.

**Participant or population** Patients of any age or sex diagnosed with subdural hygroma following rupture of a middle cranial fossa arachnoid cyst were eligible for inclusion. Both traumatic and spontaneous ruptures were considered. Studies reporting individual patient data or case series describing this condition were included, irrespective of geographic location or publication language.

**Intervention** The review evaluated all reported management strategies for subdural hygroma following rupture of a middle cranial fossa arachnoid cyst. These included conservative management (observation with clinical and radiological follow-up), pharmacological treatment (primarily acetazolamide), burr-hole evacuation with or without temporary subdural drainage, subdural tapping, microsurgical or endoscopic cyst fenestration, arachnoidoplasty, subduroperitoneal shunting, cystoperitoneal shunting, and combinations of these procedures.

**Comparator** No predefined comparator was required. The review descriptively summarized and compared outcomes reported following different management strategies, including conservative treatment, pharmacological therapy, burr-hole evacuation, cyst fenestration, and shunting procedures, where data were available. Formal quantitative comparisons or meta-analysis were not performed because of the rarity of the condition and the heterogeneity of the available evidence.

**Study designs to be included** Published case reports and case series reporting original clinical data on patients with subdural hygroma following rupture of a middle cranial fossa arachnoid cyst were included. No restrictions were applied regarding publication year or language. Review articles, editorials, letters without original patient data, and conference abstracts without sufficient clinical information were excluded.

**Eligibility criteria** Studies were eligible if they reported original clinical data on patients with subdural hygroma associated with rupture of a middle cranial fossa arachnoid cyst. Cases involving traumatic or spontaneous rupture were included. Reports describing isolated subdural hematoma, isolated intracystic hemorrhage without hygroma, postoperative hygroma, arachnoid cysts outside the middle cranial fossa, insufficient clinical or radiological information to confirm the diagnosis, or duplicate publications were excluded. When historical terminology such as "subdural effusion" or "fluid collection" was used, studies were included only if the clinical and radiological descriptions supported a cerebrospinal fluid–dominant subdural hygroma.

**Information sources** The literature search was performed using PubMed and Google Scholar from database inception through September 30, 2025. Reference lists of all included studies were manually screened to identify additional eligible publications. No restrictions were applied regarding publication language, and non-English articles were translated when necessary. No trial registries, unpublished studies, or direct author contacts were used.

**Main outcome(s)** The primary outcomes were the demographic, clinical, radiological, management, and outcome characteristics of patients with subdural hygroma following rupture of a middle cranial fossa arachnoid cyst. Specifically, data were collected on patient age and sex, mechanism of rupture (traumatic or spontaneous), clinical presentation, imaging findings, treatment strategy

(conservative or surgical), type of surgical procedure, need for reoperation, duration of follow-up, and clinical and radiological outcomes at the last reported follow-up. Because of the rarity of the condition and heterogeneity of the available evidence, outcomes were summarized descriptively.

**Additional outcome(s)** Additional outcomes included arachnoid cyst laterality and Galassi classification, subdural hygroma laterality, initial imaging modality, presence of midline shift, intervals between trauma, symptom onset, and diagnosis, radiological evolution of both the hygroma and arachnoid cyst, complications, and patterns of treatment escalation. When reported, outcomes following specific treatment modalities, including observation, acetazolamide therapy, burr-hole evacuation, fenestration, and shunting procedures, were also summarized descriptively.

**Data management** Titles and abstracts were screened, followed by full-text assessment of potentially eligible studies. Data extraction was performed independently by both authors, with disagreements resolved by consensus. Extracted variables included demographic, clinical, radiological, treatment, follow-up, and outcome data. Variables not reported in the original publications were recorded as "not reported" and excluded from the denominator for analyses of the corresponding variables. Elicit (Elicit Inc.) was used solely as a literature management and tabulation tool to facilitate organization of the included studies.

**Quality assessment / Risk of bias analysis** Because the available evidence consisted almost exclusively of isolated case reports and very small case series, formal risk-of-bias assessment using existing appraisal tools was not considered informative and was therefore not performed. The findings were interpreted in the context of the inherent limitations of descriptive observational evidence, including publication bias, selection bias, reporting bias, and incomplete reporting of clinical variables.

**Strategy of data synthesis** A pooled descriptive analysis was performed. Extracted data were summarized using frequencies and percentages for categorical variables and means, standard deviations, medians, and ranges for continuous variables when appropriate. Variables that were not reported were excluded from the denominator for analyses of the corresponding outcome. Because of the rarity of the condition, heterogeneity of the available studies, and absence of comparative study designs, meta-analysis was not performed. Results were synthesized narratively and presented in tables and figures.

**Subgroup analysis** No formal subgroup analyses were prespecified. Where sufficient data were available, descriptive comparisons were performed according to patient age, mechanism of rupture (traumatic versus spontaneous), treatment strategy (conservative versus surgical), surgical modality, and radiological characteristics. Because of the limited number of cases and heterogeneous reporting, these comparisons were descriptive only and no statistical subgroup analyses were undertaken.

**Sensitivity analysis** No sensitivity analysis was performed. The available evidence consisted predominantly of case reports and small case series with substantial clinical and methodological heterogeneity, precluding meaningful sensitivity analyses.

**Language restriction** No language restrictions were applied. Non-English studies were translated when necessary.

**Country(ies) involved** Greece.

**Other relevant information** The review was conducted and reported in accordance with the PRISMA 2020 statement. Because of the rarity of the condition and the available evidence, a pooled descriptive analysis was performed instead of a meta-analysis. The review protocol was registered retrospectively to meet journal requirements prior to editorial evaluation.

**Keywords** arachnoid cyst; subdural hygroma; middle cranial fossa; arachnoid cyst rupture; pediatric neurosurgery; systematic review.

**Dissemination plans** The findings of this systematic review are intended for publication in a peer-reviewed neurosurgical journal and may also be presented at relevant national and international scientific meetings to facilitate dissemination among clinicians and researchers.

**Contributions of each author**

Author 1 - Iordanis Alexiadis - Conceived and designed the study, performed the literature search, screened studies, extracted and analyzed the data, interpreted the findings, drafted and revised the manuscript, and approved the final version.
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