

Lumbar Cerebrospinal Fluid Drainage for Patients With Aneurysmal Subarachnoid Hemorrhage: A Systematic Review and Meta-analysis

INPLASY202360082

doi: 10.37766/inplasy2023.6.0082

Received: 27 June 2023

Published: 27 June 2023

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Wang, JH¹; Wan, SC²; Li, X³; Gao, H⁴; Chen, G⁵.**ADMINISTRATIVE INFORMATION****Support** - None.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202360082

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 June 2023 and was last updated on 11 July 2023.

INTRODUCTION

Review question / Objective (1)Patients: Patients with Aneurysmal Subarachnoid Hemorrhage; (2)Intervention: Lumbar Cerebrospinal Fluid Drainage; (3)Outcomes: Primary outcomes included cerebral vasospasm, vasospasm-related cerebral infarct and mortality. Second outcomes included infection, hydrocephalus requiring VP shunt, mRS score 0-2 and GOS score 1-4; (4)Study type: Randomized controlled trials only.

Condition being studied Subarachnoid hemorrhage caused by intracranial aneurysm rupture is a type of stroke with high mortality and disability rate. About 70% of patients with subarachnoid hemorrhage have vasospasm. Meanwhile, up to 40% of patients experience

secondary infarction. In retrospective studies, preventive lumbar spinal fluid drainage was associated with favorable outcomes. However, whether early lumbar cerebrospinal fluid drainage is beneficial to the prognosis of patients with aneurysmal subarachnoid hemorrhage lacks conclusive evidence, which is still inconclusive within the realm of evidence-based medicine.

METHODS

Search strategy Articles in PubMed, EMBASE and the Cochrane Central Register of Controlled Trials (CENTRAL) database were systematically searched for eligible studies by two independent investigators. The following search strategies were used: (((subarachnoid hemorrhage[Title/Abstract]) OR (aneurysmal subarachnoid hemorrhage[Title/Abstract])) AND (cerebrospinal fluid[Title/Abstract]))

AND (((drain[Title/Abstract]) OR (drainage[Title/Abstract])) OR (lumbar drain[Title/Abstract])) for PubMed; 'subarachnoid hemorrhage'/exp AND 'cerebrospinal fluid drainage'/exp for EMBASE; (subarachnoid hemorrhage):ti,ab,kw AND (cerebrospinal fluid drainage):ti,ab,kw for CENTRAL. Furthermore, the reference lists of all relevant articles were independently and manually searched and reviewed to ensure a more comprehensive search.

Participant or population Patients with Aneurysmal Subarachnoid Hemorrhage.

Intervention Lumbar Cerebrospinal Fluid Drainage.

Comparator Patients receiving standard treatment, not undergoing lumbar cerebrospinal fluid drainage.

Study designs to be included Randomized controlled trials only.

Eligibility criteria Inclusion criteria were defined as follow: (a) Study type: only randomized controlled trials; (b) Restriction on language: English paper only; (c) Population: patients aged >18 years with first aneurysmal SAH; (d) Aneurysm treatment performed during the first 48 hours after the initial hemorrhage; (e) Studies which reported at least one of the following outcome measures during treatment period: cerebral vasospasm, vasospasm-related cerebral infarct and mortality, infection, hydrocephalus requiring VP shunt, mRS score 0-2 and GOS score 1-4. Exclusion criteria were designed as follow: (a) Types of articles: reviews, case report and retrospective studies; (b) Population: Subarachnoid hemorrhage of other than aneurysmal origin, or pregnancy.

Information sources PubMed, EMBASE and the Cochrane Central Register of Controlled Trials (CENTRAL) databasePubmed, Embase, and the Cochrane Library.

Main outcome(s) Primary outcomes included cerebral vasospasm, vasospasm-related cerebral infarct and mortality. Second outcomes included infection, hydrocephalus requiring VP shunt, mRS score 0-2 and GOS score 1-4.

Quality assessment / Risk of bias analysis Review Manager 5.4 software (Cochrane, London, England) was used to evaluate the risk of bias in each trial. The uniform criteria of the Cochrane Collaboration were used for assessing the risk of bias for RCTs, including selection bias,

performance bias, detection bias, attrition bias, reporting bias and other potential biases. Each bias criterion was classified as "low", "high", or "unclear".

Strategy of data synthesis The data were assessed using Review Manager 5.4 software. For dichotomous outcomes, the risk ratio (RR) with a 95% confidence interval (CI) was employed for analysis. Heterogeneity among the study results was evaluated using the chi-square test. If the $I^2 < 50\%$ and the $p\text{-value} > 0.1$, it indicated that the combined results were homogeneous, warranting the use of a fixed-effect model for analysis. In cases where the $I^2 > 50\%$ or the $p\text{-value} < 0.1$, suggesting the presence of heterogeneity in the combined results, a random-effects model was utilized to analyze the data and explore potential sources of heterogeneity.

Subgroup analysis No subgroup analysis was conducted in our meta-analysis.

Sensitivity analysis Sensitivity analysis was performed using a random and fixed effects model transformation of the exposure factors.

Country(ies) involved China.

Keywords Aneurysmal subarachnoid hemorrhage; Lumbar cerebrospinal fluid drain; Cerebral vasospasm; Meta-analysis.

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