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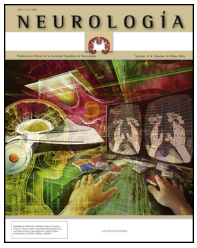

ORIGINAL ARTICLE

External lumbar cerebrospinal fluid drainage in patients with aneurysmal subarachnoid haemorrhage: A systematic review and meta-analysis of controlled trials☆

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KEYWORDS
Aneurysmal subarachnoid haemorrhage;
Cerebrospinal fluid drainage;
Delayed ischaemic neurological deficit;
External lumbar drainage;
Randomised controlled trial;
Vasospasm

Abstract
Introduction: External lumbar drainage is a promising measure for the prevention of delayed aneurysmal subarachnoid haemorrhage-related ischaemic complications.
Methods: Controlled studies evaluating the effects of external lumbar drainage in patients with aneurysmal subarachnoid haemorrhage were included. Primary outcomes were: new cerebral infarctions and severe disability. Secondary outcomes were: clinical deterioration due to delayed cerebral ischaemia, mortality, and the need of definitive ventricular shunting. Results were presented as pooled relative risks, with their 95% confidence intervals (95% CI).
Results: A total of 6 controlled studies were included. Pooled relative risks were: new cerebral infarctions, 0.48 (95% CI: 0.32-0.72); severe disability, 0.5 (95% CI: 0.29-0.85); delayed cerebral ischaemia-related clinical deterioration, 0.46 (95% CI: 0.34-0.63); mortality, 0.71 (95% CI: 0.24-2.06), and need of definitive ventricular shunting, 0.80 (95% CI: 0.51-1.24). Assessment of heterogeneity only revealed statistically significant indexes for the analysis of severe disability (I^2 = 70% and P = .01).
Conclusion: External lumbar drainage was associated with a statistically significant decrease in the risk of delayed cerebral ischaemia-related complications (cerebral infarctions and clinical deterioration), as well as the risk of severe disability; however, it was not translated in a lower

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mortality. Nevertheless, it is not prudent to provide definitive recommendations at this time because of the qualitative and quantitative heterogeneity among included studies. More randomised controlled trials with more homogeneous outcomes and definitions are needed to clarify its impact in patients with aneurysmal subarachnoid haemorrhage.

PALABRAS CLAVE
Hemorragia subaracnoidea aneurismática;
Drenaje de líquido cefalorraquídeo;
Déficit neurológico isquémico tardío;
Drenaje lumbar externo;
Ensayo clínico aleatorizado;
Vasoespasmo

Drenaje lumbar externo de líquido cefalorraquídeo en pacientes con hemorragia subaracnoidea aneurismática: revisión sistemática y metaanálisis de estudios controlados

Resumen
Introducción: El drenaje lumbar externo de líquido cefalorraquídeo es una medida promisoria para la prevención de las complicaciones de la isquemia cerebral tardía asociada a la hemorragia subaracnoidea espontánea de origen aneurismático.
Métodos: Se incluyeron los estudios controlados que evaluaran los efectos del drenaje lumbar externo en pacientes con hemorragia subaracnoidea aneurismática. Los desenlaces primarios fueron: nuevos infartos cerebrales y discapacidad grave. Los desenlaces secundarios fueron: deterioro clínico causado por isquemia cerebral tardía, mortalidad y necesidad de derivación ventricular definitiva. Los resultados se presentaron en riesgos relativos combinados, con un intervalo de confianza del 95% (IC 95%).
Resultados: Fueron incluidos un total de 6 estudios controlados. Los riesgos relativos combinados fueron: nuevos infartos cerebrales, 0,48 (IC 95%: 0,32-0,72); discapacidad grave, 0,5 (IC 95%: 0,29-0,85); deterioro clínico causado por isquemia cerebral tardía, 0,46 (IC 95%: 0,34-0,63); mortalidad, 0,71 (IC 95%: 0,24-2,06) y necesidad de derivación ventricular definitiva, 0,80 (IC 95%: 0,51-1,24). La evaluación de la heterogeneidad demostró índices estadísticamente significativos únicamente en el análisis de discapacidad grave ($I^2 = 70\%$ y $p = 0,01$).
Conclusión: El drenaje lumbar externo se asoció con una reducción estadísticamente significativa del riesgo de complicaciones causadas por la isquemia cerebral tardía (infartos cerebrales y deterioro clínico), así como del riesgo de discapacidad grave; sin embargo, esto no se tradujo en una menor mortalidad. No obstante, no es prudente emitir recomendaciones definitivas debido a la heterogeneidad cualitativa y cuantitativa entre los estudios. Son necesarios más ensayos clínicos con definiciones homogéneas de sus desenlaces para aclarar sus efectos en los pacientes con hemorragia subaracnoidea aneurismática.

Introduction

Cerebral vasospasm and delayed cerebral ischaemia (DCI) are the most frequent and severe complications of aneurysmal subarachnoid haemorrhage (ASH), occurring in between 20% and 50% of all cases.[1–3] Vasospasm is characterised by a progressive reduction in arterial diameter in the circle of Willis, and it is usually observed between days 4 and 14 after symptom onset.[4–6] DCI manifests clinically as neurological impairment which cannot be explained by such other conditions as hyponatraemia, hypoxaemia, infections, pulmonary oedema, drug intoxication, hydrocephalus, or rebleeding.[7] Lesions secondary to DCI may cause cerebral infarctions irrespective of the development of cerebral vasospasm.[8,9]

A great deal of the diagnostic and therapeutic resources required for managing patients with ASH are aimed at identifying, preventing, or treating vasospasms and DCI. Several studies have explored the use of glucocorticoids, endothelin-1 antagonists, statins, magnesium sulfate, acetylsalicylic acid, hypothermia, transdermal nitroglycerin, ebselen, and thrombolytics. However, none of these treatments has been shown to be effective in clinical practice.[1,10–12] In contrast, such other alternatives as oral nimodipine, haemodynamic therapy, intraarterial vasodilator therapy, and endovascular angioplasty have been proved useful for the prevention and treatment of vasospasm-related ischaemic neurological deficits. Their effectiveness, however, is limited.[13]

Although the pathophysiological mechanisms of vasospasm are yet to be fully understood, we currently know that breakdown products of haemoglobin play a major role in this process.[14,15] Incidence of vasospasm and DCI shows a close correlation with volume, density, and persistence of clots in the subarachnoid space and ventricular cavities.[4,14] In line with this idea, it has been suggested that early surgical removal of these clots may reduce the frequency and severity of vasospasms.[16] Komotar et al.[17] conducted a systematic review to assess the usefulness of cisternal drainage with microsurgical fenestration of the lamina terminalis, but concluded that this technique had no benefits.[17]