Chronic subdural hematoma recurrence

Epidemiology

In 2 large cohorts of US patients, approximately 5% to 10% of patients who underwent surgery for nontraumatic SDH were required to undergo repeated operation within 30 to 90 days. These results may inform the design of future prospective studies and trials and help practitioners calibrate their index of suspicion to ensure that patients are referred for timely surgical care.

Recurrence rates after chronic subdural hematoma (CSDH) evacuation with any of actual techniques twist drill craniostomy (TDC), burr hole craniostomy, craniotomy range from 5% to 30%.

Grading

Oslo grading system.

Risk factors

In the series of Santos et al. it was possible to demonstrate an age-related protective factor, analyzed as a continuous variable, regarding the recurrence of the chronic subdural hematoma (CSDH), with a lower rate of recurrence the higher the age.

The results indicate that, among possible factors associated with recurrence, only age presented a protective factor with statistical significance. The fact that no significant difference between the patients submitted to trepanning or craniotomy was found favors the preferential use of burr-hole surgery as a procedure of choice due to its fast and less complex execution.

In the series of Han et al. independent risk factors for recurrence were as follows: age > 75 years (HR 1.72, 95% CI 1.03-2.88; p = 0.039), obesity (body mass index ≥ 25.0 kg/m2), and a bilateral operation.

Chon et al. shown that postoperative midline shifting (≥5 mm), diabetes mellitus, preoperative seizure, preoperative width of hematoma (≥20 mm), and anticoagulant therapy were independent predictors of the recurrence of chronic subdural hematoma.

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According to internal architecture of hematoma, the rate of recurrence was significantly lower in the homogeneous and the trabecular type than the laminar and separated type 5).

The recurrence rate of chronic subdural hematoma (cSDH) seems to be related to the excessive neoangiogenesis in the parietal membrane, which is mediated via vascular endothelial growth factor (VEGF). This is found to be elevated in the hematoma fluid and is dependent on eicosanoid/prostaglandin and thromboxane synthesis via cyclooxygenase-2 (COX-2).

**Anticoagulant therapy**

see Chronic subdural hematoma and anticoagulant therapy.

**Antiplatelet therapy**

Antiplatelet therapy significantly influences the recurrence of CSDH 6).

**Pneumocephalus**

Remaining pneumocephalus is seen as an approved factor of recurrence 7) 8).

**Septation**

Jack et al. found a 12% reoperation rate. CSDH septation (seen on computed tomogram scan) was found to be an independent risk factor for recurrence requiring reoperation (p=0.04). Larger post-operative subdural haematoma volume was also significantly associated with requiring a second drainage procedure (p<0.001). Independent risk factors of larger post-operative haematoma volume included septations within a CSDH (p<0.01), increased pre-operative haematoma volume (p<0.01), and a greater amount of parenchymal atrophy (p=0.04). A simple scoring system for quantifying recurrence risk was created and validated based on patient age (< or ≥80 years), haematoma volume (< or ≥160cc), and presence of septations within the subdural collection (yes or no).

Septations within CSDHs are associated with larger post-operative residual haematoma collections requiring repeat drainage. When septations are clearly visible within a CSDH, craniotomy might be more suitable as a primary procedure as it allows greater access to a septated subdural collection. The proposed scoring system combining haematoma volume, age, and presence of septations might be useful in identifying patients at higher risk for recurrence 9).

**Membranectomy**

Opening the internal hematoma membrane does not alter the rate of patients requiring revision surgery and the number of patients showing a marked residual hematoma six weeks after evacuation of a CSDH 10).

In the study of Lee et al, an extended surgical approach with partial membranectomy has no advantages regarding the rate of reoperation and the outcome. As initial treatment, burr-hole drainage with irrigation of the hematoma cavity and closed-system drainage is recommended. Extended craniotomy with membranectomy is now reserved for instances of acute rebleeding with solid hematoma 11).
**Diabetes**

Surgeons should consider informing patients with diabetes mellitus that this comorbidity is associated with an increased likelihood of recurrence

Balser et al. report 11% recurrence, which included individuals who recurred as late as 3 years after initial diagnosis.

Close imaging follow-up is important for CSDH patients for recurrence prediction. Using quantitative CT volumetric analysis, strong evidence was provided that changes in the residual fluid volume during the 'self-resolution' period can be used as significantly radiological predictors of recurrence.

A structural equation model showed a significant association between increased antiinflammatory activity in hematoma fluid samples and a lower risk of recurrence, but this relationship was not statistically significant in venous blood samples. Moreover, these findings indicate that anti-inflammatory activities in the hematoma may play a role in the risk of a recurrence of CSDH.

Irrigation with artificial cerebrospinal fluid (ACF) decreased the rate of CSDH recurrence.

**Treatment**

There is no definite operative procedure for patients with intractable chronic subdural hematoma (CSDH).

Most recurrent hematomas are managed successfully with burr hole craniostomies with postoperative closed-system drainage. Refractory hematomas may be managed with a variety of techniques, including craniotomy or subdural-peritoneal shunt placement.

Although many studies have reported risk factors or treatments in efforts to prevent recurrence, those have focused on single recurrence, and little cumulative data is available to analyze refractory CSDH.

Matsumoto et al. defined refractory CSDH as ≥2 recurrences, then analyzed and compared clinical factors between patients with single recurrence and those with refractory CSDH in a cohort study, to clarify whether patients with refractory CSDH experience different or more risk factors than patients with single recurrence, and whether burr-hole irrigation with closed-system drainage reduces refractory CSDH.

Seventy-five patients had at least one recurrence, with single recurrence in 62 patients and ≥2 recurrences in 13 patients. In comparing clinical characteristics, patients with refractory CSDH were significantly younger (P=0.04) and showed shorter interval to first recurrence (P<0.001). Organized CSDH was also significantly associated with refractory CSDH (P=0.02). Multivariate logistic regression analysis identified first recurrence interval <1 month (OR 6.66, P<0.001) and age <71 years (OR 4.16, P<0.001) as independent risk factors for refractory CSDH. On the other hand, burr-hole irrigation with closed-system drainage did not reduce refractory CSDH.

When patients with risk factors for refractory CSDH experience recurrence, alternative surgical procedures may be considered as the second surgery, because burr-hole irrigation with closed-system drainage did not reduce refractory CSDH.
Implantation of a reservoir\textsuperscript{21} \textsuperscript{22} \textsuperscript{23}.

Subdural-peritoneal shunt \textsuperscript{24}.

**Middle meningeal artery embolization**

Embolization of the MMA is effective for refractory CSDH or CSDH patients with a risk of recurrence, and is considered an effective therapeutic method to stop hematoma enlargement and promote resolution \textsuperscript{25} \textsuperscript{26} \textsuperscript{27} \textsuperscript{28} \textsuperscript{29} \textsuperscript{30}.

A pilot study indicated that perioperative middle meningeal artery (MMA) embolization could be offered as the least invasive and most effectual means of treatment for resistant patients of CSDHs with 1 or more recurrences \textsuperscript{31}.

Chihara et al. have treated three cases of CSDH with MMA embolization to date, but there was a postoperative recurrence in one patient, which required a craniotomy for hematoma removal and capsulectomy. MMA embolization blocks the blood supply from the dura to the hematoma outer membrane in order to prevent recurrences of refractory CSDH. Histopathologic examination of the outer membrane of the hematoma excised during craniotomy showed foreign-body giant cells and neovascular proliferation associated with embolization. Because part of the hematoma was organized in this case, the CSDH did not resolve when the MMA was occluded, and the development of new collateral pathways in the hematoma outer membrane probably contributed to the recurrence. Therefore, in CSDH with some organized hematoma, MMA embolization may not be effective. Magnetic resonance imaging (MRI) should be performed in these patients before embolization \textsuperscript{32}.

**Case series**

see Chronic subdural hematoma recurrence case series.

**Case reports**

Chronic subdural hematoma recurrence case reports.

**References**


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