# Selection of an Appropriate Surgical Method for the Management of Chronic Subdural Hematoma in a Patient with Poor Physical Status

**Jin Eun, Jae-Geun Ahn**

*Department of Neurosurgery, Eunpyeong St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Republic of Korea*

## Abstract

Physical status is an important factor to consider when treating patients with chronic subdural hematomas. Surgical treatment of chronic subdural hematoma is mainly by burr hole trephination. However, operative methods must be selected after careful consideration of mortality, morbidity, and recurrence rates. In the case presented here, a chronic subdural hematoma was noted in a 65-year-old patient with several comorbidities; therefore, minimally invasive burr hole trephination was performed. After thrice repetition of the burr hole trephination procedure, a craniectomy for hematoma removal and middle meningeal artery embolization was finally conducted, followed by cranioplasty to treat a subsequent epidural hemorrhage. In the case discussed here, we review the options for the treatment of chronic subdural hematoma and evaluate the factors that should be considered in determining the appropriate surgical course. Despite poor patient physical status, minimally invasive operation may not always be the best option. If the patient is at high risk for recurrent subdural hematoma, craniotomy with hematoma removal may be a better choice.

**Keywords:** *Chronic subdural hematoma, burr hole trephination, meningeal artery embolization*

## Introduction

Chronic subdural hematoma is common among the elderly. Physical status is an important factor when considering patient management. Burr hole trephination is minimally invasive and is used worldwide for surgical management of this condition. However, surgical methods must be selected after careful consideration of mortality, morbidity, and recurrence rates.

We present a case of chronic subdural hematoma, wherein burr hole trephination was repeatedly performed because of hematoma recurrence; the patient finally underwent decompressive craniectomy with middle meningeal artery embolization.

## Case Report

A 65-year-old woman with pulmonary thromboembolism and acute kidney injury (AKI) in chronic kidney disease (CKD) was admitted to the hospital with dyspnea lasting for 1 week. Sulodexide (250 LSU) was administered orally for 4 days, and clexane (60 mg) injections were administered for 3 days, starting on the 2nd day of admission. The patient's initial mental status was alert; however, on the 4th day, she developed stupor. A nonenhanced brain computed tomography (CT) revealed a left chronic subdural hematoma [Figure 1].

The patient was categorized as having an American Society of Anesthesiologists (ASA) physical status classification of IV (defined as "A patient with severe systemic disease that is a constant threat to life"). Because of this and the patient's history of having received clexane injections within the last 12 h, emergency burr hole trephination was performed. After the operation, the patient's neurologic status recovered fully.

Twelve days after surgery, the patient was found wandering in a delirious state. A follow-up brain CT [Figure 2] revealed recurrence of the left subdural hematoma with a small amount of acute hemorrhage. Burr hole trephination was performed again. The subdural drainage catheter was removed the day after the operation. However, the next day, the patient's motor grade decreased with increased sleeping tendency. Follow-up brain CT showed



**How to cite this article:** Eun J, Ahn JG. Selection of an appropriate surgical method for the management of chronic subdural hematoma in a patient with poor physical status. Asian J Neurosurg 2021;16:164-9.

**Submitted:** 20-Jul-2020
**Accepted:** 24-Nov-2020 **Published:** 23-Feb-2021

***Address for correspondence:***
*Dr. Jae-Geun Ahn, Department of Neurosurgery, Eunpyeong St. Mary's Hospital, The Catholic University of Korea, 03476, 90, Baengnyeonsan-Ro, Eunpyeong-Gu, Seoul, Republic of Korea.*
*E-mail: neurobea@catholic.ac.kr*

**Access this article online**

**Website:** www.asianjns.org

**DOI:** 10.4103/ajns.AJNS_354_20

**Quick Response Code:**

recurrence of the hemorrhage [Figure 3]. A third burr hole trephination and significant volume of saline irrigation were performed. The next day, the patient's subdural drain was removed. Four days after removal of the drain, the patients' general condition was found to have worsened again. Exaggerated lethargy and aphasia were also noted. Follow-up brain CT showed mixed subdural hemorrhage and increased fluid collection at the site of the preexisting subdural hemorrhage [Figure 4]. The patient then underwent decompressive craniectomy, which is associated with a relatively low hematoma recurrence rate. On opening the dura, a minor subdural hemorrhage, moderate degree of brain swelling, and diffuse oozing without focal bleeding were noted. Coagulation using bipolar coagulator was consequently performed. After confirming bleeding cessation, duroplasty was performed using an artificial dura (Surgisis Biodesign Dural Graft, COOK Medical 7 cm × 10 cm), and the operation was complete [Figure 5].

Middle meningeal artery embolization, with continuous renal replacement therapy for the existing CKD, was additionally performed for the recurrent subdural hemorrhage. Hemorrhagic spread to additional subdural areas was not noted, although the left middle meningeal artery was unusually thickened [Figure 6a]; complete embolization with histoacryl and lipiodol was successfully performed [Figure 6b].

Three days after embolization, the patient demonstrated increased lethargy once again. A follow-up brain CT revealed epidural hemorrhage at the site of the decompressive craniectomy. Brain compression by the hemorrhage was also noted [Figure 7]. Re-operation for cranioplasty with hematoma removal was done. No hemorrhagic focus was confirmed and the hemorrhage

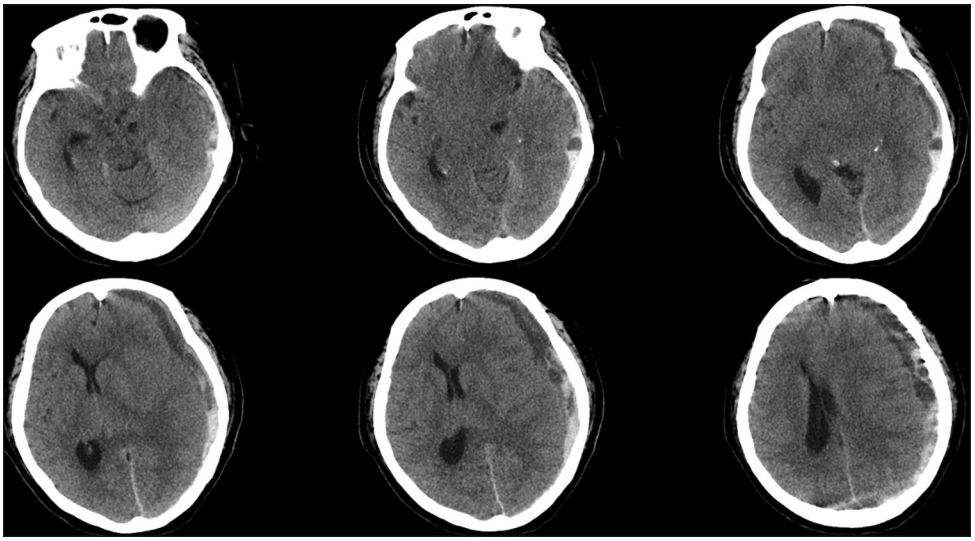

**Figure 1: Initial brain nonenhanced computed tomography images of the patient. Brain computed tomography showed chronic subdural hematoma with minimal amount acute subdural hemorrhage and midline shift**

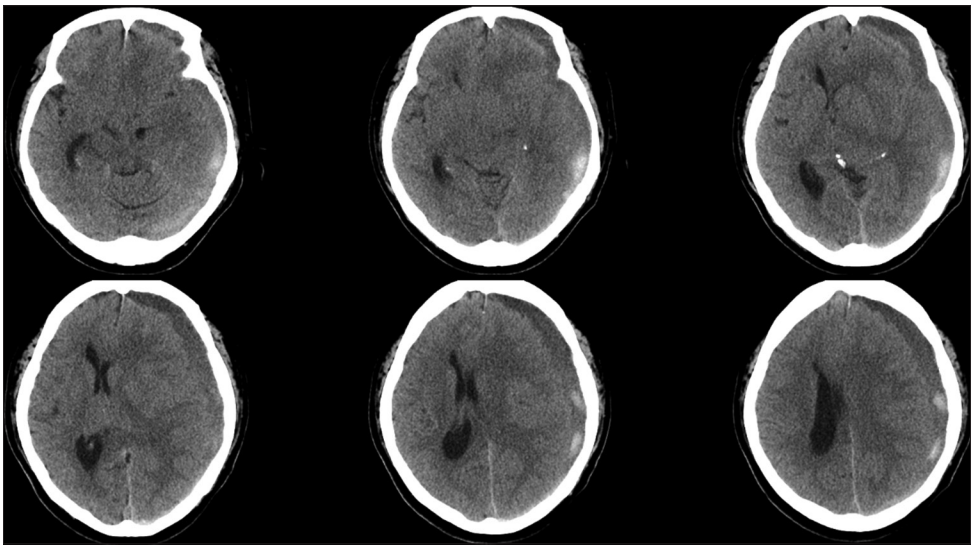

**Figure 2: Follow-up brain computed tomography image 12 days after the operation. Brain computed tomography showed recurrence of left subdural hematoma**

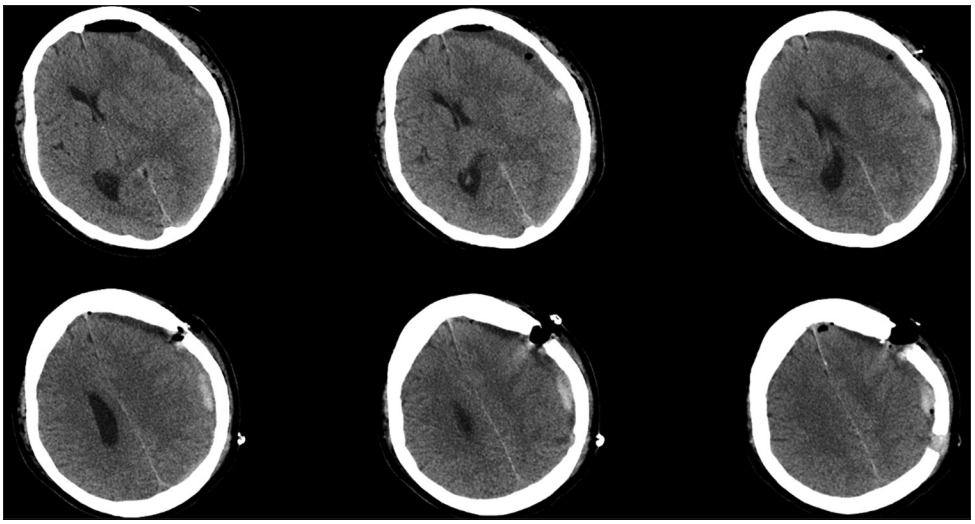

**Figure 3: Follow-up brain computed tomography image showed recurrence of left subdural hematoma with midline shift**

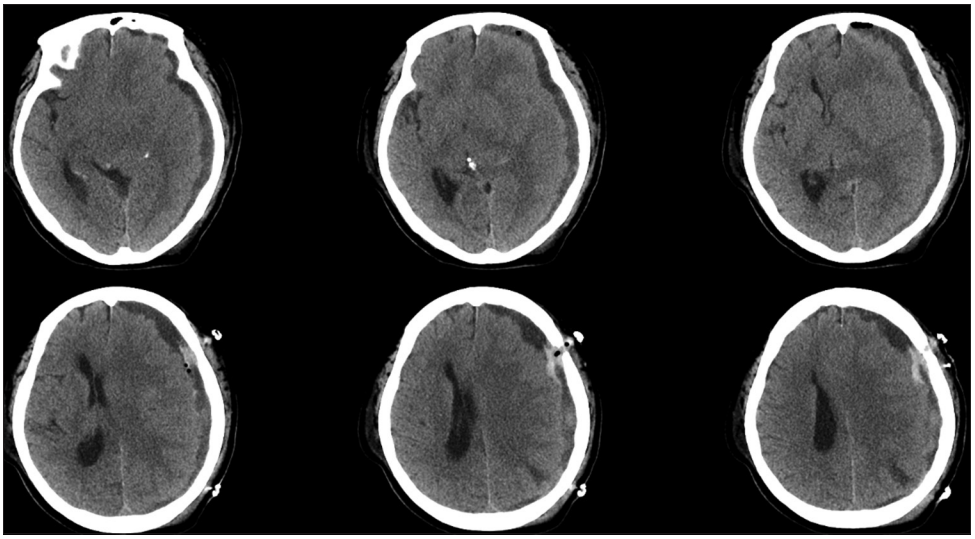

**Figure 4: Follow-up brain computed tomography image showed subacute subdural hematoma with midline shift**

noticed on the CT image was bulging of styptic agent and artificial dura with the absorption of the old hematoma. Saline irrigation and bleeding control were achieved via bipolar coagulation, followed by cranioplasty. After the operation, the patient returned to an alert state, maintained ambulation, and was discharged after a follow-up brain CT scan confirming resolution of the hemorrhage [Figure 8].

## Discussion

The three main operative methods for chronic subdural hematoma management are twist drill trephination, burr hole trephination, and craniotomy. Each surgical procedure is associated with distinct morbidity, mortality, and recurrence rates, which vary across studies, making it impossible to determine which is superior.[1,2] Therefore, we chose an operative method based on the patient's clinical status and general condition. Burr hole trephination is a relatively short procedure and is associated with lower morbidity and mortality rates compared to craniotomy, which requires a longer operating time, creation of a larger bone flap, and involves more bleeding.[1-3] However, hemorrhage recurrence rates are higher after burr hole trephination than after craniotomy.

The ASA classification of physical status is used worldwide to assess for the risk of general anesthesia, although studies in this regard are still lacking in the field of neurosurgery.[4-6] The patient discussed here was initially categorized as ASA class 4, indicating a high risk for general anesthesia. It was one of the main reasons that burr hole trephination was determined to be more surgically acceptable than craniotomy at first.

It is highly probable that the patient's preexisting CKD caused defective coagulation, resulting in diffuse oozing without focal bleeding.[7] Patients with kidney disease are more likely to exhibit coagulopathies, which may be present in the absence of other abnormal laboratory

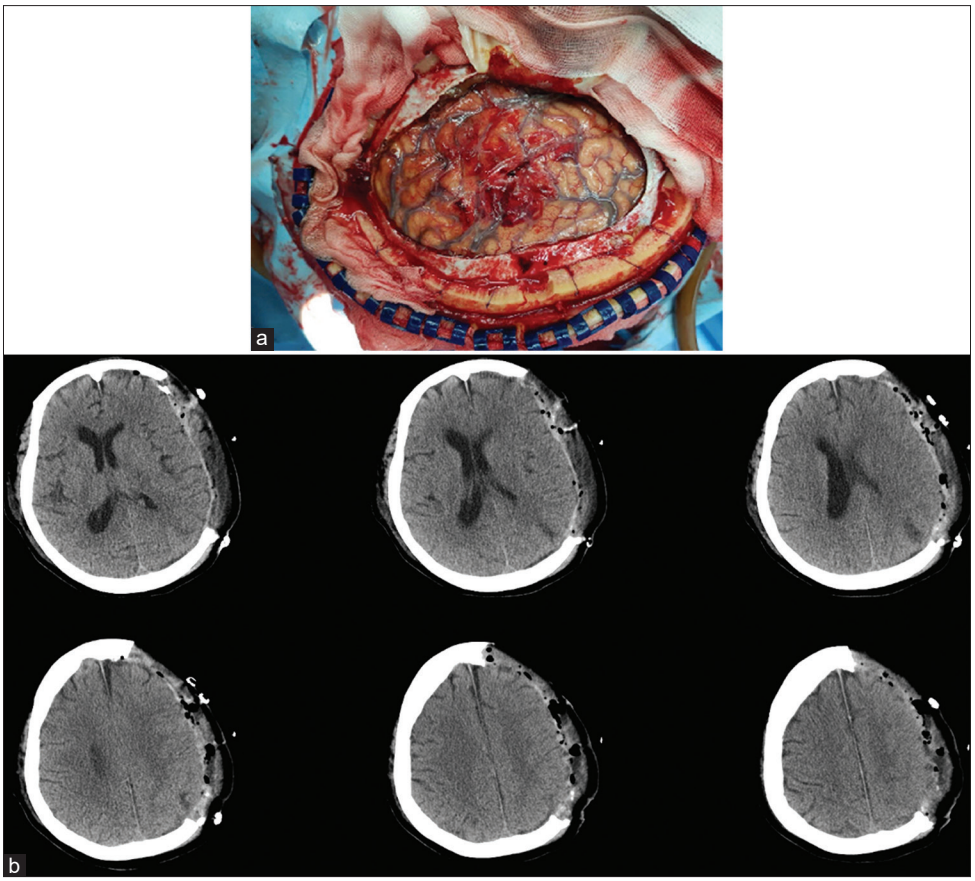


**Figure 5: (a) Clinical photo of the patient during decompressive craniectomy with duroplasty. (b) Follow-up brain computed tomography image after decompressive craniectomy showing improvement of midline shift**

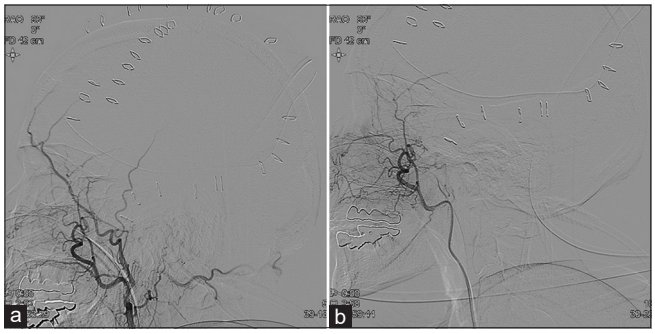


**Figure 6: Angiography showing thickened left middle meningeal artery. (a) Angiography of the left middle meningeal artery. (b) Embolization of the left middle meningeal artery was performed completely**

results.[7] The patient in this case presented with AKI in CKD at admission, which may have affected the recurrent hemorrhage.

Middle meningeal artery embolization, an additional, alternative method for treating recurrent subdural hemorrhage, was also used in the case outlined here. We were unable to confirm a causal relationship between the thickening of the left meningeal artery and the recurrent subdural hemorrhage. It is also possible that meningeal artery thickening may have affected this patient's clinical progress, given the therapeutic effects of embolization. Additional studies on the effectiveness of embolization may support this conclusion.[8,9]

## Conclusion

This patient ultimately underwent three burr hole trephination surgeries before a decompressive craniectomy was finally performed. Despite poor patient physical status, minimally invasive operation may not always be the best option. In addition, in patients with a pre-existing diminished physical status, especially kidney disease, coagulopathies may occur, and special attention should be paid to possible additional complications, such as epidural hemorrhage.

Determining the definite effect of embolization when a comparable control is not available is not possible. However, as the hemorrhage, in this case, did not expand the following cranioplasty, embolization for recurrent subdural hemorrhage may be an effective treatment. In cases with high bleeding risk, embolization should be carefully considered.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and

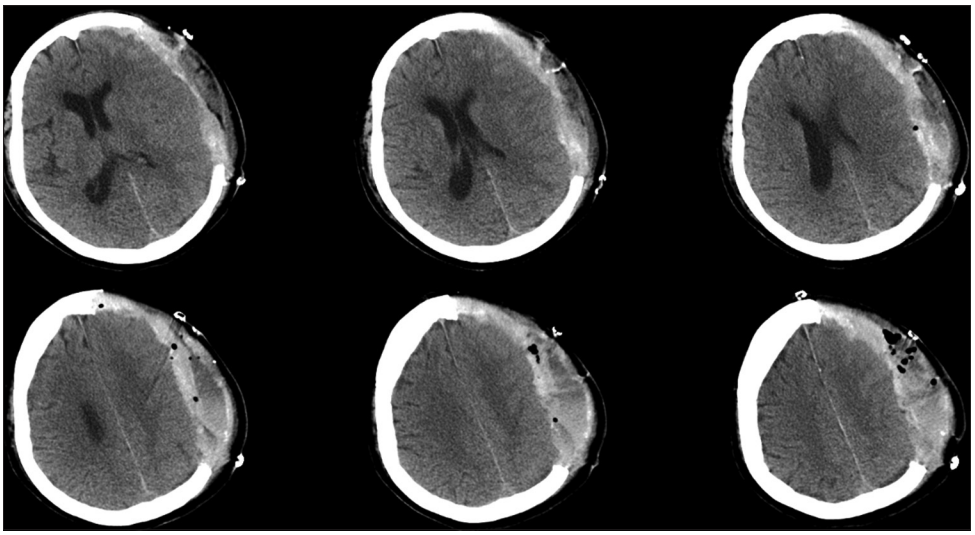

**Figure 7: Follow-up brain computed tomography image of the patient showing left epidural hematoma compressing the brain**

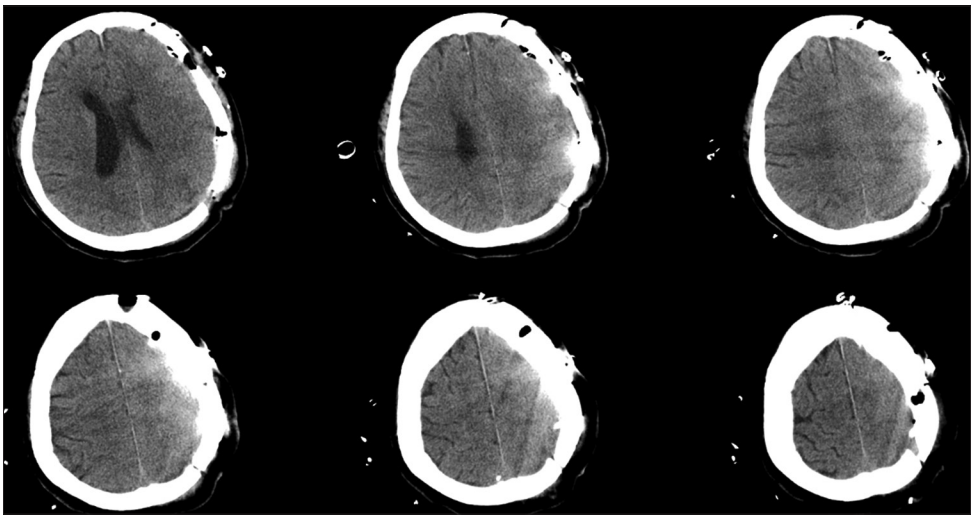

**Figure 8: Brain computed tomography image before patient discharge. No hemorrhage and midline shift were noticed**

other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.


## Financial support and sponsorship

Nil.


## Conflicts of interest

There are no conflicts of interest.

## References


1. Ducruet AF, Grobelny BT, Zacharia BE, Hickman ZL, DeRosa PL, Andersen KN, *et al*. The surgical management of chronic subdural hematoma. Neurosurg Rev 2012;35:155-69.
2. Almenawer SA, Farrokhyar F, Hong C, Alhazzani W, Manoranjan B, Yarascavitch B, *et al*. Chronic subdural hematoma management: A systematic review and meta-analysis of 34,829 patients. Ann Surg 2014;259:449-57.
3. Weigel R, Schmiedek P, Krauss JK. Outcome of contemporary surgery for chronic subdural haematoma: Evidence based review. J Neurol Neurosurg Psychiatry 2003;74:937-43.
4. de Cassio Zequi S, de Campos EC, Guimaraes GC, Bachega W Jr., da Fonseca FP, Lopes A. The use of the American Society of Anesthesiology Classification as a prognostic factor in patients with renal cell carcinoma. Urol Int 2010;84:67-72.
5. Hightower CE, Riedel BJ, Feig BW, Morris GS, Ensor JE Jr, Woodruff VD, *et al*. A pilot study evaluating predictors of postoperative outcomes after major abdominal surgery: Physiological capacity compared with the ASA physical status classification system. Br J Anaesth 2010;104:465-71.
6. Reponen E, Korja M, Niemi T, Silvasti-Lundell M, Hernesniemi J, Tuominen H. Preoperative identification of neurosurgery patients with a high risk of in-hospital

complications: A prospective cohort of 418 consecutive elective craniotomy patients. J Neurosurg 2015;123:594-604.
7. Lutz J, Menke J, Sollinger D, Schinzel H, Thürmel K. Haemostasis in chronic kidney disease. Nephrol Dial Transplant 2014;29:29-40.
8. Hashimoto T, Ohashi T, Watanabe D, Koyama S, Namatame H, Izawa H, *et al*. Usefulness of embolization of the middle meningeal artery for refractory chronic subdural hematomas. Surg Neurol Int 2013;4:104.
9. Link TW, Boddu S, Marcus J, Rapoport BI, Lavi E, Knopman J. Middle meningeal artery embolization as treatment for chronic subdural hematoma: A case series. Oper Neurosurg (Hagerstown) 2018;14:556-62.