

Is postoperative imaging mandatory after drainage of chronic subdural hematoma? Illustrative case

¿Es obligatoria la obtención de imágenes posoperatorias tras el drenaje de un hematoma subdural crónico? Caso ilustrativo

Carlos Umberto Pereira¹ 

Marcelo Barreto Barbosa¹

Antonio Carlos Silveira Azevedo¹

Lauro Roberto de Azevedo Setton²

ABSTRACT

Introduction: Chronic subdural hematoma (HSDC) has been a frequent neurosurgical condition. Its diagnosis is made using neurological and imaging examinations. The initial treatment has been surgical, and complications due to surgery are hematoma recurrence and pneumocephalus. **Case presentation:** 75-year-old male patient. History of progressive headache, difficulty in moving the right upper and lower limbs, and behavioral disturbance. Cranial tomography (CT) of the skull without contrast showed bilateral hypodense frontoparietal lesion. Bifrontoparietal trepanation and drainage of the hematoma were performed. In the immediate postoperative period, the neurological condition worsened and it was difficult to move the left side of the body. A control cranial CT scan showed an acute right parietal epidural hematoma. Conservative treatment was performed with progressive improvement of the neurological condition. **Conclusion:** The indication of CT control in the immediate postoperative period of DCS drainage is indicated when the neurological condition worsens.

Keywords: chronic; subdural hematoma; outcome; postoperative, computed tomography.

RESUMEN

Introducción: El hematoma subdural crónico (CSDH) ha sido una condición neuroquirúrgica común. Su diagnóstico se realiza mediante exploración neurológica e imágenes. El tratamiento inicial ha sido quirúrgico y las principales complicaciones de la cirugía son la recurrencia del hematoma y el neumocéfalo. **Reporte de caso:** Paciente masculino de 75 años. Historia de dolor de cabeza progresivo, dificultad para mover los miembros superiores e inferiores derechos y alteración del comportamiento. Tomografía craneal (TC) sin contraste de cabeza con lesión hipodensa frontoparietal bilateral. Se realizó trepanación bifrontoparietal y drenaje del hematoma. En el postoperatorio inmediato su estado neurológico empeoró y tuvo dificultad para mover el lado izquierdo. La TC de cabeza de control mostró un hematoma epidural parietal derecho agudo. Se realizó tratamiento conservador con mejoría progresiva del estado neurológico. **Conclusión:** La indicación de control por TC en el postoperatorio inmediato del drenaje HSDC está indicada cuando el cuadro neurológico empeora.

Palabras clave: crónico; hematoma subdural; desenlace; tomografía computarizada, postoperatoria.

¹Hospital João Alves Filho, Serviço de Neurocirurgia, Aracaju, SE, Brasil.

²Universidade de Tiradentes, Aracaju, SE, Brasil.

Received Apr 9, 2025
Accepted Apr 12, 2025



This is an Open Access article distributed under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) license (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

1 INTRODUCTION

Chronic subdural hematoma (CSDH) is a common neurosurgical condition that predominantly affects the elderly population^{1,2}. Predisposing factors include the use of anticoagulant drugs, mild traumatic brain injury, cerebral atrophy, and chronic abusive alcohol consumption¹. Diagnosis is primarily based on neurological examination, which includes symptoms such as headache, psychiatric disturbances, and focal neurological deficits, e.g. hemiparesis or aphasia, in addition to computed tomography (CT) imaging¹⁻³.

The authors report a case of CSDH that underwent surgical drainage and presented new neurological symptoms in the immediate postoperative period. A follow-up CT scan revealed the presence of a right parietal epidural hematoma. The authors discuss the necessity of performing postoperative CT monitoring for patients with CSDH.

2 CASE PRESENTATION

Patient JPS, 75 years old, male, presenting comorbidities of arterial hypertension, diabetes mellitus, and benign prostatic hyperplasia. Presented with progressive headache, difficulty in moving the right arm and leg, and behavioral disturbances. No history of previous traumatic brain injury was reported. Neurological examination revealed alert but disoriented patient, in time and space, with right-sided hemiparesis. Fundoscopic examination was impaired due to lens opacity. Non-contrast cranial CT scan showed bilateral frontoparietal hypodense lesions, more pronounced in the left hemisphere (Figure 1). The patient underwent surgical treatment with bilateral trepanation, hematoma drainage, and irrigation of the cavities with saline solution. Twelve hours after surgery, the patient developed delirium and mild left hemiparesis, with no improvement in the previous neurological symptoms. A new non-contrast cranial CT scan showed the postoperative status of the left chronic subdural hematoma (CSDH) drainage and the presence of a hyperdense lesion in the right parietal region, consistent with acute epidural hematoma (Figure 2). The patient's treatment was managed conservatively, resulting in progressive improvement of the neurological deficit.

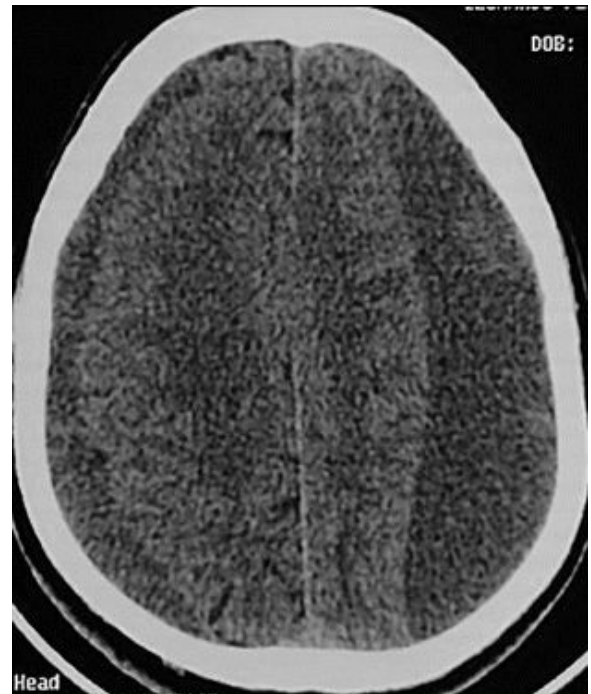


Figure 1. Non-contrast-enhanced cranial CT demonstrating bilateral frontoparietal hypodense lesion, compatible with chronic subdural hematoma.

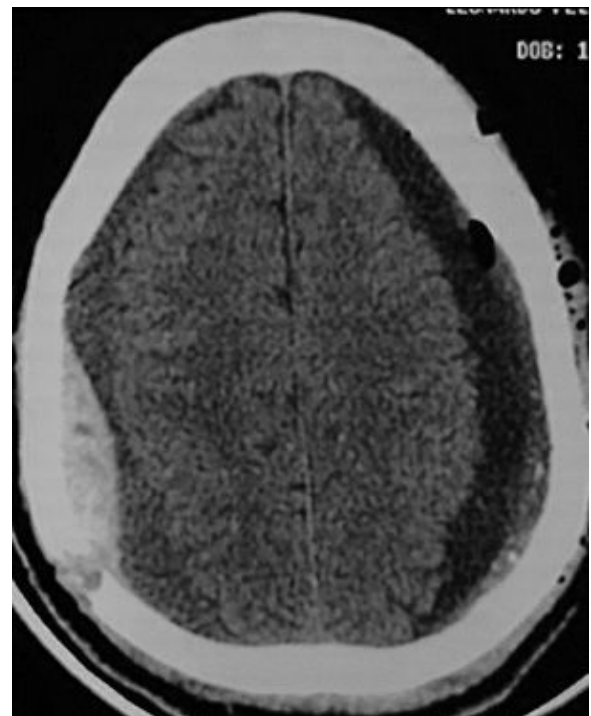


Figure 2. Non-contrast-enhanced cranial CT control 12 hours after surgery, demonstrating post-surgical status and presence of right parietal epidural hematoma.

3 DISCUSSION

Surgical treatment has been considered the best method to manage symptomatic chronic subdural hematoma (CSDH), but there is no consensus regarding the optimal surgical procedure⁴. Various approaches such as trepanation, craniotomy with or without drainage, and craniectomy have been employed, based on the patient's age, hematoma location, clinical condition, and the surgeon's preference. The primary goal of surgical intervention is to decompress the affected cerebral hemisphere and reduce the risk of complications, thereby lowering morbidity and mortality. The main complications associated with surgical treatment of CSDH include recurrence and pneumocephalus⁵⁻¹⁰.

According to Manninen et al.¹¹, neurosurgical procedures tend to have more postoperative complications compared to other surgical specialties. Computed tomography (CT) examinations are associated with significant radiation exposure¹² and operational costs³. Routine postoperative CT scans in neurosurgical procedures are commonly performed to predict the possibility of early complications, such as hemorrhage or cerebral edema¹³. Some procedures are routinely followed by CT scans to assess the extent of lesion resection or to confirm the location of a ventricular catheter in cases of shunting procedures¹⁴⁻¹⁶. Although the risk of hematoma occurrence is low¹⁵, routine postoperative CT has been considered for medico-legal reasons in other studies^{15,17}. In a series of craniotomies presented by Wen et al.¹⁷, only 1.9% required reoperation due to hematoma presence.

According to Broalet et al.⁵, postoperative complications can be severe and sometimes fatal, necessitating close postoperative monitoring to detect early signs of deterioration. Garrett et al.¹⁸ retrospectively analyzed the use of CT in all neurosurgical patients, and concurred that routine imaging without any change in neurological status would unlikely be beneficial in patients after CSDH drainage. According to Rahimi-Moraghar et al.¹⁹, individual surgeons may opt to perform immediate postoperative CT scans for various reasons, including complication evaluation and to assess potential residual hematoma reduction or enlargement and document surgical outcomes.

A Swiss study with 361 randomized patients showed that routine CT scans did not improve clinical outcomes but led to increased treatment costs, partly due to prolonged hospitalization²⁰.

Therefore, for these authors, the utility of routine CT follow-up to predict symptomatic recurrence is questionable. On the other hand, Dudoit et al.²¹ reported that routine postoperative CT scans can potentially detect CSDH recurrence before clinical deterioration occurs. In a Danish study with 202 patients, neurological symptom recurrence preceded the planned postoperative CT scan (four to six weeks after the initial surgery) in all patients who underwent a second surgery, leading to increased hospital costs¹. Rauhala et al.²² pointed out that routine CT scans may reveal significant hematoma recurrence in some clinically asymptomatic patients, leading to a decision for a second surgery. They suggest performing CT control only in clinically symptomatic patients.

According to Ng et al.³, routine postoperative cranial CT after trepanation for CSDH drainage may be unnecessary, considering the good predictive value of preoperative hematoma volume and because it is not predictive of clinical outcomes. Moussa et al.²³ indicate that early CT scans are generally performed for detecting significant residual hematoma before the late development of symptoms²³ or as part of routine postoperative care²⁴. Stanisic et al.¹⁰ demonstrated in their study that the presence of residual hematoma or pneumocephalus is predictive of hematoma recurrence.

In a study on 433 neurosurgical procedures, Fontes et al.²⁵ showed that early CT did not improve reoperation rates based solely on imaging findings. Pedersen et al.¹ reported on routine CT control - four to six weeks after CSDH drainage - and concluded that it had no clinical value. CT control is only indicated if there is a clinical suspicion of hematoma recurrence or in selected cases when the patient cannot adequately communicate, although clinical follow-up can still be equally effective. According to Brokinkel et al.²⁶, there are controversies regarding whether to indicate CT control when the drain is still in place or after its removal. These authors recommend CT control after drain removal because it can reveal both clinical and subclinical damages caused by removal, and additionally early subclinical recurrence of CSDH. For Qoqandi et al.²⁷, routine postoperative CT does not alter the course of clinical treatment, even in the presence of significant radiological findings. Any abnormality observed in CT is usually accompanied by clinical deterioration; hence, routine postoperative imaging is not necessary unless indicated.

4 CONCLUSION

The routine postoperative CT control after CSDH drainage does not hold significant clinical value. Imaging examinations in the postoperative period of CSDH are recommended if the patient's clinical condition does not improve or if there are concerns about the patient's evolution. The authors suggest that postoperative imaging should be considered when there is clinical deterioration, as in the case with our patient. Additionally, specialized healthcare services should establish guidelines for cases where early CT control is deemed necessary after a specific surgical procedure.

REFERENCES

- Pedersen CB, Sundbye F, Poulsen FR. No value of routine brain computed tomography 6 weeks after evacuation of chronic subdural hematoma. *Surg J*. 2017;3(4):e174-6. <http://doi.org/10.1055/s-0037-1607215>. PMID:29184916.
- Pereira CU, Dantas MC, Santos EAS, Santos CMT, Monteiro JTS. Hematoma subdural crônico no idosos. *Rev Bras Med*. 2005;63:331-7.
- Ng HY, Ng WH, King NKK. Value of routine early post-operative computed tomography in determining short-term functional outcome after drainage of chronic subdural hematoma: an evaluation of residual volume. *Surg Neurol Int*. 2014;5(1):136. <http://doi.org/10.4103/2152-7806.141299>. PMID:25298918.
- Lind CRP, Lind CJ, Mee EW. Reduction in the number of repeated operations for the treatment of subacute and chronic subdural hematoma by placement of subdural drains. *J Neurosurg*. 2003;99(1):44-6. <http://doi.org/10.3171/jns.2003.99.1.0044>. PMID:12854742.
- Broalet E, Haidara A, N'Dri Oka D, Tokpa A. Complications de la chirurgie de l'hématoma subdural chronique de l'adulte. *Rev Col Odonto-Stomatol Afr Chir Maxillo-Fac*. 2011;18(3):53-7.
- Kodeeswaran M, Rajedran S, Muniyandi P, Mani AK, Karthiraj N. Unexpected complications encountered in surgical treatment of chronic subdural hematoma. *Apollo Med*. 2018;15(1):21-3.
- Shaikh N, Masood I, Hanssens Y, Louon A, Hafiz A. Tension pneumocephalus as complication of burr-hole drainage of chronic subdural hematoma: a case report. *Surg Neurol Int*. 2010;1(1):27. <http://doi.org/10.4103/2152-7806.65185>. PMID:20847909.
- Cummins A. Tension pneumocephalus is a complication of chronic subdural hematoma evacuation. *J Hosp Med*. 2009;4(5):E3-4. <http://doi.org/10.1002/jhm.365>. PMID:19504584.
- Kravtchouk AD, Likhtenau LB, Potapov AA, El-Kadi H. Postoperative complication of chronic subdural hematomas: prevention and treatment. *Neurosurg Clin N Am*. 2000;11(3):547-52. [http://doi.org/10.1016/S1042-3680\(18\)30121-9](http://doi.org/10.1016/S1042-3680(18)30121-9). PMID:10918028.
- Stanišić M, Hald J, Rasmussen IA, et al. Volume and densities of chronic subdural hematoma obtained from CT imaging as predictors of postoperative recurrence: a prospective study of 107 operated patients. *Acta Neurochir*. 2013;155(2):323-33, discussion 333. <http://doi.org/10.1007/s00701-012-1565-0>. PMID:23229873.
- Manninen PH, Raman SK, Boyle K, El-Beheiry H. Early postoperative complications following neurosurgical procedures. *Can J Anaesth*. 1999;46(1):7-14. <http://doi.org/10.1007/BF03012507>. PMID:10078396.
- Melnick ER, Szlezak CM, Bentley SK, Dziura JD, Kotlyar S, Post LA. CT overuse for mild traumatic brain injury. *Jt Comm J Qual Patient Saf*. 2012;38(11):483-9. [http://doi.org/10.1016/S1553-7250\(12\)38064-1](http://doi.org/10.1016/S1553-7250(12)38064-1). PMID:23173394.
- Schär RT, Fiechter M, Z'Graggen WJ, et al. No routine postoperative head CT following elective craniotomy: a paradigm shift? *PLoS One*. 2016;11(4):e0153499. <http://doi.org/10.1371/journal.pone.0153499>. PMID:27077906.
- Khalidi A, Prabhu VC, Anderson DE, Origiano TC. The clinical significance and optimal timing of postoperative computed tomography following cranial surgery. *J Neurosurg*. 2010;113(5):1021-5. <http://doi.org/10.3171/2009.11.JNS081048>. PMID:20020840.
- Hussain SA, Selway R, Harding C, Polkey CE. The urgent postoperative CT scan: a critical appraisal of its impact. *Br J Neurosurg*. 2001;15(2):116-8. <http://doi.org/10.1080/02688690120036793>. PMID:11360373.
- Binning M, Ragel B, Brockmeyer DL, Walker ML, Kestle JRW. Evaluation of the necessity of postoperative imaging after craniotomy surgery. *J Neurosurg*. 2007;107(1):43-5.
- Wen L, Yang XF, Jiang H, Wang H, Zhan RY. Routine early CT scanning after craniotomy: is it effective for the early detection of postoperative intracranial hematoma? *Acta Neurochir*. 2016;158(8):1447-52. <http://doi.org/10.1007/s00701-016-2883-4>. PMID:27344667.
- Garrett MC, Bilgin-Freiert A, Bartels C, Everson R, Afsarmanesh N, Pouratian N. An evidence-based approach to the efficient use of computed tomography imaging in the neurosurgical patient. *Neurosurgery*. 2013;73(2):209-16. <http://doi.org/10.1227/01.neu.0000430328.25516.dd>. PMID:23632759.
- Rahimi-Movaghar V, Rasouli MR, Albright AL. Management of chronic subdural hematoma. *Lancet*. 2010;375(9710):195. [http://doi.org/10.1016/S0140-6736\(10\)60083-9](http://doi.org/10.1016/S0140-6736(10)60083-9).
- Schuch P, Fischer U, Fung C, et al. Follow-up computed tomography after evacuation of chronic subdural hematoma. *N Engl J Med*. 2019;380(12):1186-7. <http://doi.org/10.1056/NEJMc1812507>. PMID:30893542.
- Dudoit T, Labeyrie PE, Deryckere S, Emery E, Gaberel T. Is systematic postoperative CT scan indicated after chronic subdural hematoma

- surgery? A case-control study. *Acta Neurochir.* 2016;158(7):1241-6. <http://doi.org/10.1007/s00701-016-2820-6>. PMID:27147520.
22. Rauhala M, Helén P, Huhtala M, et al. Chronic subdural hematoma: incidence, complications, and financial impact. *Acta Neurochir.* 2020;162(9):2033-43. <http://doi.org/10.1007/s00701-020-04398-3>. PMID:32524244.
23. Moussa AH, Joshy N. The impact of computed tomography on the treatment of chronic subdural hematoma. *J Neurol Neurosurg Psychiatry.* 1982;45(12):1156-8. <http://doi.org/10.1136/jnnp.45.12.1156>. PMID:7161611.
24. Tahsim-Oglou Y, Beseoglu K, Hanggi O, Stummer W, Steiger HJ. Factors predicting recurrence of chronic subdural hematoma: the influence of intraoperative irrigation and low-molecular-weight heparin tromboprophylaxis. *Acta Neurochir (Wien).* 2012;154(6):1063-7, discussion 1068. <http://doi.org/10.1007/s00701-012-1334-0>. PMID:22476866.
25. Fontes RB, Smith AP, Munoz LE, Byrne RW, Traynelis VC. Relevance of early head CT scans following neurosurgical procedures: an analysis of 892 intracranial procedures at Rush University Medical Center. *J Neurosurg.* 2014;121(2):307-12. <http://doi.org/10.3171/2014.4.JNS132429>. PMID:24878289.
26. Brokinkel B, Ewelt C, Holling M, et al. Routine postoperative CT-scans after burr hole trepanation for chronic subdural hematoma: better before or after drainage removal? *Turk Neurosurg.* 2013;23(4):458-63. PMID:24101264.
27. Qoqandi O, Almubarak AO, Bafaquh M, et al. Efficacy of routine post-operative head computed tomography on cranial surgery patients outcome. *Neurosciences.* 2020;25(4):281-6. <http://doi.org/10.17712/nsj.2020.4.20200035>. PMID:33130808.

CORRESPONDING AUTHOR

Carlos Umberto Pereira

E-mail: umberto@infonet.com.br

Funding: none.

Conflict of interests: nothing to disclose.