

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Late peritoneal metastases of medulloblastoma following ventriculoperitoneal shunting: A case report[☆]

Hajar Ouazzani Chahdi, MD^{a,*}, Amal Akammar, MD^a, Ismail Chaouche, MD^b, Nizar El Bouardi, MD^b, Meriam Haloua, MD^a, Badreedine Alami, MD^b, Moulay Youssef Alaoui Lamrani, MD^b, Mustapha Maaroufi, MD^b, Meryem Boubbou, MD^a

^aHassan II University Hospital of Fez, Department of Mother and Child Radiology, Faculty of Medicine, Pharmacy and Dental Care, Sidi Mohammed Ben Abdellah University, Fez, Morocco

^bHassan II University Hospital of Fez, Department of Radiology, Faculty of Medicine, Pharmacy and Dental Care, Sidi Mohammed Ben Abdellah University, Fez, Morocco

ARTICLE INFO

Article history:

Received 1 March 2026

Revised 19 July 2026

Accepted 29 July 2026

Available online 26 August 2026

Keywords:

Metastase

Peritoneal

Ventriculoperitoneal shunting

ABSTRACT

Medulloblastoma typically disseminates through cerebrospinal fluid pathways, making extraneural peritoneal metastases an exceptional occurrence often associated with the presence of ventriculoperitoneal (VP) shunts. We report the case of an 11-year-old girl who presented with chronic postprandial vomiting and malnutrition 45 months after initial treatment for desmoplastic medulloblastoma. Imaging revealed extensive peritoneal masses and osteosclerotic lesions, without evidence of intracranial tumor recurrence. This case highlights the risk of shunt-mediated tumor dissemination and emphasizes the necessity for long-term clinical vigilance and a high index of suspicion when survivors present with new, nonspecific abdominal symptoms.

© 2026 The Author(s). Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction

Medulloblastoma is the most common malignant brain tumor in children, accounting for more than 20% of pediatric brain neoplasms [1,2]. While these tumors frequently cause increased intracranial pressure requiring ventriculoperitoneal (VP) shunt placement, their metastatic spread typically re-

mains confined to the central nervous system. Extraneural metastases are rare and generally carry a poor prognosis. Among these, peritoneal involvement is considered exceptional and is most often reported in patients with VP shunts, suggesting a plausible iatrogenic route of tumor dissemination. However, this causal link remains inferential, and alternative mechanisms, such as hematogenous spread or other cerebrospinal fluid (CSF) mediated pathways, must also be

[☆] Competing Interests: The authors have declared that no competing interests exist.

* Corresponding author.

E-mail address: hajar.ouazzanichahdi@usmba.ac.ma (H. Ouazzani Chahdi).

<https://doi.org/10.1016/j.radcr.2026.07.115>

1930-0433/© 2026 The Author(s). Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

considered. Late extraneural relapses occurring several years post-treatment are particularly uncommon and often present with nonspecific abdominal symptoms that pose significant diagnostic challenges. The presence of concurrent widespread bone lesions, as seen in the present case, further highlights the possibility of diverse metastatic routes, including the blood-borne path to our knowledge, this case represents one of the latest reported peritoneal relapses of desmoplastic medulloblastoma mediated by VP shunting, with extensive extraneural dissemination and no intracranial recurrence.

Case presentation

We report the case of an 11-year-old girl who presented in April 2021 with a 3-month history of progressive headaches, decreased visual acuity, and gait disturbances. Neurological examination revealed cerebellar ataxia with a widened base of support. Brain MRI demonstrated a fourth ventricular mass causing obstructive hydrocephalus with tonsillar herniation. After ventriculoperitoneal (VP) shunt placement in April 2021, the patient underwent complete macroscopic tumor resection 1 month later. Histopathological examination

with immunohistochemistry (synaptophysin positive, GFAP positive, β -catenin negative) confirmed a high-grade desmoplastic medulloblastoma, non-WNT subtype. The patient received adjuvant craniospinal radiotherapy (54 Gy in 30 fractions) from August to October 2021, which was well tolerated. Serial brain MRI examinations over the following 3 years demonstrated stable residual vermian cavity without tumor recurrence, with expected chronic subdural collections and signs of intracranial hypotension (Fig. 1).

In July 2025, approximately 4 years after completion of treatment, the patient developed chronic postprandial vomiting resistant to antiemetic therapy, associated with abdominal pain. Clinical examination revealed a debilitated and malnourished child (weight: 25 kg, -2 SD) with diffuse abdominal tenderness, and biological evaluation showed C-reactive protein at 90 mg/L, white blood cells at 12,000/ μ L, and severe hypokalemia at 1.9 mmol/L. Upper gastrointestinal endoscopy demonstrated gastric and duodenal stasis suggesting extrinsic compression, and abdominopelvic ultrasound showed multiple peritoneal and bilateral ovarian masses. Contrast-enhanced thoracoabdominopelvic computed tomography (CT) revealed multiple peritoneal masses; the largest lesion was located in the subhepatic space, invading the pyloric region and the proximal duodenal seg-

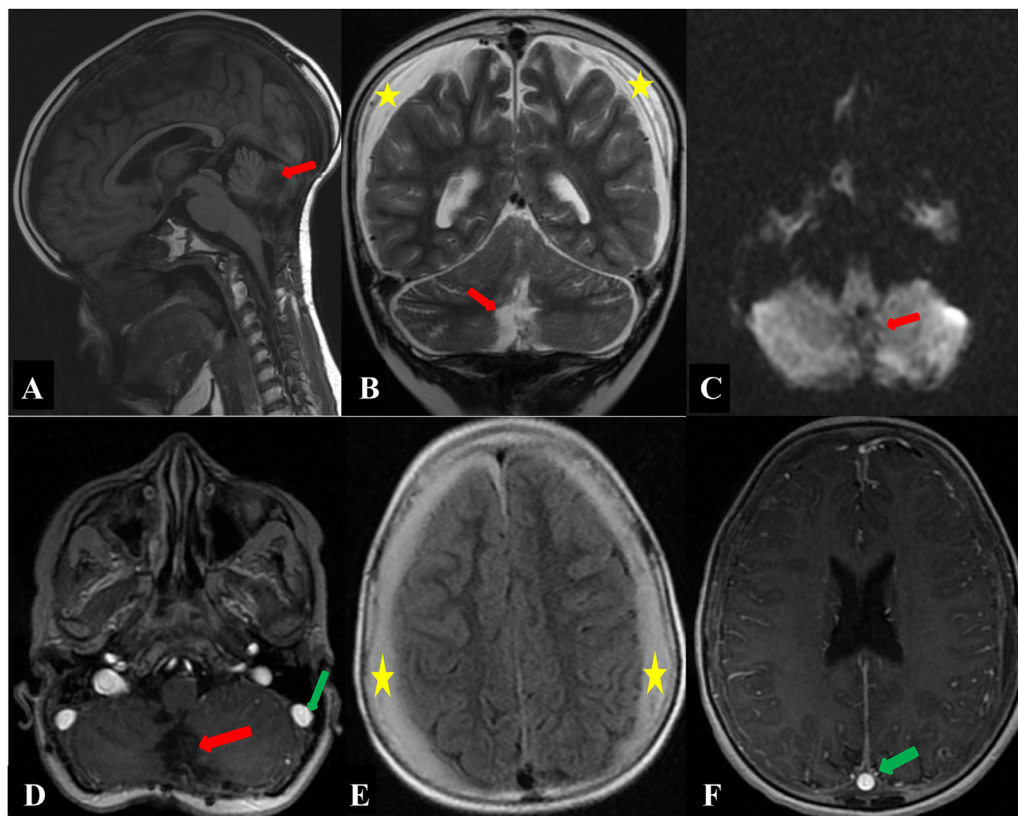


Fig. 1 – Postoperative surveillance brain MRI, including sagittal T1-weighted (A), coronal T2-weighted (B), axial diffusion (C), axial T1-weighted after injection of gadolinium (D), and axial FLAIR (E) sequences, demonstrates a small central vermian cavity (Red Arrow), exhibiting low signal on T1-weighted and high signal on T2-weighted, without diffusion restriction or contrast enhancement. These findings are consistent with postoperative gliosis rather than tumor recurrence. Additionally, bilateral hemispheric subdural collections (Star), accompanied by engorgement and bulging of the dural venous sinuses (Green Arrow), are present, in keeping with intracranial hypotension.

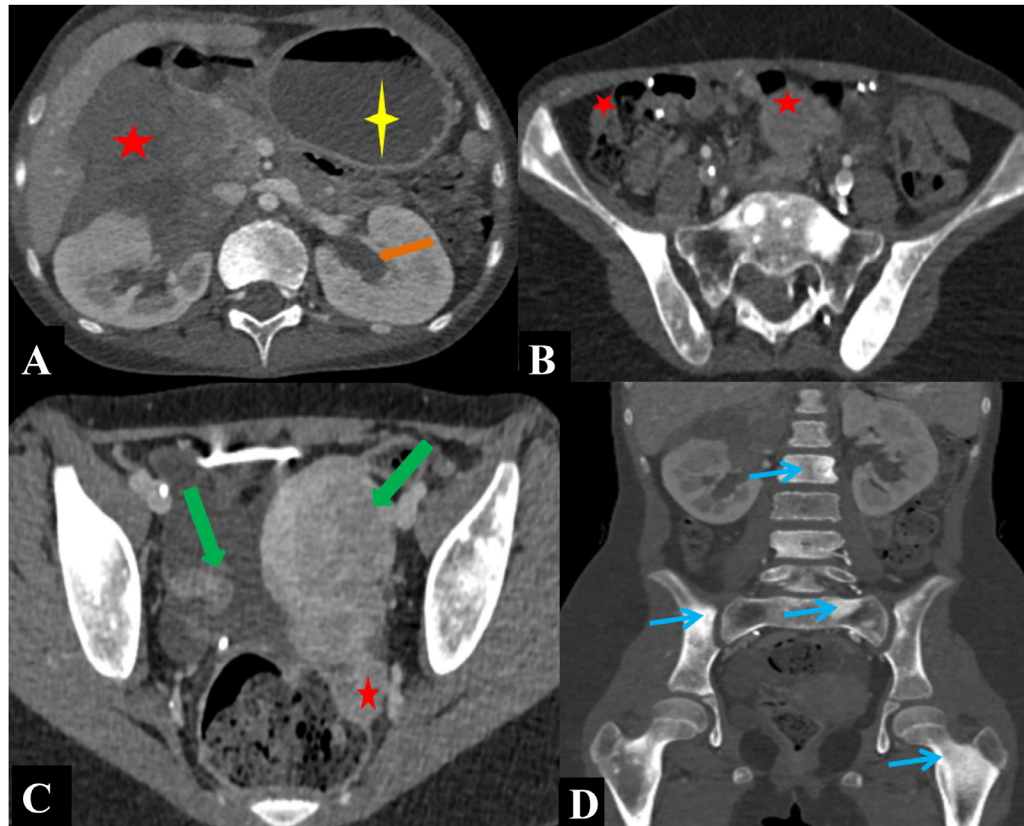


Fig. 2 – Contrast-enhanced abdominopelvic computed tomography (CT) in axial sections (A–C), demonstrates multiple peritoneal masses and nodules of varying sizes distributed throughout the subhepatic region, the right paracolic gutter, the interloop spaces, and the pelvis (Red star). These lesions were ill-defined, exhibited irregular margins, and demonstrated heterogeneous contrast enhancement. The largest lesion was located in the subhepatic space, invading the pyloric region and the first duodenal segment, causing upstream gastric stasis. A small pelvic intraperitoneal effusion was also noted. Additionally, bilateral ovarian masses were identified (Green arrow); they were roughly oval-shaped and well-circumscribed, though with irregular borders and heterogeneous enhancement. The left-sided mass encased the distal left ureter, resulting in ipsilateral hydroureteronephrosis (Orange arrow). Bone-window images (D) showed multiple osteocondensing lesions affecting the axial and appendicular skeleton, suggestive of secondary locations (Blue arrow). These findings illustrate the extensive nature of the peritoneal dissemination, occurring 45 months after completion of treatment for desmoplastic medulloblastoma.

ment, thereby causing upstream gastric stasis. Additionally, bilateral adnexal masses and widespread osteosclerotic bone lesions consistent with secondary metastases were identified (Fig. 2). Brain CT demonstrated stable intracranial findings without evidence of posterior fossa recurrence. Peritoneal biopsy with immunohistochemistry subsequently confirmed metastatic medulloblastoma in August 2025.

The patient's condition progressively deteriorated despite supportive care and correction of metabolic disturbances. Multidisciplinary evaluation concluded palliative radiotherapy was not indicated given the extensive metastatic burden. In October 2025, she presented with altered consciousness (GCS: 7–8), severe jaundice, and status epilepticus, rapidly progressing to multi-organ failure including cholestatic syndrome (bilirubin 19× normal), vasoplegic shock, respiratory failure, and acute kidney injury. Despite aggressive resuscitation, she suffered cardiorespiratory arrest and was pronounced deceased.

Discussion

Medulloblastoma is the most common malignant pediatric brain tumor and is characterized by a prominent propensity for dissemination along the cerebrospinal fluid (CSF) pathways; indeed, leptomeningeal “drop metastases” along the neuraxis occur in up to one-third of patients [3,4]. Extranodal metastasis is far less common, occurring in only 1%–2% of patients at diagnosis and cumulatively in 5%–10% during follow-up. While the bone and bone marrow represent the most frequent sites of systemic spread, peritoneal involvement is exceptional; fewer than 20 cases have been reported in the literature, virtually all of which occurred in patients with ventriculoperitoneal (VP) shunt in place [5–7]. Our case illustrates an unusually late and extensive peritoneal relapse of desmoplastic medulloblastoma, manifesting 45 months after initial treatment in a patient who had undergone VP shunting for ob-

Table 1 – Reported cases of peritoneal or extraneural metastases of medulloblastoma associated with VP shunting.

Study	Age	Histology	Interval to metastasis (mo)	Presentation	Outcome
Hoffman et al. [8]	Mixed (n = 4)	NR	Variable	Abdominal mass	Died, no CNS recurrence
Berger et al. [12]	Mixed (n = 3)	MB	~15 mo (mean)	Variable	Poor survival
Jamjoom et al. [11]	Child	MB	NR	Scrotal hydrocele	Poor
Magtibay et al. [20]	26 y	MB	NR	Abdominal mass	Surgical resection
Arias-Garzón et al. [19]	26 y	MB	24 mo	Abdominal pain	Chemotherapy + surgery, improved
Pettersson et al. [7]	5 y	Anaplastic MB	3 mo	Thoracoabdominal mass	Died at 5 mo
Aqamour et al. [21]	14 y	MB	~36 mo	Acute abdomen	NR
Present case, 2025	11 y	Desmoplastic MB	45 mo	Chronic vomiting, gastric outlet obstruction	Died at 2.5 mo postdiagnosis

MB, medulloblastoma; NR, not reported.

structive hydrocephalus. Notably, this relapse occurred in the absence of intracranial recurrence, a pattern and latency that contributes meaningfully to the sparse literature on this rare complication.

The causal role of ventriculoperitoneal shunts in extraneural dissemination has been debated since Hoffman et al. first described it in 1976, shunt-mediated dissemination involving the migration of viable tumor cells from the cerebrospinal fluid (CSF) to the peritoneal cavity via the catheter lumen has been proposed as the primary pathophysiological mechanism [8]. However, this mechanism remains speculative rather than definitive. Because medulloblastoma can also disseminate hematogenously or via CSF pathways independently of mechanical diversion, establishing a direct causal link to the device in individual cases remains challenging. In our patient, the linear, subhepatic-to-pelvic distribution of disease along the presumed catheter tract, combined with the lack of intracranial recurrence, strongly suggests a shunt-mediated pathway; nevertheless, alternative or concurrent hematogenous spread cannot be entirely excluded.

Because 73% and 100% of children with posterior fossa tumors present with obstructive hydrocephalus requiring intervention, the optimal strategy for CSF diversion whether via permanent VP shunt, endoscopic third ventriculostomy, or temporary external ventricular drainage remains a subject of active debate, driven in part by the theoretical risk of tumor seeding [9,10]. In a critical analysis of 160 medulloblastoma cases with systemic metastases, Jamjoom et al. found that only 18.7% of patients had a shunt in place, and the device was judged to be the probable route of spread in just 6.9% of cases [11]. Conversely, Berger et al. reported that all 8 children who developed extraneural metastases in their series had medulloblastoma, and 3 of these patients carried a VP shunt, supporting a plausible contributory role for mechanical diversion in at least a subset of patients [12].

The interval to extraneural relapse is typically short; approximately 80% of cases are diagnosed within 3 years of ini-

tial treatment, and earlier onset (less than 18 months) predicts a worse clinical outcome [6]. Our patient's 45-month latency is therefore atypical and may relate to the desmoplastic histology. Indeed, several series associate this specific subtype with more indolent behavior and longer survival after extraneural relapse compared to classic or large-cell/anaplastic variants [13,14]. Table 1 compares our case with selected published reports of shunt-related peritoneal metastases from medulloblastoma. Recent reports continue to expand this clinical picture. A 2025 case of SHH-activated medulloblastoma presenting with late extraneural skeletal spread, a 2025 systematic review of 23 published cases of extracranial medulloblastoma metastases, and a 2024 report of cervical lymph node metastasis all underscore that atypical sites and delayed presentations, though rare, are increasingly recognized. These findings emphasize the necessity of maintaining a low threshold for metastatic work-up in long-term survivors presenting with new, unexplained symptoms [15–17].

Prognosis after extraneural relapse remains poor, with a reported median survival of 8 months and 1-, 2-, and 5-year overall survival rates of 41.9%, 31%, and 26%, respectively [6]. Our patient's survival of only 2.5 months following diagnosis likely reflects the extensive tumor burden, which included bone metastases and probable hepatobiliary involvement as evidenced by severe cholestasis. Furthermore, her clinical presentation chronic vomiting and gastric outlet obstruction secondary to pyloric invasion differed from the acute abdominal masses or ascites more typically described in the literature, illustrating the varied and nonspecific manifestations of this complication.

Treatment options for extraneural relapse are correspondingly limited. While isolated reports describe durable remission following aggressive, multimodal therapy combining chemotherapy and surgical debulking, these outcomes remain the exception; in our patient, the rapid progression of disease and subsequent multi-organ deterioration precluded any intervention beyond palliative care [18,19].

This case reinforces the critical need for continued clinical vigilance. New, otherwise unexplained gastrointestinal or abdominal symptoms in a patient with a history of medulloblastoma and an active VP shunt even years after apparently successful primary treatment warrant prompt cross-sectional imaging and, where feasible, tissue confirmation. Ultimately, while early recognition is unlikely to alter the poor prognosis, it remains vital for guiding appropriate management decisions and facilitating informed family counseling.

Conclusion

Peritoneal metastasis is an exceptionally rare and usually fatal form of extraneural spread in medulloblastoma. This case shows that relapse can occur many years after apparently curative treatment, in the absence of intracranial recurrence, and with nonspecific gastrointestinal symptoms as the only initial manifestation. A VP shunt is a plausible, though not definitively proven, route of dissemination in such cases. Clinicians should maintain a high index of suspicion and pursue prompt imaging in any medulloblastoma survivor with a shunt who develops new, unexplained abdominal symptoms, however long after initial treatment.

Patient consent

The patient's parents have provided written informed consent for the publication of the clinical information and any accompanying images in Radiology Case Reports.

REFERENCES

- [1] Magtibay PM, Friedman JA, Rao RD, Buckner JC, Cliby WA. Unusual presentation of adult metastatic peritoneal medulloblastoma associated with a ventriculoperitoneal shunt: a case study and review of the literature. *Neuro Oncol* 2003;5(3):217–20. doi:10.1215/S115285170200042X.
- [2] Hildebrand J, Dewitte O, Dietrich PY, de Tribolet N. Management of malignant brain tumors. *Eur Neurol* 1997;38(3):238–53. doi:10.1159/000113379.
- [3] StatPearls. Medulloblastoma. 2023. <https://www.ncbi.nlm.nih.gov/books/NBK431069/>. [accessed August 22, 2026].
- [4] Choi JY. Medulloblastoma: current perspectives and recent advances. *Brain Tumor Res Treat* 2023;11(1):1–12. doi:10.14791/btrt.2022.0047.
- [5] Mobark NA, Al-Harbi M, Mosleh O, Santagata S, Snuderl M, Abedalthagafi M. A case of molecularly profiled extraneural medulloblastoma metastases in a child. *BMC Med Genet* 2018;19(1):10. doi:10.1186/s12881-018-0526-8.
- [6] Mazloom A, Zangeneh AH, Paulino AC. Prognostic factors after extraneural metastasis of medulloblastoma. *Int J Radiat Oncol Biol Phys* 2010;78(1):72–8. doi:10.1016/j.ijrobp.2009.07.1729.
- [7] Pettersson D, Schmitz KR, Pollock JM, Hopkins KL. Medulloblastoma: seeding of VP shunt tract and peritoneum. *Clin Pract* 2012;2(2):e37. doi:10.4081/cp.2012.e37.
- [8] Hoffman HJ, Hendrick EB, Humphreys RP. Metastasis via ventriculoperitoneal shunt in patients with medulloblastoma. *J Neurosurg* 1976;44(5):562–6. doi:10.3171/jns.1976.44.5.0562.
- [9] Lam S, Reddy GD, Lin Y, Jea A. Management of hydrocephalus in children with posterior fossa tumors. *Surg Neurol Int* 2015;6(Suppl 11):S346–8. doi:10.4103/2152-7806.161413.
- [10] El-Ghandour NMF. Endoscopic third ventriculostomy versus ventriculoperitoneal shunt in the treatment of obstructive hydrocephalus due to posterior fossa tumors in children. *Childs Nerv Syst* 2011;27(1):117–26. doi:10.1007/s00381-010-1228-2.
- [11] Jamjoom ZAB, Jamjoom AB, Sulaiman AH, Rahman N-U, Al-Rabiaa A. Systemic metastasis of medulloblastoma through ventriculoperitoneal shunt: report of a case and critical analysis of the literature. *Surg Neurol* 1993;40(5):403–10. doi:10.1016/0090-3019(93)90221-L.
- [12] Berger MS, Baumeister B, Geyer JR, Milstein J, Kanav PM, LeRoux PD. The risks of metastases from shunting in children with primary central nervous system tumors. *J Neurosurg* 1991;74(6):872–7. doi:10.3171/jns.1991.74.6.0872.
- [13] Young RJ, Khakoo Y, Yhu S, Wolden S, De Braganca KC, Gilheeny SW, et al. Extraneural metastases of medulloblastoma: desmoplastic variants may have prolonged survival. *Pediatr Blood Cancer* 2015;62(4):611–15. doi:10.1002/pbc.25354.
- [14] Gupta T, Dasgupta A, Epari S, Shirsat N, Chinnaswamy G, Jalali R. Extraneuraxial metastases in medulloblastoma: is histology and molecular biology important? *J Neurooncol* 2017;135(2):419–21. doi:10.1007/s11060-017-2586-6.
- [15] Marzouki S, De Vulder N, Dekeyser S. From cerebellum to skeleton: a case report of SHH-activated medulloblastoma with extraneural spread. *Acta Neurol Belg* 2025;125(1):247–52. doi:10.1007/s13760-024-02663-1.
- [16] Vega-Moreno DA, Navarro-Fernández JO, Reyes-Soto G, Serrano-Murillo M, López-Valdés JC. Extracranial metastatic medulloblastoma: two case reports and systematic literature review. *SN Compr Clin Med* 2025;7:101. doi:10.1007/s42399-025-01853-z.
- [17] Harrak M, Kamal S, Zerbani H, El Bakouri H, Ouaya S, Sellal N, et al. Cervical lymph node metastasis from medulloblastoma in a young adult: case report and literature review. *Cureus* 2024;16(5):e61339. doi:10.7759/cureus.61339.
- [18] Fiorillo A, Maggi G, Martone A, Migliorati R, D'Amore R, Alfieri E, et al. Shunt-related abdominal metastases in an infant with medulloblastoma: long-term remission by systemic chemotherapy and surgery. *J Neurooncol* 2001;52(3):273–6. doi:10.1023/a:1010687121450.
- [19] Arias-Garzón W, Pacheco-Barsallo F, Trujillo-Jácome C. Peritoneal metastases of medulloblastoma due to placement of ventriculoperitoneal shunt in an adult patient. *Cir Cir* 2011;79(5):458–63.
- [20] Magtibay PM, Friedman JA, Rao RD, Buckner JC, Cliby WA. Unusual presentation of adult metastatic peritoneal medulloblastoma associated with a ventriculoperitoneal shunt: a case study and review of the literature. *Neuro Oncol* 2003;5(3):217–20. doi:10.1215/S115285170200042X.
- [21] Aqamour R, Leknani M, Nasri S, Kamaoui I, Skiker I. Peritoneal metastasis of a cerebellar medulloblastoma through a ventriculoperitoneal shunt: a case report. *Radiol Case Rep* 2024;19(9):3610–12. doi:10.1016/j.radcr.2024.05.021.