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RESEARCH ARTICLE

RADIOTHERAPY IN ADULT MEDULLOBLASTOMA WITH SYNCHRONOUS DROP METASTASIS: A CASE REPORT

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Abstract

Background: Adult medulloblastoma is a rare, fast-growing cancerous tumor, and synchronous spinal metastasis at diagnosis represents an uncommon and high-risk presentation. Evidence guiding management in adults remains limited, with most therapeutic strategies extrapolated from pediatric protocols.

Case presentation: We report the case of a 24-year-old patient with medulloblastoma presenting with neuraxial dissemination at initial staging. Magnetic resonance imaging confirmed a posterior fossa mass with synchronous spinal drop metastasis.

Treatment and outcome: The patient underwent a multimodal therape utic approach centered on craniospinal irradiation. Radiotherapy was delivered to the entire neuraxis followed by targeted boosts to sites of macroscopic disease, using conformal techniques to ensure adequate coverage while respecting organ-at-risk constraints. Treatment was well tolerated and resulted in sustained complete remission at follow-up.

Conclusion: This case contributes to the limited body of literature addressing radiotherapeutic management of adult medulloblastoma with synchronous spinal metastasis and supports the pivotal role of modern craniospinal irradiation in achieving durable disease control. It also underscores the importance of systematic neuroaxis staging and individualized boost strategies in this rare adult presentation.

Introduction:-

Medulloblastoma is a malignant embryonal tumor of the cerebellum and represents the most common malignant brain tumor in children. In adults, its incidence is markedly lower, accounting for approximately 0.4–1% of primary intracranial neoplasms, with an estimated annual incidence of 0.5–0.6 per million [1,2]. Adult medulloblastoma differs from pediatric disease in epidemiology, molecular distribution, recurrence patterns, and therapeutic tolerance. According to the current World Health Organization classification, medulloblastoma is divided into four principal molecular subgroups: Wingless/Integrated (WNT)-activated, Sonic Hedgehog (SHH)-activated, Group three, and

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Group four [3]. In adults, tumors are predominantly SHH-activated and Group four, each characterized by distinct biological behavior and prognostic implications [4,5].Risk stratification is based on the extent of postoperative residual disease, histopathological features, and neuraxial dissemination according to the Chang staging system [6]. Additional adverse prognostic factors include large cell or anaplastic histology and chromosome 17q abnormalities [7–9]. International guidelines recommend a multimodal therapeutic approach combining maximal safe surgical resection, craniospinal irradiation, and platinum-based chemotherapy for patients with high-risk or metastatic disease [10,11]. However, synchronous spinal metastasis at diagnosis remains uncommon in adults and is insufficiently characterized in the literature. Most therapeutic recommendations are extrapolated from pediatric protocols or derived from retrospective adult series.Despite the recognized potential for cerebrospinal fluid dissemination, detailed reports focusing specifically on synchronous spinal metastasis in adults remain scarce, particularly regarding radiotherapeutic management strategies.Given the well-recognized propensity of medulloblastoma for cerebrospinal fluid dissemination, systematic craniospinal magnetic resonance imaging at initial diagnosis is essential. The aim of this report is to describe the diagnostic work-up, treatment strategy, and short-term outcome of an adult medulloblastoma presenting with synchronous spinal dissemination, emphasizing comprehensive staging and the role of conformal craniospinal irradiation combined with focal spinal boosting within a structured multimodal approach.

Case presentation:

A 24-year-old male was referred to our oncology center for adjuvant management following partial resection of a posterior fossa tumor. He reported several months of occipital headaches, gait imbalance, and progressive visual blurring, without vomiting or seizures. His medical history was unremarkable except for prior tobacco and cannabis use. Initial computed tomography revealed a left cerebellar mass associated with obstructive triventricular hydrocephalus and early tonsillar descent. Magnetic resonance imaging confirmed a 5 cm left cerebellar tentorial lesion initially suggestive of meningioma. A ventriculoperitoneal shunt was placed, followed by posterior fossa craniotomy achieving approximately 70% tumor resection. Postoperative brain and spine magnetic resonance imaging demonstrated residual vermian and left cerebellar tumor with persistent mass effect, as well as a T5 intradural drop metastasis (Figure 1). Three months later, the patient presented with an Eastern Cooperative Oncology Group performance status of zero, a normal neurological examination, preserved coordination and gait, and no cranial nerve deficits.Histopathological examination revealed a poorly differentiated small round blue cell tumor, and immunohistochemistry confirmed medulloblastoma, World Health Organization central nervous system grade four.

Figure 1: (a) Axial contrast-enhanced MRI of the brain demonstrating a left cerebellar tentorial mass and (b) Sagittal cranio-cervico-thoracic MRI demonstrating an intradural extramedullary drop metastasis at the T5 vertebral level (arrow).

MRI: magnetic resonance imaging:

The patient underwent radiotherapy simulation in the supine position using a five-point thermoplastic mask with knee and foot support. Planning computed tomography with 3 mm slice thickness was fused with pre treatment magnetic resonance imaging for target delineation. Target volumes included the entire craniospinal axis, the posterior fossa, and the T5 metastatic lesion. Treatment was delivered using three-dimensional conformal radiotherapy. Cranial irradiation was performed with parallel opposed lateral 6 MV photon beams, with collimator rotation to align cranial and superior spinal fields and minimize dose inhomogeneity at the cranio-cervical junction. The spinal axis was treated using two adjacent posterior 18 MV photon fields to account for the 7 centimeters tissue depth between the posterior skin surface and the spinal canal, thereby reducing entrance-dose hot spots. Field matching was achieved using two feathered junctions located at the cranio-cervical and dorsal-lumbar transitions to improve longitudinal dose homogeneity. The craniospinal phase delivered 36 Gy in 18 fractions. The posterior fossa boost increased the cumulative dose to 54 Gy. A focal boost of 7.2 Gy was delivered to the T5 lesion using a three-field arrangement consisting of one posterior beam and two oblique beams with dose weighting of 50% to the posterior beam and 25% to each oblique beam (Figure 2).

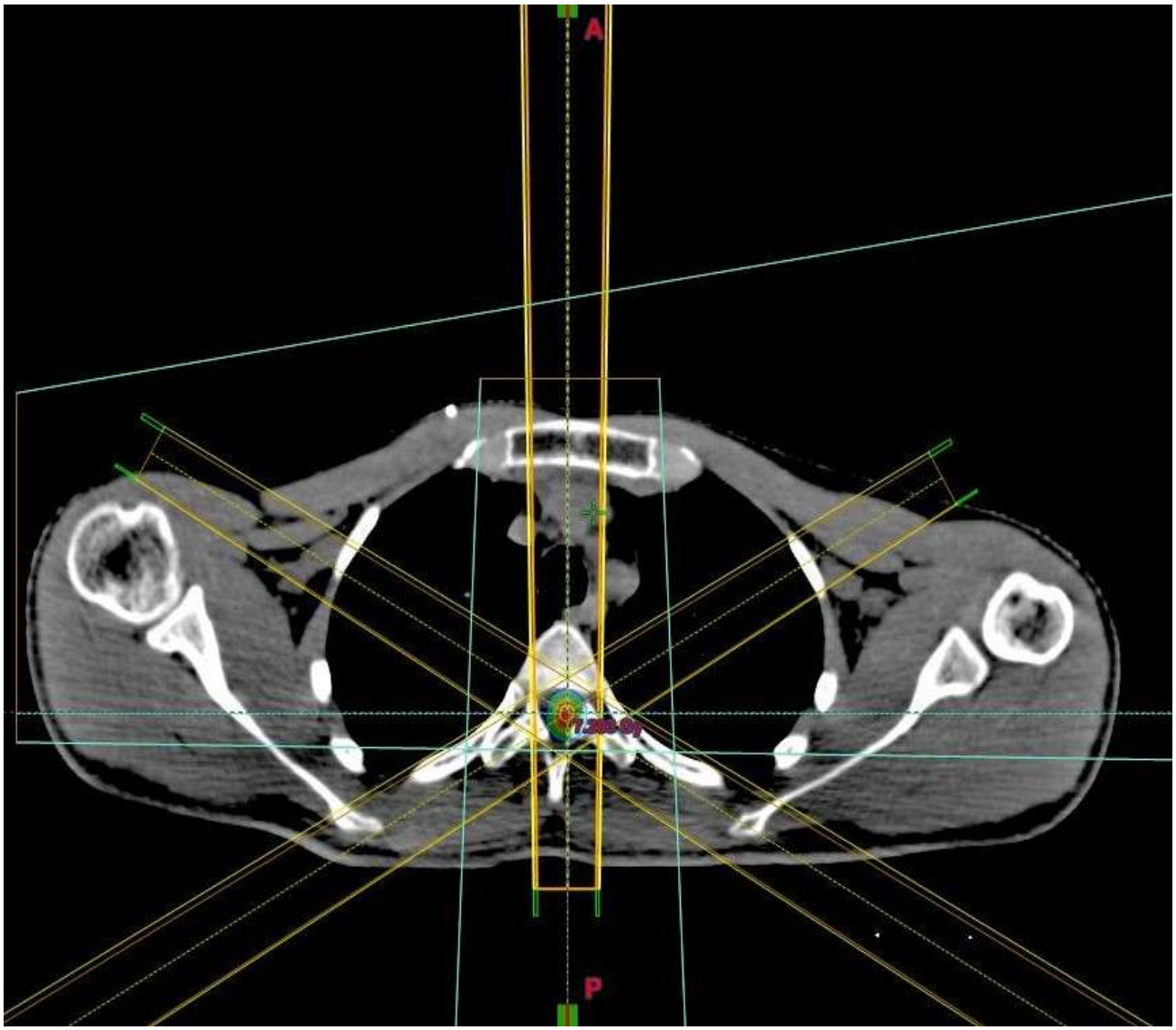

Figure 2: Axial treatment planning image demonstrating three-dimensional conformal radiotherapy boost to the T5 spinal metastasis, illustrating beam arrangement and dose distribution centered on the metastatic lesion.

Radiotherapy was completed without interruption. Acute toxicities were limited to grade one radiodermatitis over the dorsal spine, grade one esophagitis, and occipital-predominant alopecia. Following radiotherapy, the patient received six cycles of cisplatin at 75 mg/m² and etoposide at 100 mg/m² administered over three consecutive daysevery three weeks as adjuvant systemic therapy for high-risk metastatic disease. Chemotherapy was complicated by grade two vomiting, grade two mucositis, dysphagia to solids, odynophagia, and oropharyngeal candidiasis requiring brief hospitalization for supportive care, with subsequent clinical improvement.No grade ≥3 hematological toxicity was observed, and treatment was completed as planned.Post-treatment magnetic resonance imaging demonstrated a left cerebellar gliotic sequellar area without recurrent disease. At approximately 17 months following completion of radiotherapy, the patient remains clinically stable with no radiological evidence of local or metastatic recurrence.

Discussion:-

Spinal metastasis in adult medulloblastoma is an uncommon but clinically significant manifestation reflecting dissemination along cerebrospinal fluid pathways. Although medulloblastoma is the most frequent malignant brain tumor in children, metastatic behavior appears less common and more heterogeneous in adults. Published series estimate that approximately 10-20% of adults develop metastatic disease during the course of illness, whereas synchronous spinal involvement at diagnosis remains distinctly rare [1-4]. The most frequently reported pattern consists of intradural extramedullary drop metastases, although intramedullary and epidural presentations have also been described in isolated adult cases [12-15]. In our patient, spinal dissemination was detected at initial staging and was clinically asymptomatic, emphasizing the importance of systematic craniospinal magnetic resonance imaging even in the absence of spinal symptoms.

Clinical presentation in adult spinal metastasis is variable. Some patients experience axial pain, radiculopathy, or neurological deficits, particularly in epidural or intramedullary disease, while others remain asymptomatic, as observed in our case and in previously reported series [12-15]. Magnetic resonance imaging remains the most sensitive modality for detecting neuraxial dissemination and distinguishing leptomeningeal from parenchymal or epidural involvement. Baseline craniospinal imaging is therefore essential for accurate staging and therapeutic planning. Long-term surveillance is equally important, as delayed spinal relapses have been reported years after initial therapy [12].

Management of adult medulloblastoma relies on a multimodal strategy integrating surgery, craniospinal irradiation, and systemic chemotherapy [7-11]. Maximal safe resection constitutes the initial therapeutic step but does not eliminate the need for adjuvant treatment in metastatic cases [7-9]. Craniospinal irradiation remains the cornerstone of therapy because of the tumor's capacity for diffuse neuraxial spread. Standard adult regimens recommend 30-36 Gy to the entire neuraxis followed by a posterior fossa or tumor-bed boost to approximately 54-55.8 Gy. In our patient, 36 Gy craniospinal irradiation was delivered using a three-dimensional conformal technique with meticulous junction management and dosimetric verification to ensure homogeneous longitudinal coverage.

Several radiotherapy techniques are available. Conventional three-dimensional conformal craniospinal irradiation remains widely accessible and can achieve satisfactory dose distribution when careful geometric alignment is applied [16,17]. Advanced modalities such as intensity-modulated radiotherapy and volumetric modulated arc therapy may improve conformity but may increase integral dose exposure [17]. Proton craniospinal irradiation offers superior sparing of cardiac, thyroid, and gastrointestinal structures and may reduce long-term toxicity, although availability remains limited [18,19]. In our setting, conformal craniospinal irradiation provided adequate neuraxial coverage and was well tolerated, demonstrating that optimal disease control can be achieved even in the absence of advanced technologies when planning is rigorous.

The presence of macroscopic spinal metastasis requires additional therapeutic considerations. While surgery may be indicated in cases of spinal cord compression or diagnostic uncertainty, most reported adult spinal metastases are intradural and not amenable to surgical resection [13-15]. Radiotherapy therefore constitutes the primary local treatment modality. In addition to craniospinal irradiation, focal boosting of gross spinal disease is recommended within spinal cord tolerance limits to optimize local control. Our patient received an additional 7.2 Gy focal boost to the T5 lesion, consistent with accepted practice for isolated drop metastases. The sustained radiological response observed at 17 months supports the effectiveness of this combined craniospinal and focal boost approach.

Systemic platinum-based chemotherapy further enhances disease control in high-risk or metastatic adult patients [10,11]. In our case, adjuvant chemotherapy was administered following radiotherapy to address potential microscopic dissemination. Prognosis in adult medulloblastoma is influenced by metastatic status, extent of resection, histological subtype, molecular subgroup, and adherence to multimodal therapy [7-9]. Although molecular profiling was not available for our patient, the favorable clinical and radiological evolution highlights the potential benefit of comprehensive neuraxial irradiation combined with focal spinal boosting and systemic therapy.

Given the rarity of synchronous spinal metastasis in adults, continued reporting of detailed cases with explicit radiotherapeutic parameters is essential to strengthen the evidence base. Our case reinforces the pivotal role of carefully planned craniospinal irradiation and highlights the feasibility of achieving satisfactory neuraxial disease control using conformal techniques within a structured multimodal approach.

This report has several limitations. First, it describes a single clinical case, which limits the generalizability of the findings and precludes definitive conclusions regarding treatment efficacy. Second, molecular subgrouping was not performed due to limited local resources, although molecular classification is increasingly recognized as an important prognostic and therapeutic factor in adult medulloblastoma. Third, the follow-up duration of 17 months, while encouraging, remains relatively short to assess long-term disease control and late treatment-related toxicity. Larger studies with extended follow-up are needed to better define optimal management strategies in this rare adult presentation.

Conclusion:-

Adult medulloblastoma with synchronous spinal metastasis is rare and represents a diagnostically and therapeutically challenging presentation. This case underscores the importance of systematic craniospinal imaging at diagnosis and supports the role of multimodal management integrating craniospinal irradiation, focal spinal boosting, and adjuvant chemotherapy. The sustained remission achieved in our patient demonstrates that carefully planned three-dimensional conformal radiotherapy can provide effective neuraxial disease control. Continued reporting of similar adult cases is essential to refine evidence-based treatment strategies for this uncommon presentation.

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Conflict of Interest:

All authors declare that there are no conflicts of interest regarding the publication of this manuscript. The authors declare no competing financial or non-financial interests.

Ethical Approval:

Written informed consent was obtained from the patient for publication of this case report and accompanying images. According to institutional policy, ethical committee approval is not required for single case reports.

References:-

[1] Smoll NR, Drummond KJ. The incidence of medulloblastoma and primitive neuroectodermal tumours in adults and children. J Clin Neurosci. 2012;19(11):1541-1544. doi:10.1016/j.jocn.2012.04.009
[2] Smoll NR. Relative survival of childhood and adult medulloblastoma patients. Cancer. 2012;118(5):1313-1322. doi:10.1002/cncr.26379
[3] Louis DN, Perry A, Wesseling P, Brat DJ, Cree IA, Figarella-Branger D, et al. The 2021 WHO classification of tumors of the central nervous system: a summary. Neuro Oncol. 2021;23(8):1231-1251. doi:10.1093/neuonc/noab106
[4] Korshunov A, Remke M, Kool M, Hielscher T, Northcott PA, Williamson D, et al. Biological and clinical heterogeneity of adult medulloblastoma. J Clin Oncol. 2010;28(18):3054-3060. doi:10.1200/JCO.2009.27.1828
[5] Remke M, Hielscher T, Northcott PA, Witt H, Ryzhova M, Wittmann A, et al. Adult medulloblastoma comprises distinct molecular subgroups. J Clin Oncol. 2011;29(19):2717-2723. doi:10.1200/JCO.2011.34.9373
[6] Chang CH, Housepian EM, Herbert C Jr. An operative staging system and a megavoltage radiotherapeutic technic for cerebellar medulloblastomas. Radiology. 1969;93(6):1351-1359. doi:10.1148/93.6.1351

[7] Brandes AA, Franceschi E, Tosoni A, Blatt V, Ermani M, et al. Adult medulloblastoma: prognostic factors and treatment. Int J Radiat Oncol Biol Phys. 2003;57(3):755-761. doi:10.1016/S0360-3016(03)00612-9
[8] Ramaswamy V, Taylor MD. Medulloblastoma: from myth to molecular. J Clin Oncol. 2017;35(21):2355-2363. doi:10.1200/JCO.2017.72.7846
[9] Atalar B, Choi CYH, Harsh GR, Gibbs IC, Adler JR, Chang SD, et al. Adult medulloblastoma: treatment outcomes and prognostic factors. Radiother Oncol. 2018;127(1):96-102. doi:10.1016/j.radonc.2018.01.014
[10] National Comprehensive Cancer Network. Central nervous system cancers (version 2025) [Internet]. Plymouth Meeting (PA): NCCN; 2025 [cited 2026 Feb 1]. Availablefrom:https://www.nccn.org
[11] Rudà R, Reifenberger G, Frappaz D, Pfister SM, Laprie A, Santarius T, et al. EANO-EURACAN clinical practice guidelines for diagnosis, treatment and follow-up of post-pubertal and adult medulloblastoma. Lancet Oncol. 2021;22(10):e541-e554. doi:10.1016/S1470-2045(21)00422-2
[12] Wendland MM, Shrieve DC, Watson GA, Chin SS, Peterson K, et al. Adult medulloblastoma: patterns of failure following craniospinal irradiation. J Neurooncol. 2006;78(2):191-196. doi:10.1007/s11060-005-9093-4
[13] Goyal N, Kakkar A, Julka PK, Sharma MC, Suri V, et al. Spinal metastases in adult medulloblastoma: case report and literature review. World Neurosurg. 2018;111:266-271. doi:10.1016/j.wneu.2017.12.142
[14] Madhugiri VS, Moiyadi AV, Shetty P, Jalali R. Intradural spinal metastasis from adult medulloblastoma. Br J Neurosurg. 2012;26(2):278-280. doi:10.3109/02688697.2011.606038
[15] Kaya A, Ozgural O, Kahraman S, et al. Intramedullary spinal metastasis from adult medulloblastoma. Asian J Neurosurg. 2015;10(2):142-145. doi:10.4103/1793-5482.153508
[16] Parker W, Freeman CR. A simple technique for craniospinal radiotherapy. Med Dosim. 2006;31(2):110-118. doi:10.1016/j.meddos.2005.06.001
[17] Yoon M, Shin DH, Kim JH, et al. Craniospinal irradiation techniques: adosimetriccomparison. RadiatOncol J. 2016;34(1):1-9. doi:10.3857/roj.2016.34.1.1
[18] Brown AP, Barney CL, Grosshans DR, McAleer MF, de Groot JF, et al. Proton craniospinal irradiation reduces normal tissue exposurecomparedwith photon techniques. J Clin Oncol. 2013;31(14):1877-1883. doi:10.1200/JCO.2012.45.7716
[19] Eaton BR, Esiashvili N, Kim S, Weyman EA, Thornton LT, et al. Clinical outcomes among children with standard-risk medulloblastoma treated with proton and photon radiation therapy. Cancer. 2016;122(23):3730-3738. doi:10.1002/cncr.30254