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SUDDEN UNEXPECTED DEATH DUE TO CEREBELLAR ASTROCYTOMA (PILOCYTIC ASTROCYTOMA): AN AUTOPSY CASE*

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Summary

Tumors of the central nervous system are among the rare causes of sudden and unexpected deaths. This case report describes the sudden and unexpected death of an otherwise healthy, 22-year-old male soldier from cerebellar astrocytoma due to hemorrhage in affected cerebellar hemisphere. He was admitted to an emergency room with headache and vomiting, subsequently became unresponsive to external stimuli and spontaneous respiration ceased. Initial diagnosis was subarachnoidal hemorrhage and encephalitis. After being connected to life support unit in the intensive care unit he was diagnosed as a hematoma in right cerebellar hemisphere. In spite of all efforts in the intensive care unit he was accepted as dead in the third day of admittance.

Since he was under military service this case was accepted as forensic case and was sent to the Mortuary Department of Institute of Forensic Medicine of Turkey for autopsy. At autopsy there was no sign of trauma and other changes that might be responsible for death except for the hemorrhage in the right cerebellar hemisphere. Histological examination of the case revealed the diagnosis of cerebellar astrocytoma (pilocytic astrocytoma) and diffuse bleeding in the cerebellar tissue. We concluded that this hemorrhage in the cerebellum created pressure effect on the adjacent vital centers and was responsible for death. Although this tumor type is generally non-aggressive and slowly progressing, in this case it led to the bleeding within the tumor causing sudden unexpected death.

Key words: Cerebellar astrocytoma, sudden and unexpected death, autopsy

ANİ BEKLENMEDİK ÖLÜM SEBEBİ OLARAK PİLOSİTİK ASTROSİTOM: OLGU SUNUMU

Özet: Santral sinir sistemi tümörleri nadiren ani ve beklenmedik ölüm nedeni olurlar. Burada sunulan olgu, tamamen sağlıklı görünen ve bilinen yakınması bulunmayan 22 yaşında bir askerde serebellum içine kanama ile ani ölüme neden olmuş bir pilositik astrositom olgusudur. Acil servise kusma ve başağrısı yakınması ile başvuran olguda kısa süre içinde uyaranlara yanıtsızlık ve spontan solunumun durması ile koma gelişmiştir. Subaraknoid kanama ve ensefalit öntanıları düşünülen hastanın yoğun bakım izleminde sağ serebellar hematom tanısı konulmuştur. Yoğun bakımda uygulanan tüm destek tedavi girişimlerine rağmen olgu, hastaneye kabulün üçüncü gününde eks olarak kabul edilmiştir.

İzin dönüşünde meydana gelen bu ölüm olgusu, olgunun asker olması da dikkate alınarak adli nitelik kazanmış ve otopsi yapılmak üzere Adli Tıp Kurumu Başkanlığı Morg İhtisas Dairesi'ne gönderilmiştir. Otopside travmatik değişim saptanmayan olguda, sağ serebellar hemisferde hematom saptanmıştır. Histopatolojik incelemede ise serebellar astrositom (pilositik astrositom) ve serebellumda yaygın kanamai tespit edilmiştir. Bu tip tümörler genellikle yavaş seyirli, saldırgan olmayan tümörler olarak bilinmesine rağmen, bu olguda tümördeki kanama ani beklenmedik ölüm nedeni olarak karşımıza çıkmıştır.

Anahtar kelimeler: serebellar astrositom, ani beklenmedik ölüm, otopsi

Introduction

Gliomas, principally astrocytomas, account for the majority of intracranial neoplasms (1). Most neurosurgical and neuropathologic series reported the incidence of gliomas in as 40-45 % among all intracranial tumors (2).

These tumors originating from neuroectoderm are classified on the basis of the predominant cell type. Those showing predominance of astrocytes namely astrocytomas are the most diverse and complex group of glial tumors. Astrocytomas are generally classified as diffuse and circumscribed astrocytomas. Pilocytic astrocytoma belongs to the latter group and also known as pilocytic astrocytoma of the juvenile type. This type of astrocytoma may be found in the forms of cerebellar, infundibular and optic nerve glioma (1,2).

Pilocytic astrocytomas (juvenile pilocytic astrocytomas) are the tumors with very typical circumscription, distinctive histological pattern and almost always show biologically low grade. They occur most often in the cerebellum and known as “cerebellar astrocytoma” or “cystic astrocytoma”. For cerebellar ones if surgery is available in terms of accessibility, surgery generally results in cure. These lesions are growing very slowly and about 60 % of them are cystic. Mass effect seen in some of these tumors is mainly due to the cystic expansion (3,4).

In the relevant literature there are reports of sudden and unexpected death due to hemorrhage from occult central nervous system tumors. In one of these studies in a pediatric autopsy group the pathological diagnosis was cerebellar medulloblastoma in 1 of 10 cases whereas 1 was an optic chiasm astrocytoma (5).

In our case the reason of the sudden-unexpected death in young adult male was hemorrhage in the cerebellar astrocytoma and because of the rarity of this condition in this type of tumors we tried to emphasize this cause of sudden death.

Case

A 22-year-old man presented to an emergency room with headache and vomiting. There was no history of trauma, prior disease or seizures. In the first hospital he was admitted as provisional diagnosis was encephalitis and subarachnoidal hemorrhage. In a short while he became agitated and spontaneous respiration ceased. He was connected to mechanical ventilator and referred to another hospital. In this hospital computed tomography revealed the hemorrhage in right cerebellar hemisphere. Neurosurgeons accepted the case being inoperable and his follow up was continued in the intensive care unit. In the third day of admission he was accepted as dead and sent to the mortuary department of the Institute of Forensic Medicine of Turkey.

At autopsy, the most significant findings were within the brain and cerebellum. The fresh brain weighed 1370 gram and meningeal vessels were found to be prominent and whole surface of brain to be reddish-purple colored. When whole brain was serially sectioned, multiple areas of softening in consistency were detected. In cerebellar sections, hematoma filling the whole hemisphere was detected in the right hemisphere of the cerebellum (Figure 1).

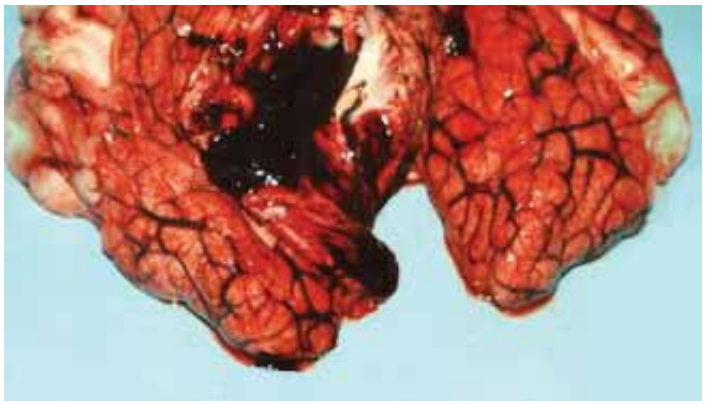

Figure 1. Hematoma filling the cerebellar hemisphere

Microscopic sections from brain and cerebellum showed severe hyperemia. In cerebellar sections, biphasic tumor composed mainly of cells having small round nuclei, medium-width cytoplasm and spindle- like cells forming short bundles was detected. In this biphasic tumor, scarce microcystic areas were also determined. In some of tumor cells pleomorphism and hyperchromasia were prominent. Some of the cells bearing small and eccentric nuclei, in where some thereby forming multinucleate giant cells. No Rosenthal fibers, but a few eosinophilic granular bodies were detected. No mitotic figure was detected. It was determined that the tumor was showing invasion to cerebellar parenchyma and subarachnoidal space as a thin zone adjacent the main mass. It was diagnosed as a pilocytic astrocytoma (cerebellar astrocytoma) (Figure 2, 3, 4). In a thorough microscopic examination of other organs, there was no significant change that could explain the death cause otherwise.

In toxicological analysis carried on the samples obtained during autopsy (internal organs, blood and urine) no toxic substance was detected.

Based on the findings of autopsy and histopathologic findings the diagnosis of primary cerebellar astrocytoma (pilocytic astrocytoma) was made. The cause of death was certified as astrocytoma of the cerebellum and the manner of that as natural. Absence of traumatic and toxicologic findings supported the natural death manner. Hemorrhage in the cerebellar hemisphere was thought to be responsible for death via mass effect.

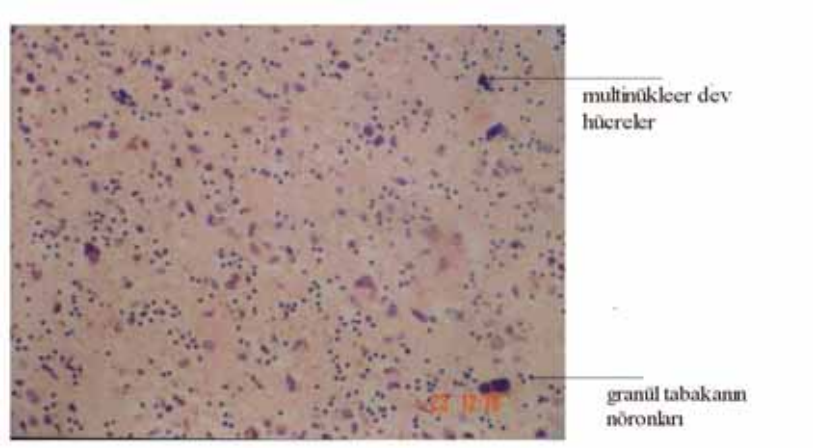

Figure 2. Pilocytic astrocytoma showing invasion to the molecular and granule layers of cerebellum (HE, X 200).

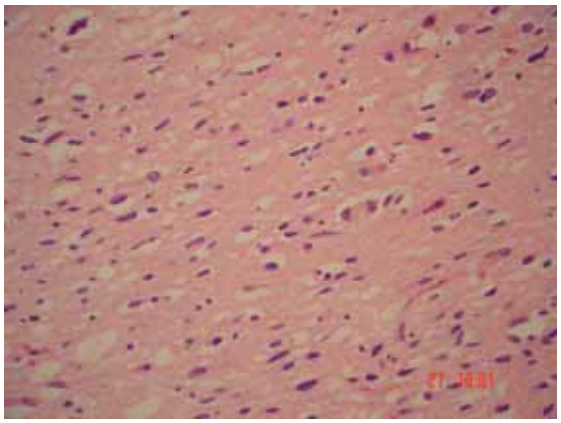

Figure 3. Pilocytic astrocytoma (HE X 200)

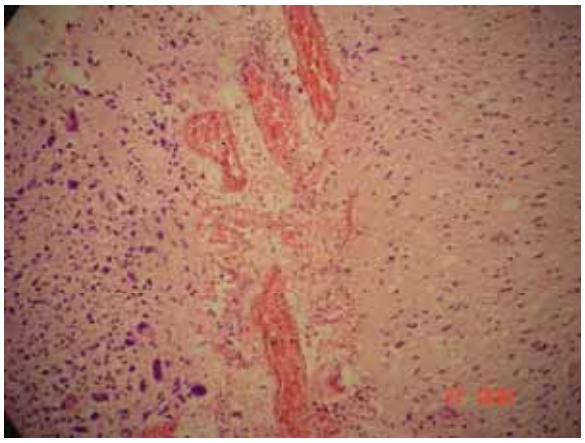

Figure 4. Infiltration of tumor in subarachnoidal space (HE X 200)

Discussion

Juvenile pilocytic astrocytomas occur more often in children and young adults. They are the most common astrocytic tumors in children, accounting for 80-85 % of cerebellar astrocytomas and 60 % of optic gliomas. These types of astrocytomas usually arise from cerebellum, brainstem, hypothalamic region, optic pathways. Cerebellum is the most common site of occurrence of juvenile pilocytic astrocytoma (6).

Headache, nausea, vomiting, irritability, ataxia and visual disturbances are the most common presenting symptoms and these are generally associated with increased intracranial pressure due to mass effect or hydrocephalus.

Etiologic factors of these tumors are unknown and malignant transformation of these tumors is reported to be rare (7). The incidence rate of these tumors in both sexes is equal. Peak incidence is 5-14 years and it is reported that age affects the clinical course of the disease especially in the cases of optic nerve gliomas. Juvenile pilocytic astrocytomas generally have better prognosis than most of other astrocytomas. 10-year survival rate is reported to be as high as 90 % if surgical resection is possible. It was reported that disease-free survival rates of cerebellar astrocytomas in childhood cases being 92 %, 88 % and 88 % for 5, 10 and 15 years respectively (2). Morbidity of these tumors depends on the location of tumor and associated complications of resection.

Intracranial tumors are rare causes of sudden unexpected death in forensic pathology. The incidence was between 0.17 % and 0.54 % in several series of forensic autopsies (8,9). Undiagnosed brain tumors leading to sudden death were reported to be low-grade astrocytomas and other rare

intraventricular tumors. Lindboe reported two cases of undiagnosed gliomas resulted in sudden death (10). At autopsies of these two cases low-grade astrocytoma in the right subthalamic area and oligodendroglioma in the left temporal lobe were detected. In these two cases the cause of sudden death was attributed to these tumors either directly or indirectly.

Opeskin reported a sudden death case of 20-year-old woman presented with neurologic symptoms (11). Symptoms were present untill the age of 11 months but the tumor remained clinically undiagnosed. Autopsy of this case revealed the diagnosis of brainstem glioma. Matsumoto presented a case of sudden death in a 20-year-old male resulting from intratumoral hemorrhage in a glioblastoma (12).

In a study of posterior fossa tumors, Gleckman reported sudden unexpected death in 2 cases (13). In one of these cases the necroscopic diagnosis was ganglioglioma that infiltrated nearly the entire medulla and in the second case was a pilocytic astrocytoma arising from the ventral cerebellum and extending into the fourth ventricle and compressing the brain stem.

In a study of sudden unexpected deaths due to primary intracranial neoplasms, 19 deaths due to unsuspected primary intracranial neoplasm were reported of the total 10, 995 medico-legal autopsies (9). Nine (47.4 %) of these tumors were in the astrocytoma-glioblastoma category and sudden onset of unconsciousness was the leading symptom in six cases. In five of these six cases there were no known preceding symptoms. In our case also there was no history of known preceding disease and he was an almost healthy soldier. Sudden onset of symptoms such as headache and vomiting, he became unconscious rapidly. The provisional diagnosis was a right cerebellar hematoma. At autopsy, a diffuse hemorrhage in the right cerebellar hemisphere was found. Histopathologic examination revealed the diagnosis of pilocytic astrocytoma accompanied by an intratumor hemorrhage.

Although it is well known that pilocytic astrocytomas are well circumscribed and slowly growing tumors, parenchymal invasion in a narrow zone around the tumor or subarachnoidal invasion was also been reported (10). Likewise, tumoral invasion in subarachnoidal space and in molecular and granuler layers was detected in our case. Incidence of characteristic features like microcystic component, eosinophilic bodies and Rosenthal fibers is decreasing with increasing age and detection of pleomorphism and hyperchromasia in some of cell groups is possible. In these cases, hyperchromasia and pleomorphism are considered as the findings of aging of the tumor (10, 11). Mitosis in these tumors was reported to be seen very rarely in the literature, and in our case also there was no mitotic figure.

In spite of the fact that pilocytic astrocytomas have better prognosis than other astrocytic tumors and grow very slowly, they can be the cause of sudden death due to hemorrhage into the tumor (12,14). Detailed macroscopic and microscopic evaluation in this case revealed the diagnosis of pilocytic astrocytoma of the cerebellum and hemorrhage in the right cerebellar hemisphere. Sudden, unexpected death in this case was thought to be due to mass effect of the intratumoral hemorrhage to the surrounding vital centers and sudden increase in intracranial pressure.

In conclusion, in sudden and unexpected death of young cases spontaneous hemorrhage in undiagnosed tumors of the central nervous system must also be taken into consideration

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