CASE REPORT

RJME
Romanian Journal of Morphology & Embryology
http://www.rjme.ro/

Subdural hematoma – a cause of death in the development of a prostatic adenocarcinoma with dural metastases: case report

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Abstract

Non-traumatic subdural hematoma secondary to dural metastases is a rare complication. Dural metastases from a prostate adenocarcinoma occur in the advanced stages of this pathology and may sometimes be the first manifestation of a prostate carcinoma. Less than 40 cases of subdural hematoma are reported in the literature as a consequence of dural metastases from a prostate adenocarcinoma. The authors present the case of a male patient diagnosed with stage IV prostate adenocarcinoma with bone metastasis, who is admitted for left hemisphere subdural hematoma with right hemiparesis. The evolution of the patient is unfavorable, and the autopsy shows dural metastases and a collection of subdural coagulated blood. The chronic subdural hematoma with re-bleeding is a rare cause of death in the development of a prostate adenocarcinoma.

***Keywords*:** subdural hematoma, prostate adenocarcinoma, metastases, death.

Introduction

Non-traumatic subdural hematoma secondary to dural metastases as a consequence of a prostate adenocarcinoma is a rare complication. Dural metastases from a prostate adenocarcinoma occur in the advanced stages of this condition and may sometimes be its first manifestation. The first case of prostate dural metastases was reported in 1981 and the literature reports only a few cases [1].

The subdural hematoma occurs by stretching and breaking of Santorini emissary veins, which drain the venous blood from the surface of the cerebral hemispheres into the dural venous sinuses. Subdural hematoma may be acute, subacute or chronic. Acute and subacute subdural hematoma is usually associated with traumatic lesions and is clinically manifested up to 72 hours after the traumatic moment, respectively between three days and 2–3 weeks after the injury. In contrast, chronic subdural hematomas, although may be the result of traumatic lesions, also occur in pathological conditions, with the potential to cause visceral bleeding, including at the cerebral level; chronic subdural hematomas are clinically manifested starting from the third week after their formation [2]. In the elderly, clinical symptomatology of the subdural hematoma can occur with a delay of days–weeks. Symptomatology may be absent in the case of slow bleeding, even in the case of a chronic voluminous subdural hematoma.

The organization of the subdural hematoma is a long-lasting process, which starts with the exceeding of the dural capacity of absorption of the blood. Approximately 24 hours after the formation of the subdural hematoma, a fibrin network is laying down on the dura mater adjacent to it. Up to eight days after the formation of the hematoma, a membrane with 12–14 cell layers appears, and after 3–4 weeks, the hematoma is covered with a fibrous tissue membrane, its nanocapillaries being the source of internal bleeding [3].

In some patients, the symptomatology do not occur for several weeks or months after the onset of the subdural bleeding, resulting in the formation of a chronic subdural hematoma. Thus, instead of resorbing the subdural hematoma, by organization, the subdural blood collection increases in size. This process of enlargement of the chronic subdural hematoma, the end result of a vicious circle of re-bleeding and hyperfibrinolysis, continues until it can produce clinical signs that allow to diagnose the condition. The persons with a predisposition to developing a chronic non-traumatic subdural hematoma are children less than 6 months old and the elderly; both age groups have cranial spaces that allow the slow accumulation of large amounts of blood [4].

The aim of this study is to report a rare case of death due to a subdural hematoma, secondary to dural metastases in a patient with prostate adenocarcinoma. The medical literature reported less than 40 cases of subdural hematoma, secondary to dural metastasis coming from a tumor, of which only four cases of non-traumatic subdural hematoma secondary to dural metastases coming from a prostate adenocarcinoma [5].

The present case has multiple particularities. The first is the presence of dural metastases coming from a prostate

adenocarcinoma, notably being the fact that the natural history and many aspects of the mechanism for distant metastases are poorly understood. The second particularity of the case is the rarity of this pathology in the medical literature. And, finally, the cause of death of the patient – death due to a non-traumatic subdural hematoma, which is an uncommon cause of death.

Case presentation

The authors present the case of a 59-year-old male, diagnosed two years before with stage IV prostate adenocarcinoma, with metastases located in the lumbar spine and pelvic bones. A magnetic resonance imaging (MRI) examination performed one month after diagnosis reveals osteoconcentrated secondary bone lesions, a tumor mass enlarged in the spinal canal L2, with a slightly compressive effect on the medullar sac. In April 2016, because of a persistent headache, the patient was admitted in a neurosurgery clinic. The admission diagnosis was "left hemisphere chronic subdural hematoma, right hemiplegia, stage IV prostate adenocarcinoma with bone metastases, anemia, thrombocytopenia, coagulation disorders, upper digestive bleeding". A cranio-cerebral computed tomography (CT) was performed to confirm the diagnosis of left hemisphere chronic subdural hematoma, with a maximum thickness of 15–16 mm. The surgical intervention, left craniectomy and drainage was necessary for removing the hematoma. The evolution of the patient was unfavorable, being orotracheally intubated and mechanically ventilated, with active bleeding in the mouth. The following day, after the surgical intervention, a cranio-cerebral CT was performed to reveal the presence of the left hemisphere subdural hematoma, with a thickness at that time of 9.5 mm and a right hemisphere hygroma of 8.4 mm. The evolution of the patient was unfavorable, and the death occurs the 10^{th} day after the surgical intervention.

At the autopsy, corpse with normal constitution. At the external examination, we identified epicranial surgical incision, of 5 cm, sutured located on the left parieto-temporal region. The internal examination reveals a left parietal craniectomy hole of 2.5 cm in diameter; free extradural space; in the subdural space, there was a collection of reddish-black coagulated blood located in the left hemisphere; the dura mater sectioned corresponding to the craniectomy hole shows, on the internal face, multiple sessile formations of semi-hard consistency, with variable dimensions (the largest of 3/2 cm, the smallest of 1/0.5 cm), which protrudes endocranially (dural metastases) (Figures 1 and 2); the inner lip of the calotte presents numerous reddish-yellowish-white areas, slightly protruding endocranially; the base of the cranium, on the anterior and middle area, highlights multiple whitish areas that contrast with the normal bone tissue; they have an increased consistency at palpation and are diffusely disseminated (bone metastases) (Figure 3). At the opening of the abdominal cavity, there was a large amount of serous citrine fluid in the peritoneal cavity (6000 mL); the liver has a mottled, hard appearance at palpation, with multiple whitish areas. The bladder shows the deletion of the characteristic structure, and the enlarged prostate with the modification of the normal structure and the presence of numerous semi-hard, whitish formations alternating with the characteristic structure of the prostatic tissue.

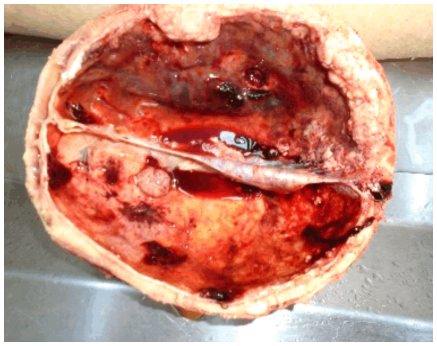

Figure 1 – ***Cranial calotte with dura mater, structure which highlight multiple sessile formations of semi-hard consistency with variable dimensions and colors.***

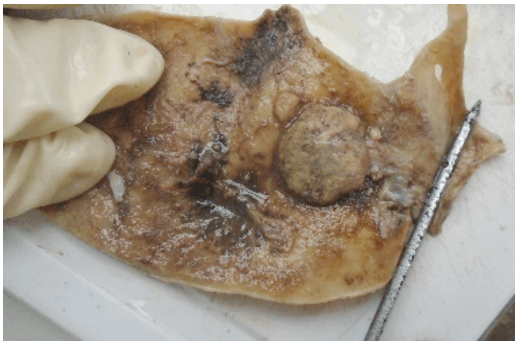

Figure 2 – ***Fragment of dura mater after 10% formalin fixation, with tumoral sessile mass which protrudes inside of subdural space.***

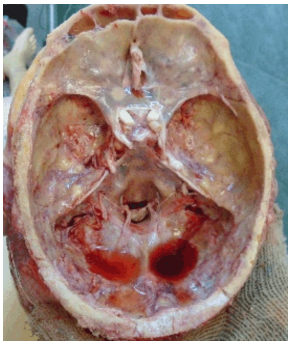

Figure 3 – ***The base of the cranium highlights multiple whitish areas, disseminated on the anterior and middle area that contrast with the normal bone tissue.***

The anatomopathological examination revealed the chronic subdural hematoma with re-bleeding and metastatic carcinoma implants at the level of the dura mater (Figures 4a, 4c and 5a), indicating the presence of an appearance of subdural bleeding (Figure 4b), associated with a fibrin network, delimited by grain tissue with numerous siderophages, also the presence of numerous tumors, with a slightly differentiated appearance of carcinoma, with central areas of tumor necrosis and multiple tumor emboli (Figure 5b); the microscopic prostate tissue sample presents areas of intense stromal fibrosis, moderate inflammatory infiltrate and irregular hyperplastic glands with moderate dysplasia and obvious Robin sympexions (Figure 6a), and also areas of moderately differentiated adenocarcinoma (Figure 6b).

The death of the above-mentioned patient was due to the chronic subdural hematoma, with re-bleeding formed on the background of the carcinomatous dural and bone metastasis within a stage IV prostate adenocarcinoma.

Discussion

Prostate adenocarcinoma, a third-age-specific tumor with an average age of 72 years, is the most common

type of tumor in the male gender [6]. The clinical evolution of the prostate adenocarcinoma is very variable: the tumor may be of a small grade and clinically silent, or aggressive and advanced at the time of diagnosis. The prostate cancer tends to metastasize in the pelvic and retroperitoneal lymph nodes, as well as in the liver, bones, lung; less characteristic is the metastasis in the central nervous system (CNS) [7, 8]. The particularity is the affinity of bone metastases in the spine and pelvis through a retrograde venous pathway as described by Batson, in 1940 [9]. While the metastatic vertebral disease and the subsequent compression of the spinal cord are common, the metastases affecting the rest of the CNS is rare. Cerebral metastases have an incidence of between 0.83% and 4% of all the cases of prostate cancer, and the dural involvement is even rarer, not often reported in the literature [10].

The mechanism by which the dural metastases are formed during the development of prostate cancer is controversial. The literature mentions that the prostate adenocarcinoma develops the most commonly cranial metastases. Thus, starting from cranial metastases, tumor cells get in the dura by invading the subdural/dural veins. The specialty studies show the importance of vertebral veins in the process of dissemination of the metastases. Starting from the prostate adenocarcinoma, the tumor cells through the plexiform branches infiltrate the sacrum, ascend to the lumbar spine, from where they are distributed through the venous circulation in all the organs [11].

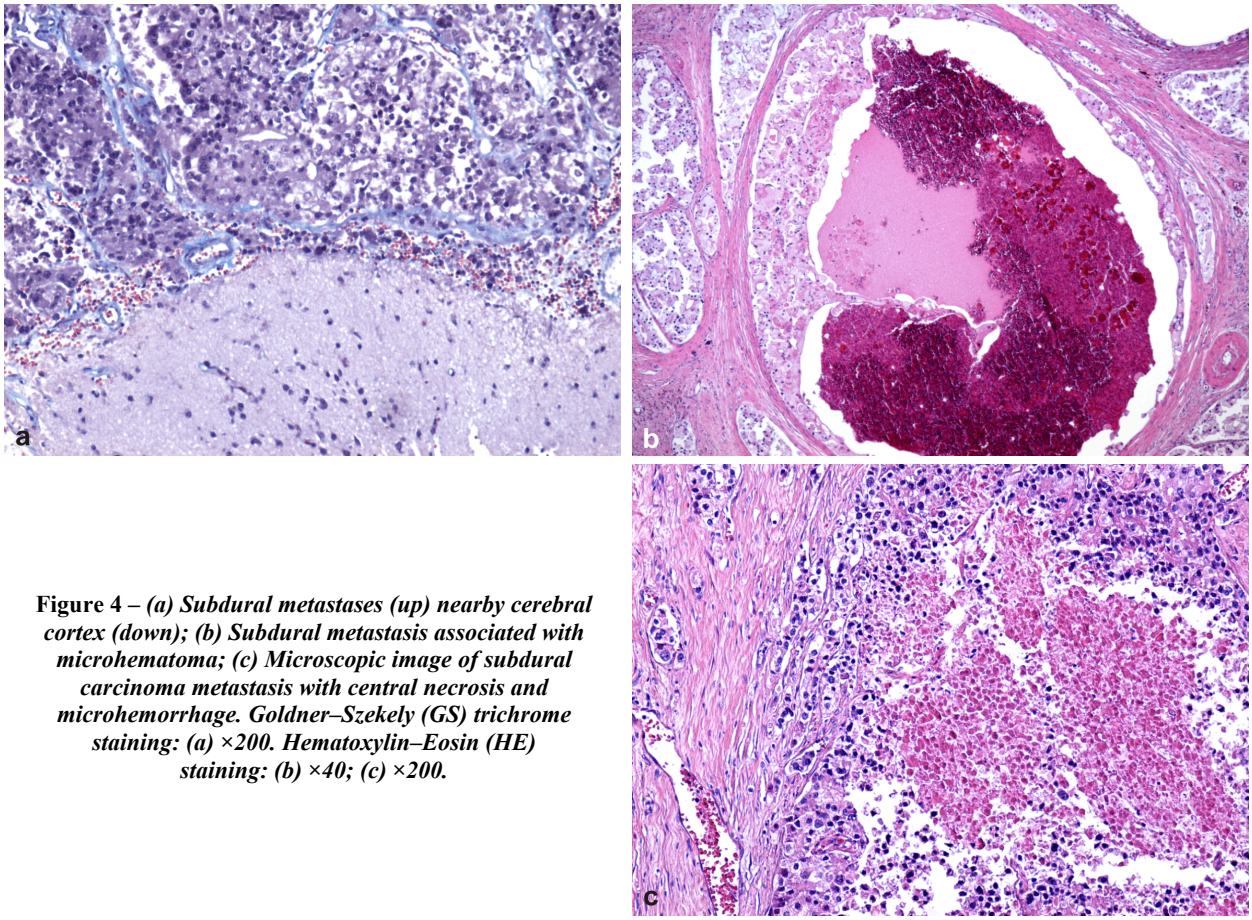

Figure 4 – *(a) Subdural metastases (up) nearby cerebral cortex (down); (b) Subdural metastasis associated with microhematoma; (c) Microscopic image of subdural carcinoma metastasis with central necrosis and microhemorrhage. Goldner–Szekely (GS) trichrome staining: (a) ×200. Hematoxylin–Eosin (HE) staining: (b) ×40; (c) ×200.*

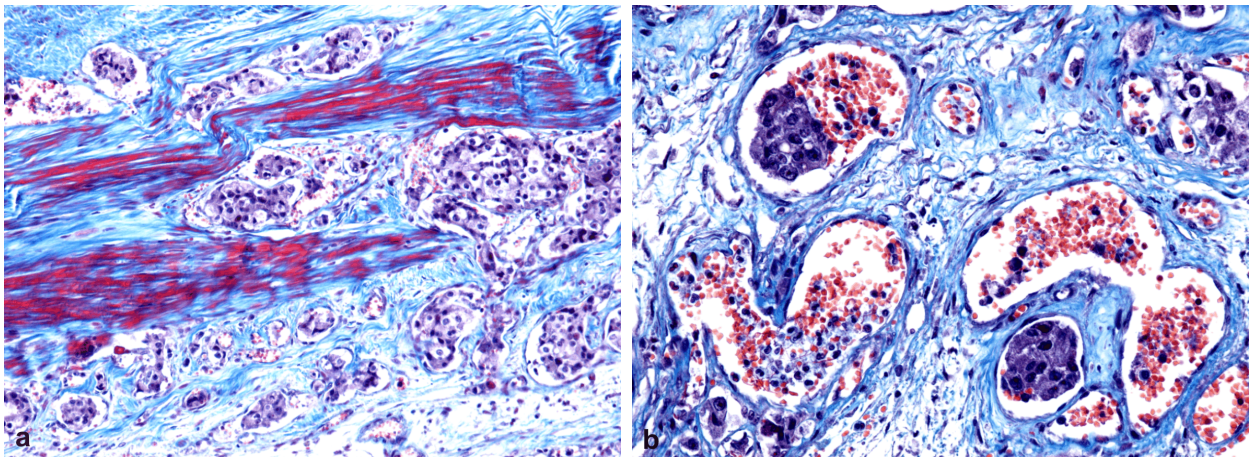

Figure 5 – *(a) Multiple areas of dural carcinoma metastasis, which dissociates the connective fibers of dura mater; (b) Multiple tumor emboli present in the dura mater angiogenesis vessels. GS trichrome staining: (a) ×100; (b) ×200.*

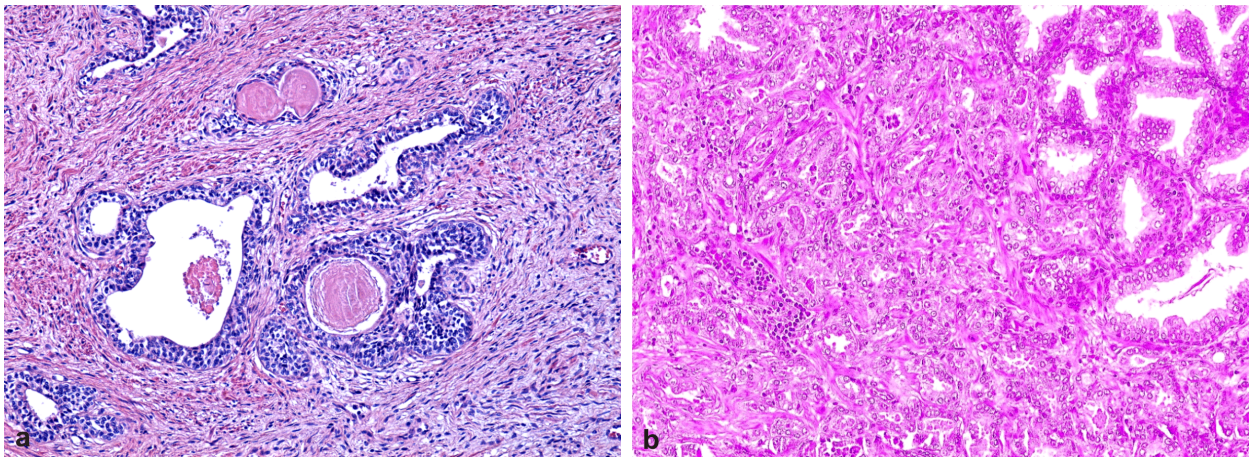

Figure 6 – ***(a) Image of prostatic tissue with areas of intense stromal fibrosis, moderate inflammatory infiltrate and irregular hyperplastic glands with moderate dysplasia and obvious Robin sympexions; (b) Malignant proliferation with Gleason 4B pattern, with fused glands, invading an area of benign nodular hyperplasia. HE staining: (a) ×100; (b) ×200.***

The vertebral veins are tributary to the meningo-rachidian veins. The vertebral part of the venous network is composed of thin-walled vessels that, when empty of blood, are difficult to identify. Gilbert Breschet was the first author to fully appreciate the complexity and inter-relation of the veins of the cranium with those of the spine. At the cranial and cervical level, the venous network does not have valves except at the place of shedding of the internal jugular veins. At the cranial level, the venous network of the cerebral hemispheres, the veins of the meninges and the diploid veins anastomose in a rich network. This explains why a primary tumor, at any level of the human body, can metastasize at the cerebral level.

The serious complications of prostate adenocarcinoma include the ones treated by neurosurgery. A percentage of 15–30% of the complications is represented by the metastases formed by the prostatic tumor cells that disseminate through the Batson plexus in the spine and later at the cerebral level. Subsequent to the formation of the dural metastases, super complications of these ones occur, and they are represented by the chronic subdural hematomas. The specialty literature reports less than 40 such cases of chronic subdural hematoma, secondary to the dural metastases coming from a tumor, representing 15–40%; only four cases of this percentage are represented by non-traumatic subdural hematoma secondary to the dural metastases coming from a prostate adenocarcinoma [12].

The etiology of chronic subdural hematomas is generally represented by the re-bleeding in the sinusoid vessels with thin walls of the neo-membrane formed around the acute subdural hematoma during resorption. Another etiology of the formation of subdural hematoma in the pre-existing conditions of the prostate adeno-carcinoma is represented by coagulation disorders, which are consistently present in neoplastic patients. According to the specialty literature, in case of the presence of dural metastases, the mechanism of formation of the subdural hematoma is represented by three situations: (*i*) breaking of the neoformation vessels in the dural metastasis, which are fragile; (*ii*) mechanical obstruction of the dural veins and dilation of the upstream capillary vessels; (*iii*) hemorrhagic diffusion in the metastatic lesions as a consequence of an angiodesmoplastic reaction to the metastatic invasion [13].

In the diagnosis of the prostate adenocarcinoma and implicitly of its complications, imaging methods are important. Subdural hematoma is most commonly diag-nosed by performing a cerebral CT. For the imaging diagnosis of the dural lesions, the cerebral CT with contrast agent has been shown to be beneficial, but in the presence of subdural hematomas, the diagnosis of dural metastases becomes difficult. The method of choice in identifying the dural metastases is represented by the nuclear MRI, and enhanced by the use of contrast agent, a method that is useful in establishing the morphology and the subsequent surgical therapy, the spreading and the percentage of resectability; it is also able to differentiate the lepto-meningeal involvement. The specialty literature notes that it is difficult to differentiate the dural metastases from meningioma by MRI examination, indicating new techniques, such as magnetic resonance spectroscopy [14]. For the definitive diagnosis, it is preferred the biopsy during surgery and the histological examination, but most of the dural metastases are identified during autopsy.

The prognosis of patients developing dural meta-stases is reserved, especially under the conditions of the development of subdural blood collections. The optimal management of dural metastases is still unclear, however, there seems to be a clear consensus that the surgical evacuation of subdural collections is advantageous. Some authors support the resection of the dural metastases. The obtained benefit should be balanced, by assessing the risk of surgical mortality, given that the patients in question have an advanced malignant disease, with limited life expectancy [15, 16].

Conclusions

The dural metastases of the prostate adenocarcinoma represent rare neurosurgical complications that may become acute by forming subdural hematoma. The latter represent most often the first symptomatology of the oncological patient who was diagnosed in an advanced stage, whose evolution is unfavorable. Thus, the ante-mortem diagnosis of dural metastases masked mostly by

the subdural hematomas is difficult, the autopsy being the method of highlighting them and implicitly the cause of death. The correct evaluation of the oncological patient with prostate adenocarcinoma and his pluridisciplinary investigation would stop the occurrence and the evolution of dural metastases and would reduce the risk of the secondary development of subdural hematomas.

Conflict of interests

The authors declare that they have no conflict of interests.

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Received: April 28, 2017

Accepted: February 19, 2018