A contemporary and a historical patient with an ectopic meningioma

A contemporary and a historical Patient with an ectopic Meningioma

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ABSTRACT

INTRODUCTION: Ectopic meningiomas are rare tumors which can be encountered by all surgical specialties.

PATIENTS AND METHODS: We report on two different cases, a contemporary one and a historical one, highlighting the diversity of clinical presentations and prognoses of these lesions. Furthermore epidemiological aspects, clinical features, and diagnostic and therapeutic work-up in patients with an ectopic meningioma are reviewed.

RESULTS: Typically, ectopic meningiomas present as gradually expanding lesions, causing a variety of symptoms by their mass effect. Diagnosis is based on histological characteristics, which are similar to those of intracranial meningiomas. Treatment is primarily surgical.

CONCLUSION: The cases we report are at different ends of the clinical and prognostic spectrum. Therapeutic options for different clinical scenarios are discussed.

CASE REPORTS

Anno 2017. A 7-year old child is referred to the plastic surgery department with a small, painless swelling on the scalp, which causes no symptoms but is mainly aesthetically disturbing. It was already present at birth and has gradually increased in size. On examination a homogeneous, firm mass on the vertex is seen, with a maximum diameter of 1,5cm, covered by normal scalp. There is no lymphadenopathy in the head and neck region. The past medical history is unremarkable. The initial differential diagnosis includes an adnexal tumor or epidermal inclusion cyst. Echography shows a more or less nodular, inhomogeneous, nonvascularized structure with blurred contours in the subcutis, and not adjacent to the skull. The lesion is surgically removed.

Microscopy (figure 1) shows an unclearly defined tumor in the dermis, consisting of a pleomorphic population of spindle cells with indistinct boundaries, organized in vague clusters and whorls. Several intranuclear pseudo-inclusions as well as psammoma bodies and thick bundles of collagen are present. There are few mitotic figures and there is no cytonuclear atypia. Immunohistochemical staining shows positivity for Epithelial Membrane Antigen (EMA) and for progesterone receptor; the lesion is immunonegative for CD6,

NKI/C3, NSE and somatostatin.

Based on these findings the uncommon diagnosis of cutaneous ectopic meningioma (WHO type I) is made.

Microscopically, surgical margins are not clear and a re-excision is performed. The postoperative recovery of our patient is uncomplicated and a MRI, performed to exclude an intracranial component of the tumor showed nonspecific postoperative changes.

Anno 1730. The first case report of an ectopic meningioma was published by Johannes Salzmann (1), professor in anatomy and surgery and also librarian at the university of Strasbourg. He had performed a forensic autopsy on a patient who had died in suspicious circumstances after a seizure. The autopsy revealed a large tumor at the left fronto-parietal side of the skull with an intra- and an extracranial part, but without involvement of the dura mater (figure 2). The original report, written in Latin, gives a unique insight in the natural history of an untreated ectopic (probably calvarial) meningioma–and in the clinical practices of that time. Salzmann meticulously reconstructed the course of illness of the patient in the last four years of his life (2). 'A locksmith of about 43 years old with a sanguine-melancholic temperament and a lean physique who was consuming quite a lot of alcohol, was suddenly hit, in June 1723, by heavy chest-pain and impulses to vomit, and shortly thereafter also by severe headaches and chills throughout his body. These symptoms disappeared immediately once he had taken a vomitive and sal volatile, which re-enabled him to perform his duties properly. He indeed remained in that condition for an entire year, until, in July of the following year, he was struck by a similar headache and repeated bilious vomiting, after he had gotten into an argument with his wife and had become quite angry. Again this passed after the administration of the remedies. Later, forced to lead an inevitably irregular life, and not erroneously concerned about his wife's faithfulness, since she was seeing other men, he adopted a vile way of life himself and not only did he drink heavily, as he was already used to do, but he also indulged in illicit, covert sexual practices. As a result he contracted gonorrhoea and an inflamed exulceration of his penis. Due to an inopportune sense of shame – which he had not felt before, however – he hid that from his doctor and made the issue even worse by applying various remedies without distinction. Anyhow, in the end he was healed again by a surgeon whose help he had been forced to invoke and this way he kept himself well during a trimester, while he had time off from work and took care of his household, except that in his actions he no longer exhibited his usual strength. After that period, he was repeatedly hit by

very severe, sudden headaches. When he abandoned his anvil a third time, he suddenly began to dizzy and fell to the ground moaning the name of Jesus.

Members of his family who hastened to him and found him all stiff and cold begged Mr. D. von Lindern, who by a happy coincidence came along, for help. When he saw that the patient had lost consciousness and that his limbs were cold, albeit without having breathing difficulty, he immediately ordered to perform a phlebotomy, to hold a stimulant under his nose and to apply a rather sharp clyster. After these remedies had been applied, he woke up again within six hours, regained his consciousness and asked with clear voice who had awakened him. The following days he felt better. However, he complained about swallowing difficulties and a burning sensation around the glans of his penis. On the basis of these and also of other symptoms, the aforementioned physician had the strong suspicion that the patient was infected with the venereal disease (syphilis) and that his repeatedly recurrent headache was due to it; therefore, he called upon mercury and subjugated him to a salivation cure with euphorbia. This made him recover his previous health (or so it seemed) and he lived immune to the abovementioned symptoms until the middle of March 1727, when, after he had been offered a cup at someone else's house and drank it, he experienced heavy torments in his abdomen and passed away a few hours later, suffering convulsions.'

Salzmann concludes that, in retrospect, all symptoms of the man (headaches, nausea, dizziness, seizures) could easily be explained by pressure effects of the tumor on the patient's brain tissue. Whether he even attributed the observed personality changes–the heavy drinking and the adoption of a libertine lifestyle - to the tumor, is unclear.

DISCUSSION

Ectopic meningiomas are a rare finding with a broad spectrum of clinical presentations. They have been described in a variety of locations (3-16), most commonly (~90%) in the head and neck region. In order of frequency they have been reported in the calvarium, paranasal sinuses/ nasal cavity, orbit, middle ear/external auditory canal, scalp, neck, mandible, maxilla, infratemporal fossa, and oropharynx. Occasionally they are found in the lungs, paraspinal region, extremities (shoulder, elbow, finger, foot), retriperitoneum, and mediastinum.

Based on a limited number of observations the incidence of these tumors seems to be bimodal with a first peak in the second decade of life and a second peak during the fifth to seventh decade (3-5) .

The definition and nomenclature of ectopic meningiomas are not unequivocal. Classification

of a meningioma as 'ectopic' is not always straightforward; for some locations, the distinction between a primary intradural or a primary extradural form can be subtle (6). Moreover, most likely some cases from the pre-CT/MRI era may have been misclassified by lack of knowledge of an eventual intracranial origin (3). Next to ectopic these tumors have been referred to as extradural, extracranial, extraneuraxial, or, depending on the location, as cutaneous, calvarial, intraosseous or intradiploic (3,5).

Clinical presentation

Signs and symptoms are diverse and depend on the size and location of the tumor. In most of the reported cases symptoms were present prior to the diagnosis (4); more rarely meningiomas are incidental findings following medical imaging. Most commonly a painless, enlarging mass is observed. In ear and temporal bone lesions, progressive hearing loss, tinnitus, otorrea, vertigo, facial spasms and temporomandibular dysfunction have been described (5,7). Nasal obstruction, epistaxis, intranasal masses, proptosis, ptosis and exophthalmia are seen in tumors of the sinonasal tract; headache, visual acuity loss, diplopia, proptosis, ptosis, papillary oedema, and exophthalmia can be present in lesions near the orbit (4,5). Seizures or cranial nerve deficits occur when the tumor compresses or encases nervous tissue; infiltration into tissue is very seldom observed. In the skin, local changes in hair growth above the tumor can be seen (9-11). More rare symptoms are localized pain, bleeding, or dyspnea . Infrequently, a history of trauma at the tumor site is present (8).

Origin

Meningiomas arise from meningothelial cells, and various hypotheses have been formulated on how these cells end up outside the neuraxis. None of the proposed mechanisms on its own can explain all of the cases described in literature.

Meningothelial cells could be misplaced during early embryogenesis, at the time the neural tube closes (9); arachnoid cells could be trapped within cranial sutures during birth and molding of the head (12), or following a head trauma (13); meningiomas of the paranasal sinuses or orbit could develop out of ectopic arachnoid cells within cranial and peripheral nerve sheaths (9). Some ectopic meningiomas could originate from perineural cells rather than from ectopic arachnoid cells (both are embyologically related) (14); alternatively, they might differentiate directly from pluripotent mesenchymal cells (15).

Events that trigger the growth of ectopic cells could be radiation, chronic inflammation, or trauma (3,10,16).

Diagnosis

Whereas classical meningiomas have characteristic imaging features, radiology is not particularly helpful in the primary diagnosis of their ectopic variants. Ectopic meningiomas are diagnosed based on cytological and histopathological findings. They have cytomorphological and immunohistochemical properties similar to their counterparts in the central nervous system (5,11); typical features are clusters of spindle cells, whorls, intranuclear inclusions, and psammomatous calcification. Immunoreactivity for vimentin, EMA, S-100 and Progesteron receptor can be helpful in determining the origin of the tumor cells (17).

Based on their cytomorphology, ectopic meningiomas are graded according to the WHO classification (18), and they seem to occur with a similar frequency as other meningiomas: almost 90% are WHO I (benign) types (4,8).

In many cases, the diagnosis is only evident after surgical excision. If not yet performed before surgery, additional radiological imaging (MRI) afterwards is needed to exclude an intracranial extension of the meningioma.

Treatment

Ectopic meningiomas are surgically removed (3-5,8) and their prognosis is considered good. Follow up data in literature are limited; in a recently reported series of 170 reviewed cases with a mean follow up period of three years, tumor recurrence was observed in 38 patients (22,4%) and 29 people died–14 of them (8,2%) from tumor-related causes (4). The most important factor in determining the prognosis is the completeness of surgical excision (3). Furthermore, atypical and malignant ectopic meningiomas have a higher recurrence and death rate (4,8).

Surgery may involve reconstruction of adjacent tissues. For incompletely resected or recurrent tumors radiotherapy can be considered ; chemotherapy can be an option for inoperable or progressive tumors (8). Lastly, targeted therapies are being investigated for refractory cases (19).

Due to their location, ectopic meningiomas are commonly treated by physicians unfamiliar with this type of tumor. Mattox et al published a flow chart with treatment and follow up recommendations for different clinical scenarios (8), see figure 3.

CONCLUSION

In most cases, ectopic meningiomas are benign masses which, upon timely diagnosis and

surgical resection, have a good prognosis (as in our case of the young girl). The mass effect of growing tumors can cause a diversity of symptoms and even death (as in the case of the unfortunate locksmith). Incompletely resected, recurrent, or inoperable masses, as well as tumors with atypical and malignant histology, require a broader multidisciplinary oncologic approach.

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Legends of the figures:

Figure 1: H&E stain (x40 magnification) showing clusters of pleomorphic tumor cells next to bundles of collagen. W: whorl; P: psammoma body (calcification)

Figure 2: Drawing from Salzmann's article, showing the extracranial (left) and intracranial part of the ectopic meningioma. Image from the Biodiversity Heritage Library. Contributed by the National History Museum Library, London | www.biodiversitylibrary.org

Figure 3: Treatment and follow up algorithm for ectopic meningiomas as suggested by Mattox et al (8) (slightly adapted; algorithm for metastatic tumors is not shown)

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Figure 1 (High Resolution)

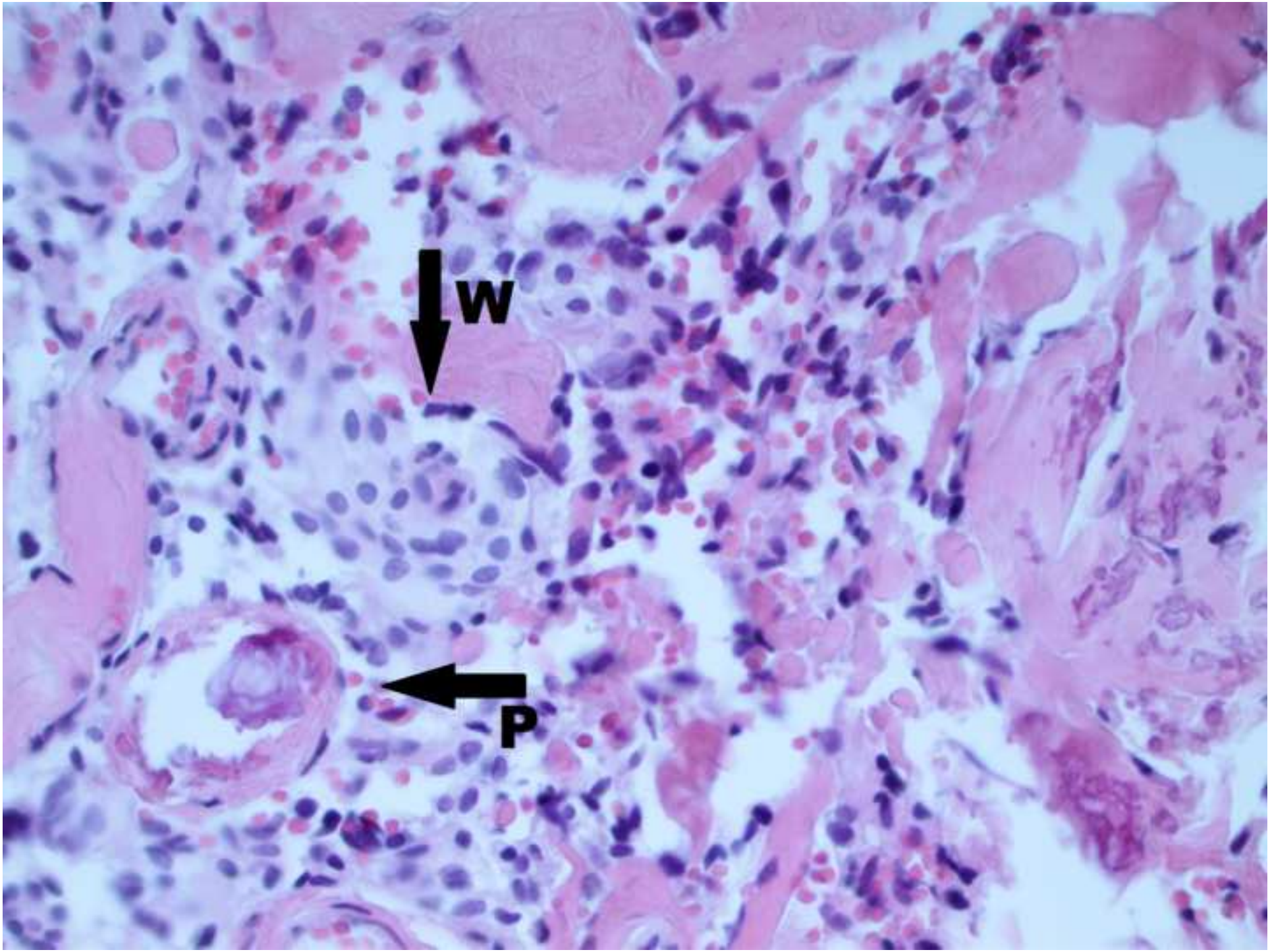

Figure 2 (High Resolution)

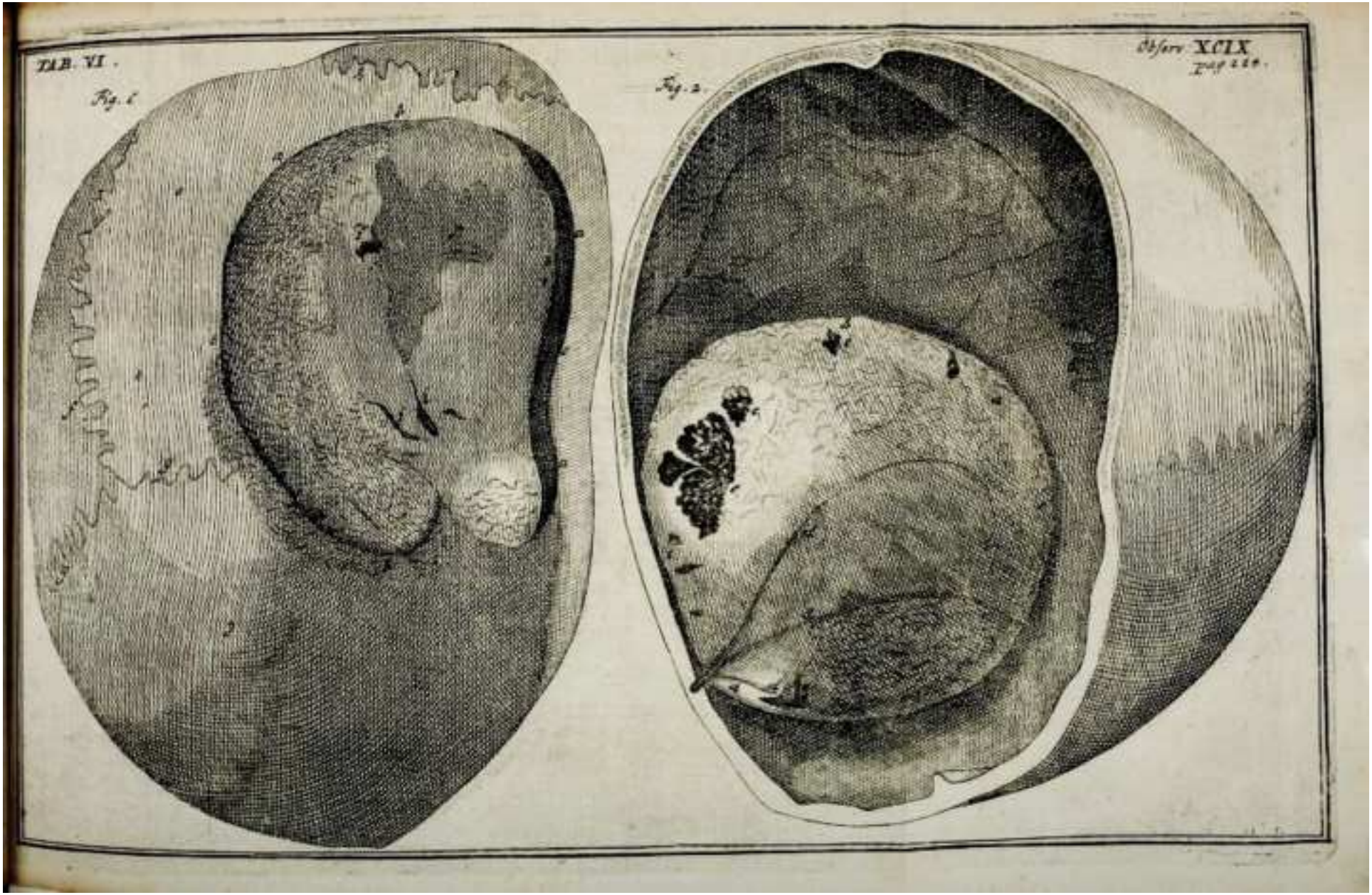

Figure 3 (High Resolution)