A CASE OF TERATOMA HEPATIS.

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From the Pathological-Anatomical Institute of Professor Chiari in Prague.

(PLATE XVI.)

NEOPLASMS of the liver, both primary and secondary, are very frequently found. Much has been said upon these growths of the liver, and the literature upon these conditions is voluminous. Notwithstanding, after a very careful and thorough search thereof, I have been unable to find a report of a single case of a true teratoma hepatis. Therefore, on account of its extreme rarity, I feel that no apology is necessary in reporting such an interesting case, which was kindly furnished to me for special investigation by Professor Chiari, under whom I was a volunteer in the German Pathological-Anatomical Institute in Prague. The museum number of the specimen is 5049.

The case is that of a six-weeks old boy, with the following *clinical history*, which was given me through the kindness of Professor Epstein.

The child, on the day of its birth, 31st January 1891, was brought to the clinic of Professor Epstein, and it weighed 2640 grms., and measured 45 cm. long; it was jaundiced, and there was albumin in the urine. The icteric condition persisted for about two weeks, while albuminuria lasted for about four weeks. In the middle of February, for a short period, there was a slight degree of dyspepsia. On the 9th of March the symptoms of bronchitis set in, and the child died from this disease on the 11th of March.

The tumour was first observed on the 21st of February. One could detect the sensation of a tumour in the right half of the abdomen; this extended to the middle line, and terminated in the ileo-cæcal region. Sometimes the intestines were interposed between the tumour and the right abdominal wall. On 23rd February the circumference of the abdomen at the umbilicus was 35 cm., and increased up to the 1st of March, when it measured 38 cm.

The clinical diagnosis was, *tumor renis dextri* and *bronchitis capillaris*.

The result of the post-mortem examination, which was made twenty hours after death, is as follows:—

The body is 52 cm. long, weighs 3120 grms., and is of ordinary development. The skin upon the face and posterior aspects is reddened. Rigor mortis is not pronounced. The hair is thin, and about 2 cm. long. The pupils are equal, and moderately dilated. The neck is short. The lower border of the chest is greatly expanded. The abdomen is excessively expanded, and measures in circumference at the umbilicus 36 cm., and on its right side is of pronounced resistance upon palpation. In the scrotum both testicles are present.

The scalp is pale. The skull measures in the horizontal circumference 33·5 cms. The bones of the skull and the fontanelles are apparently normal. In the sinuses *duræ matris* is a large quantity of dark-coloured blood. The inner meninges are cedematous, and contain a moderate quantity of blood. The cerebral convolutions are of normal arrangement. The ventricles are not dilated. The brain substance is cedematous, and of normal blood supply.

On opening the abdomen one sees that the enlargement was caused by a large tumour mass, about the size of a man's fist, which occupied the lower half of the right lobe of the liver. The right kidney is crowded backwards, and compressed to a high degree. The small intestines and the ascending colon are displaced to the left, while the stomach and transverse colon are upwards and to the left. Between the above-mentioned tumour mass the ascending colon, and the lower part of the ileum, are slight adhesions. The diaphragm on both sides extends to the sixth rib.

The mucous membranes of the trachea, larynx, pharynx, and mouth are pale. The thyroid and thymus are of ordinary size.

Both lungs are free from adhesions, and their edges are expanded. The tissues of the lung contain a normal quantity of blood, and are markedly cedematous. In the left lung are a few lobular patches of pneumonic hepatisation, and the left bronchial tract contains pus. The mucous membrane of the bronchi is reddened; that of the œsophagus is pale. The heart is of normal shape and size, as are also its large vessels.

The liver is distinctly enlarged, and measures 11·5 cm. in its frontal diameter; 8·3 cm. antero-posteriorly; and 6·8 cm. vertically.

The left lobe shows, both in respect to its size and position, a complete normal condition, and has also a perfectly smooth surface. In the enlargement of the organ as a whole, only the right lobe is involved. The right lobe shows upon its right half of the lower surface, also in places upon its upper surface, numerous, irregular, large, and small-sized nodules. The liver surface in the neighbourhood of the suspensory ligament appears perfectly smooth; on its inferior surface is the protruding tumour mass, about 6 cms. in diameter. By this tumour mass of the right lobe are compressed to the left the quadrate lobe and the gall bladder (Plate XVI. Fig. 1). This portion of the liver, as well as the lobus *Spigelii* is apparently free from deposits of tumour mass. The ligamentum *teres* and the ductus *venosus Arantii* are normal in position and also the vena *portæ*, ductus *choledochus*, and the hepatic artery. The tumour mass which protrudes out of the lower half of the right lobe presses upon the wall of the ascending vena cava, and, breaking through its wall here and there, occludes the entire lumen by its proliferation. On a sagittal section (*vide* Plate XVI. Fig. 2), carried through the middle of the right lobe, one recognises that it consists chiefly of heterogeneous tissue. This tissue belongs to the above-mentioned protuberance, and only the upper edge is covered by a band of liver tissue, 2 cm. wide. The transition between the foreign tissue and the true liver tissue is wave-like, but everywhere shows a sharp distinction between the two at many places; indeed, one finds a distinct connective tissue septum between the two.

The capsule of the liver continues uninterruptedly over the surface of the tumour. The tumour itself is richly supplied with blood vessels, and has in general a greyish-yellow colour. It consists of numerous lobules, separated from each other by connective tissue septa. The same has for the most part a soft medullary consistency, but one detects in many places numerous cartilaginous and bone-like deposits, especially upon drawing the hand over the cut surface of the tumour. Furthermore, one sees in the posterior part of the tumour numerous smooth-walled cysts of various sizes, up to about 1 cm. in diameter, which are filled with a serous fluid. In the upper part they are fewer in number. On a sagittal section one sees that branches of the vena *hepatica* are infiltrated with the tumour mass.

The *spleen* is of ordinary size.

The *right kidney* is indented by the compression of the tumour mass, its calyces and pelvis are contracted, and the parenchyma is rather pale.

The *left kidney* is slightly hyperæmic, while its calyces and pelvis are moderately dilated.

The *suprarenals* are apparently normal.

The *bladder* contains very little urine.

The *stomach and intestines* are slightly distended.

The stomach contains curdled milk. The intestines are distinctly bile-stained, and contain respectively chymous and fæculent masses.

In the mesocolon ascendens, which lies next to the tumour mass, are a few lymph glands of a medullary consistency.

The *pancreas* is apparently normal.

From this post-mortem examination the *pathological-anatomical diagnosis* is made of *bronchitis suppurativa pneumonia lobularis sinistra, tumor hepatis (teratoma hepatis)*.

A sagittal section, with a thickness of about 2 cm., was taken from the tumour mass, which had been preserved in alcohol since the post-mortem examination. It was then divided into smaller specimens, to the number of twenty-four, commencing at the anterior border (*vide* Diagram).

These were then decalcified in 5 per cent. nitric acid, with the exception of Numbers 3, 4, and 5, which were supposed not to contain any calcareous matter. After decalcification they were washed in running water for twenty-four hours, and then rehardened in alcohol in the usual manner. After hardening they were stained in cochineal-alum (Csokor's method), proceeding further by Bumpus' method, namely, embedding them in celloidin, and mounting them upon blocks. They are then placed in chloroform for twenty-four hours, to continue the hardening process, transferred into oil of thyme for twenty-four hours, and cut, the knife being always moistened with the oil. The sections were arranged upon the slides in

serial order, and after removal of the oil with drying paper were mounted in Canada balsam.

The non-decalcified pieces—Numbers, 3, 4, and 5—were hardened in the usual alcohol method, embedded in celloidin, and cut unstained. They were then stained by such methods as van Gieson's and the double stain of hæmotoxylin-alum and eosin. These sections were also mounted in serial order. There was no amyloid disease.

I will give a brief description of the different pieces into which I divided the sagittal section (*vide* Diagram), numbering from 1 to 24 respectively, giving me five vertical columns, which I describe from before backwards; the first or most anterior column containing Numbers 1, 6, 11, 16, 21; the second, 2, 7, etc.; the third, 3, 8, etc. (*vide* Diagram).

Microscopic sketches were made from each specimen. I only wish to note the most important histological features of these specimens by a brief description of the microscopic examination. In giving this short description I follow the sections in their order (*vide* Scheme).

Specimen No. 1 shows that the upper and outer border is formed by a connective tissue capsule, within which are many small bile ducts. In the centre is a large band of connective tissue, branching out and forming a coarse meshwork, within which are large groups of epithelial cells similar to liver cells; these are further divided into an alveolar arrangement by a fine reticulum of connective tissue (Plate XVI. Fig. 3). In some places the reticulum consists of small new formed blood vessels only; there are a few plaques of embryonic bone-like tissue containing numerous osteoblasts, which are in the midst of bands of connective tissue, in some parts quite near to the epithelial tissue (Plate XVI. Fig. 4). Some of the epithelial cells show karyokinesis. Within the epithelial masses, here and there, are small round deeply-stained nuclei (Plate XVI. Fig. 3), in which the epithelial tissue is quite analogous to embryonic liver tissue.¹

No. 6.—The outer border is formed by the same capsule of connective tissue, containing numerous small bile ducts and some small blood vessels. In an embryonic liver tissue are larger ducts which, in some places, contain a lumen, while in others the walls are kept in close contact by pressure of the surrounding cells. Numerous bone-like plaques are scattered throughout the specimen.

No. 11.—The outer border is also of connective tissue, containing numerous bile ducts. This connective tissue extends into the epithelial masses, as in the previous specimen; but at other points it almost penetrates into the bone plaques. A large number of small round deeply-stained nuclei within the epithelial tissue are also present in this specimen.

No. 16.—The arrangement is about the same as in No. 11, with the exception that there are a larger number of bone plaques which contain many osteoblasts; in many places they show calcification and mucoid degeneration. The number of cysts which are lined by a single row of cylindrical epithelium is greater in the lower border.

No. 21 is composed mostly of bone-like tissue. Gland ducts are also found in the tumour mass, close to the connective tissue. In the lower border are cysts of various sizes, some of which show detachment and destruction of the epithelial lining.

¹ *Vide* Saxer, "Ueber die Entwicklung und den Bau der normalen Lymphdrüsen und die Entstehung der roten und weissen Blutkörperchen," Anatomische Hefte, von Merkel und Bonnet, 1896.

No. 2 (the first of the second column).—The septum between the epithelial cells is seen to be a branch from the larger septa of connective tissue. In some of the smaller septa, between the groups of epithelial masses, are blood capillaries, within which are often numerous deeply-stained nuclei. Some of the larger septa are of a true spindle-celled sarcomatous-like structure. In one place is a concentric ball of cornified epithelial cells, of a cholesteatoma-like character, surrounded by well-preserved epithelial cells, which are adjoined by epithelial and connective tissue of the tumour mass; in the neighbourhood are gland duct-like formations, lined with cylindrical-celled epithelium (Plate XVI. Fig. 5).

No. 7.—The upper half is of about the same structure as the previous specimen, No. 2, while the lower half is composed of large plaques of bone, which at many points show degeneration. No cysts are present.

No. 12.—The upper third is found to be composed mostly of cysts, between which is interposed tissue in the form of a spindle-celled sarcoma-like arrangement. Here and there are a number of balls of cornified epithelium, like atrophic cells. A few islets of bone tissue are present.

No. 17.—The upper part is mostly of connective tissue, which surrounds the epithelial groups. In some places the connective tissue is in the form of a spindle-celled sarcoma. In the right lower border are large plaques of bone tissue.

No. 22 is composed mainly of cysts of various sizes, the cyst wall in many places showing degeneration of its epithelium. Only one large bone plaque is present. Only a small quantity of epithelial tissue is also present, as most of the tissue is in the form of connective tissue.

No. 3 (the first in the third column).—The tumour mass is separated from the liver by a dense fibrous capsule. The groups of epithelial cells are very similar to the liver cells (Plate XVI. Fig. 3), both in respect to size, form, nuclei, and also in staining. Within the groups of epithelial masses the deeply-stained nuclei are in some places much more numerous than in others, and in some places they are agglomerated. Some of these deeply-stained nuclei appear to be within the blood capillaries. The nuclei of the connective tissue are very numerous, simulating in form a spindle-celled sarcoma; van Gieson's stain bringing out the same characteristics as hæmatoxylin-eosin.

No. 8 is much like No. 3, except that here are groups of epithelial cells, from which are formed gland duct-like masses. Connective tissue in many places is abundant. Many plaques of young bone tissue, containing numerous osteoblasts, are present, and at one point is a pearl-nest formation. Deeply-stained nuclei are found outside and within the blood capillaries in the connective tissue.

No. 13 is about the same as No. 8, except that there are invasions of the tumour mass into the veins; numerous cysts of various sizes are scattered throughout the specimen. Here and there are groups of epithelial masses, in the exquisite form of embryonic liver tissue.

No. 18 contains a large proportion of connective tissue. In the centre of some of the bone plaques is seen mucoid degeneration and calcification. Cysts up to the size of a pea are present, many of which show destruction and detachment of their epithelial lining.

No. 23.—The epithelial masses are represented by some gland duct-like masses, and small isolated islets of epithelial cells. Here and there one sees that some of these epithelial masses are surrounded by a proliferating bone tissue, and that concentric balls of atrophic epithelial cells are formed in this manner.

No. 4 (the first in the fourth column), is mostly liver tissue, except in the lower border, where there is a tumour mass, separated from the liver tissue by a dense fibrous capsule. In the tumour are groups of epithelial cells, separated by fine strands of connective tissue.

No. 9 consists wholly of tumour mass. The septa of connective tissue in many places are in the form of a spindle-celled sarcomatous tissue; in other parts of the septa are isles of young bone with many osteoblasts. There are balls of cornified-celled epithelium, which seem to take their origin from the gland ducts. In some places the epithelial mass seems to be in the form of embryonic liver cells (Plate XVI. Fig. 4), and between these cells are deeply-stained nuclei. The upper part of No. 14 is similar to No. 9, the lower half is like No. 19, which shows a prevalence of connective tissue; in many places the connective tissue takes the form of a sarcoma. In many of the points of bone, calcification and mucoid degeneration may be seen in their centre; only here and there are groups of epithelial cells.

No. 24 is similar to No. 19, except that the lower part contains numerous groups of epithelial masses, some of those in the right lower border completely simulating embryonic liver tissue, with deeply-stained nuclei in the capillaries and between the supposed liver cells.

No. 5 is composed entirely of liver tissue, with a small number of leucocytes in the interlobular spaces.

No. 10 is mostly liver tissue, except the inner and lower third, which consists of tumour tissue, separated from the liver tissue by a fibrous capsule containing many bile ducts. The tumour mass is made up mostly of groups of epithelium and connective tissue septa. At its lower border are a few bone plaques with osteoblasts. No cysts are present.

The upper border of No. 15 consists of normal liver tissue. The tumour mass is composed mostly of epithelial groups, and in some places the connective tissue is in the form of a spindle-celled sarcoma. In the capsule of the liver there are numerous bile ducts. In some of the epithelial groups are found gland duct-like formations, the cells of which are flattened by compression of the connective tissue; in this manner they are transformed into balls, which show a partial concentric arrangement of a cholesteatoma-like character. No bone tissue or cysts are present. On the outer border is a large vein filled with tumour mass, which has protruded outwards through its wall.

The upper half of Specimen No. 20 is of the same structural arrangement as No. 15. The lower half is made up mostly of connective tissue. In the inner half is a large bone plaque, within which are groups of epithelium that also contain cysts with a destroyed epithelial lining.

This macro- and microscopical study of the specimen shows that there can be no doubt as to its being a true teratoma hepatitis, a teratoma *sensu strictiori*, because it is a congenital tumour composed of different tissues which do not normally exist in this position. This histological structure and such arrangement of tissues are not to be found in any form of tumour except that of teratoma; this disordered production of the liver is therefore a teratoma. It is rather difficult, if not impossible, to give a definition that will cover the many forms of teratomata. One can define generally as teratoma such characteristic reproduction of tissues, as generally offer a complicated combination, insomuch as they consist partly of tissues which, according to natural principles, do not appear in the place where the tumours ordinarily develop themselves. When one finds in a teratoma many different formations of tissue, which partly show rudiments of organs or perfected excessive organs, for the individual, such formation may be considered as a heterochthonic teratoma or

a bigerminal implantation, as, for example, a fœtus *in fœtu*. On the other hand, a teratoma which contains various formations of tissue, the genesis of which does not require the existence of rudiments of a second fœtus, is considered as an authochthonic teratoma or a monogerminal implantation.

The case of teratoma now reported is formed from the entoderm and mesoderm only, not from the ectoderm. From the *entoderm* we have such new formed tissues, as spots of embryonic liver tissue, large gland ducts, formations of cholesteatoma-like balls or pearls, these being formed by compact layers of cells which are derived from the entoderm. Exceedingly abundant are the formations of new blood vessels, which in many places form the septa between the groups of epithelial masses. Within these vessels, and also scattered throughout the tumour, especially in the epithelial masses between the cells, are the small round deeply-stained nuclei, which, in all probability, are neither more nor less than young blood corpuscles. This hæmatopoesis is a special function of the embryonic liver, which was especially shown by Saxer.¹

From the *mesoderm* is derived the connective tissue, which in many places became sarcomatous; also plaques of bone-like tissue, which are scattered throughout the tumour, also containing numerous osteoblasts, showing an active state of development. In some places the neoplastic liver tissue was compressed and destroyed by an excessive proliferation of the mesoderm, by which it is proved that these inclusions of residua of liver tissue are formed in this manner.

On the other hand, there is, in many places, an excess of the neoplastic liver tissue invading the veins. In relation to the true liver tissue, it is extending and constricting in character. Having extended and infiltrated the vena cava ascendens, and branches of the venæ hepaticæ, it also compressed the lobus quadratus and cystis fellæ, and at the same time remained within the capsule of the liver. The tumour undoubtedly has had its origin and development from the right lobe, and at the time of death only about one-third remained within the normal liver tissue, about two-thirds of the tumour mass protruding.

The increase after birth was rather a rapid one (*vide* "Anamnesis"), and one may conjecture that its development was accelerated by the sarcomatous condition of the connective tissue around the epithelial masses. I am unable to state that the enlarged glands of the mesocolon were sarcomatous, since they were not examined histologically, but this is probable, since they were of a medullary consistency. The tumour was certainly the chief cause of death by producing marasmus, the bronchitis and pneumonia being accidental and terminal.

As to the origin and etiology of teratomata very little, if anything, is known positively, but suppositions are numerous.

¹ *Loc. cit.*

In this case the teratoma seems to be due to disturbances in the formation of the tissues within the liver of the foetus, from which arose the tumour containing the various kinds of new-formed tissues previously mentioned. Within the right lobe were infolded abnormally matrices of two of the germinal layers, namely, the *entoderm* and *mesoderm*, from which developed the various tissues of the tumour previously mentioned. It is impossible to assert when the tumour had its origin, but it was certainly at a very early stage of foetal development. It would still be much more difficult to say or understand why it so developed.

Ciliated epithelial-celled cysts of the liver are sometimes classified under the general head of teratomata, but in my opinion they are not teratomata in a restricted sense of the term, but are, in all probability, nothing but cysts of the embryonic bile ducts.

The two cases reported by Hulke and Pye-Smith in the *Transactions of the Pathological Society of London*, and mentioned by some authors as teratoma of the liver, are, I think, not true teratomata of the liver. In the case reported by Hulke, of multiple dermoids connected with the liver, the origin of the dermoids was not in the liver. The mother cyst, which was located in the uterine appendages, had at some time ruptured, and the matrices had become attached to the liver and peritoneum by adhesion. Pye Smith states in the case reported by him that—

“The mass was closely adherent to the liver, and the stomach was spread out upon the front surface, the kidneys very closely compressed behind it and squeezed into irregular, angular shapes, while the intestines, both large and small, were pushed downwards by its growth. So there can be no doubt, from the anatomical relations observed in dissection, as well as from the physical signs during life, that the tumour was unconnected with the ovary, and had grown downwards and forwards from its original seat in or near the lesser bag of omentum.”

From the report of this case it is, in all probability, a teratoma of the omentum.

It is with great pleasure that I take the opportunity of publicly thanking Professor Chiari for the extreme kindness and attention that he has ever shown me during my study under him.

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DESCRIPTION OF PLATE XVI.

FIG. 1.—Under surface of liver.

<i>Lid.</i>	.	.	Lobus dexter.
<i>L.s.</i>	.	.	Lobus sinister.
<i>L.sp.</i>	.	.	Lobus Spigelii.
<i>L.q.</i>	.	.	Lobus quadratus.
<i>C.f.</i>	.	.	Cystis fellea.
<i>V.c.a.</i>	.	.	Vena cava ascendens.
<i>D.v.A.</i>	.	.	Ductus venosus Arantii.
<i>L.t.</i>	.	.	Ligamentum teres.
<i>P.h.</i>	.	.	Porta hepatis.
<i>P.</i>	.	.	Protuberances of the teratoma.

FIG. 2.—Surface of sagittal section, carried through the middle of lobus dexter.

<i>L.</i>	.	.	Band of liver tissue.
<i>V.h.</i>	.	.	Thrombotic infiltration of tumour mass in vena hepatica.
<i>F.c.</i>	.	.	Fibrous capsule surrounding the tumour mass.
<i>C.</i>	.	.	Numerous cysts of various sizes.

FIG. 3.—Groups of epithelial cells, separated by fine septa of connective tissue; and small, round, deeply-stained nuclei.

FIG. 4.

<i>E.l.</i>	.	.	Embryonic liver tissue.
<i>C.t.</i>	.	.	Connective tissue.
<i>P.b.</i>	.	.	Plaque of young bone tissue.

FIG. 5.

<i>C.t.</i>	.	.	Connective tissue.
<i>E.m.</i>	.	.	Epithelial mass with a fine mesh-work of connective tissue.
<i>D.</i>	.	.	Gland duct, with a row of cylindrical-celled epithelium.
<i>Ch.m.</i>	.	.	Pearl of cholesteatoma-like mass.
<i>A.c.</i>	.	.	Atrophic cells.