THE LIVER IN JAUNDICE.

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By jaundice is meant a yellowness of the skin. It is a name drawn from the French word *jaune*. By the Greeks the disease was called icterus. In most modern books, the fanciful etymology of Pliny the Younger (*Nat. Hist.*, lib. xxx, cap. xi) is given. A certain yellow bird was called icterus; and the sight of this by one jaundiced was death to the bird, but recovery to the man. If Aretæus, as seems more probable, lived after Pliny, he was likely to have had this derivation in mind when he says: the name icterus "is derived from certain four-footed and terrestrial animals, called *ictides*, whose eyes are of this colour" (*On the Causes and Symptoms of Disease*, book 1, chap. xv). This animal, the *ictis*, was the yellow breasted marten, and appears to have been kept by the Greeks in their houses for the same purpose as we keep cats, viz., that of killing mice. The object of comparison would thus be close at hand. As to Pliny's derivation, it seems highly improbable that a means of curing the disease should be known before the disease itself had a name. The name used by the Latins, *morbus regius*, has also a common and faulty explanation. It is so called, not on account of the royal diet and regimen needed by jaundiced patients, but on account of the resemblance of the yellow colour of their skin to gold, the *rex metallorum*.

It is my object in these papers to describe those changes in the liver which follow an obstruction to the flow of bile into the duodenum. These morbid appearances divide themselves into two heads: 1, the changes met with in the bile-passages; 2, those met with in the parenchyma of the liver itself. The former of these will first be considered.

The first effect of an obstruction in the bile-ducts is a dilatation of the duct behind the obstruction. Should the obstruction be in the common duct, it is the gall-bladder which suffers at first. Its walls are easily distended, and it may, therefore, become enormously dilated. One of the most dilated gall-bladders on record was met with by Cline (reported by John Andree, *Considerations on Bilious Diseases*, Hertford, 1788, p. 18). A tumour gradually formed in the belly of a boy, aged 16. Fluctuation was clearly felt, and the swelling was tapped. More than twenty ounces of a bilious fluid were let out. The boy died in seven days; and, on examination, the gall-bladder was found to contain two quarts of bile, and stretched from the liver to the pelvis. Van Swieten likewise (*Comment.*, sect. 950) found in a boy, aged 12, the gall-bladder of immense size, holding eight pounds of a thick bile. The greatest amount of fluid in the gall-bladder that Frerichs has seen (*Klinik der Leberkrankheiten*, Braunschweig, 1861, Band II, p. 447) is eighteen ounces. I have never seen the gall-bladder distended so much as this, although it is not uncommon to find it as long as six, seven, or eight inches.

Usually it is filled with a dark viscid bile. But if the gall-bladder be much distended, and any obstruction to the flow of bile through the cystic duct take place, as often happens when gall-stones are the cause of jaundice, the bile becomes absorbed, and its place taken by a colourless fluid, which is either viscid or limpid. In one of Van Swieten's cases, the taste of the fluid was saltish; and he also, in another case, mentions its coagulation by heat. This *hydrops vesicæ fellæ*, as it is called, was first noticed by Glisson (*Anatomia Hepatis*, Hagæ, 1681, end of cap. xxxix), and by Regnerus de Graaf (*Tract. Anat. Med. de Succo Pancreat. Naturâ et Usu*, Lugd. Bat., 1671), who also noticed the absence of bitterness in the fluid.

There are not many analyses of the colourless fluid found in the gall-bladder or ducts on record. J. C. B. Bernard (Reil's *Archiv*, 1799, Band III, p. 477) seems to have been the first to examine the fluid very attentively. He found the fluid transparent as water, of the consistence of white of egg, and tenacious. Heat, alcohol, and acids did not cause coagulation, but only a flocculent precipitate. The fluid was unaltered by mineral alkali or carbonate of vegetable alkali. Albert Schaefer (*De Hydropne Ductuum Biliarium*, Diss. Inaug., Turici, 1842, p. 9) found in the fluid of the bile-ducts the same chemical and physical characters as in the plasma of the blood. Frerichs (*op. cit.*, p. 449) found the fluid alkaline, transparent, and containing mucous corpuscles. There were no bile-pigments or bile-acids. Nitric acid caused a slight cloudiness; acetic acid made the fluid gelatinous and thick. In another case, he found a great quantity of albumen. Casali (Virchow's *Fahresbericht*, f. 1869, Band I, p. 287) has also lately found much the same state. But Ritter (*Comptes rendus*, 1872, tome lxxiv, p. 813), however, states that certain colourless fluids from the bile-passages gave no reaction of bile-pigment, yet contained the rest of the biliary constituents. This statement needs

to be investigated by further observers, as the general experience of physicians is that both bile-pigment and bile-acids are absent. I have recently had the opportunity of examining this colourless fluid in two cases, and could not detect the presence of bile-pigments or bile-acids on the repeated and careful application of Gmelin's and Pettenkofer's tests.

The presence of a colourless fluid in the gall-bladder and the bile-ducts was formerly looked upon as evidence that the liver had ceased to secrete bile. Indeed, a recent writer (W. Moxon, *Transactions of the Pathological Society of London*, 1873, vol. xxiv, p. 129) is still plainly of this opinion. But, to my mind, the evidence seems rather the contrary. It should be remembered that it was the large ducts which were seen to be filled with this colourless fluid, and that nothing is said of the state of the smaller ducts, of the interlobular and capillary ducts. These continue to receive the bile poured into them by the liver-cells, but the bile does not reach the large ducts, because the small ducts are shut off from the large, either by plugs of this tenacious fluid or biliary gravel. In a case which I recently examined at St. Bartholomew's, the large ducts were perfectly colourless; but, by gently pressing the liver, a yellow fluid could be made to issue from the small ducts. Also, by careful dissection, the small ducts could be seen to be stained yellow.

Precisely the same inference may be drawn from Oskar Wyss's experiments (*Archiv der Heilkunde*, 1867, p. 469). He made biliary fistulæ in dogs, and then poisoned them with phosphorus. He found that though very little or no bile flowed out of the fistulæ, the dogs, notwithstanding, became jaundiced. Here, then, seemed to be evidence that the liver ceased to secrete bile. On dissecting the livers of these dogs, the large ducts were found indeed unstained, and containing a colourless mucus, but the openings of the smaller ducts into the large were plugged with a thick mucous secretion which hindered the flow of bile into the larger tubes. Ebstein (*Archiv der Heilkunde*, 1867, p. 506; and 1869, p. 379) has noticed also the same plugging of the fine ducts in patients who became jaundiced after poisoning themselves with phosphorus.

The ducts outside the liver become dilated. It is common to see them as large as, or even larger than, the middle finger. In man, I have never seen them tortuous; in animals, it is not uncommon to see this appearance when the ducts have been tied near the duodenum. The size which these ducts may sometimes attain is enormous; so that at first sight they may be mistaken for tumours connected with the liver. There is an old case of Traffelmann (quoted by Schenk, *Observationes Medice*, Lugdun., 1644, lib. III, sect. ii, p. 405) often quoted, and invariably misquoted. In the body of Daniel, Archbishop of Mainz, who died in 1582, the bile-ducts were found filled with gall-stones, and dilated "*instar utriculi*". Morgagni (*De Sedibus et Causis Morborum*, Epist. XXXVII, sect. xlvii), quoting this, changed the *utriculi* into *ventriculi*, and this error has been followed up to the present day by every writer who has mentioned the case.

Of modern instances, the most extreme dilatation seems to have been reached in a case recorded by Halliday Douglas (*Monthly Journal of Medical Science*, Edinburgh, 1852, vol. xiv, p. 97). In a jaundiced girl, aged 17, a fluctuating tumour could be felt on the right side nearly as low as the ilium. Thirty ounces of fluid were taken away by tapping. On examination after death, a sac was found on the right side of the belly, over the front wall of which the duodenum passed as a flat band. The sac contained within a few ounces of half a gallon of a yellow fluid. The walls of the sac were dense and fibrous, one-twelfth to one-eighth of an inch in thickness. At the upper part of the sac, the dilated openings of the hepatic and cystic ducts were seen. The hepatic duct within the liver was much dilated. Todd, also (*Dublin Hospital Reports*, 1817, vol. i, p. 328) found in a girl of 14, the hepatic and common ducts so enormously dilated that they contained more than a quart of bile, and formed a sac which reached from the porta of the liver to the os sacrum. They lay behind the duodenum, pancreas, and root of mesentery, and covered the anterior surface of the right kidney and the greater part of the left. The cause of the dilatation was a scirrhus state of the pancreas. Frerichs (*op. cit.*, Band II, p. 444) also gives a drawing of an immense dilatation of the common ducts.

Within the liver, the ducts also become dilated. But they do not enlarge so greatly as outside. The proper parenchyma of the liver prevents this. In all the cases which I have yet met with, the dilatation has been uniform or cylindrical. Virchow (*Die krankhaften Geschwülste*, Berlin, 1863, Band I, p. 254) has described the saccular or cystic dilatation. The cyst is at first filled with bile; later on, this becomes thick; the bile decomposes and deposits cholesterin, bilirubin, and hæmatoidin. These dilatations chiefly affect the bile-ducts near the surface of the liver; further, the liver-tissue around them atrophies, so that they lie close under the liver-capsule. These dilatations may be as large as a cherry or walnut; they may closely resemble a small echinococcus cyst, only they have no mem-

braneous wall. Leyden (*Beiträge zur Pathologie des Icterus*, Berlin, 1866, p. 119) says that these saccular dilatations usually become separated from the gall-duct by chronic inflammation of the surrounding liver-tissue. Their contents become watery, thin, or tenacious. Their origin is then doubtful. If they dry up, it is, indeed, difficult to distinguish them from dried up echinococci, unless hooklets or laminated membranes be found. Monneret (*Traité élém. de Pathologie interne*, Paris, 1864, tome i, p. 660) describing these dilatations, has compared them to the saccular dilatations which the bronchi undergo, a comparison which can scarcely be approved of, as the causes in the two cases are altogether different; in the liver, a pent up secretion causes the widening; in the lung, it is most commonly caused by disease of the surrounding lung-tissue.

Friedreich (*Archiv für patholog. Anatomie*, Band xi, 1857, p. 466) has described a cyst, which, he inclines to think, resulted from a dilated gall-duct. In the contents, he found well marked ciliated epithelium. I believe no similar case exists on record. The epithelium of the gall-ducts is ciliated in some of the lower animals during foetal life; and in some it persists even during the whole of life.

I have also not met with any similar case to that of Boismont, which is quoted by Abercrombie (*Diseases of the Stomach, etc.*, London, 1837, third edition, p. 331). The liver had the appearance of a large undulating cyst. The appearance was found to depend upon a remarkable distension of all the biliary vessels with dark coloured bile, and was accompanied by wasting of the proper substance of the liver. The affection seemed to depend upon a singular obstruction of the common duct by a membranous band which passed over it.

It is not uncommon to find large ducts opening into hydatid cysts and abscesses. A large cyst will not, in all probability, be due to a dilatation of the duct. The contents are of little help, because hydatids often hold masses of red hæmatoidin exactly corresponding to those spoken of by Virchow above. The diagnosis will really depend upon the structure of the wall. The laminated structure of the hydatid membrane is diagnostic. The question of diagnosis from abscess is much more difficult. It depends chiefly upon two points: whether any obstruction in, or general dilatation of, the bile-ducts exist; and whether the lining membrane of the gall-duct can be traced around the walls of the abscess. Joffroy (*Comptes rendus des Séances de la Société de Biologie*, année 1869, p. 218) gives the following rules. In abscess, secondary to rupture of the bile-duct, there is often no limiting membrane, or, if there be, it is not lined with columnar epithelium, and the contents of the abscess do not show columnar epithelium, but liver-cells in process of disorganisation. The collections of pus found in saccular dilatations of the bile ducts, on the other hand, are always bounded by a membrane formed by the dilated bile-duct, which, in some places at least, retains its epithelial covering; and columnar epithelium is also found with the pus: liver-cells are never found.

The amount and extent of the general dilatation of the ducts depend upon the degree of obstruction and the length of time which it has lasted. If the obstruction be complete, of course the dilatation will be great. In some cases, the dilatation does not reach the interlobular ducts. I am doubtful, from my own observations, if the capillary ducts ever become varicose, as Oskar Wyss (*Archiv für Path. Anatomie*, 1866, Band xxxv, p. 553) and H. Meyer (*Stricker's Medicinische Jahrbücher*, Wien, 1872, p. 133) have described. I have never seen such an appearance in man; or in animals whose bile-ducts have been ligatured. The walls of the bile-ducts become thickened, even to the naked eye. Under the microscope, this thickening resolves itself into a great overgrowth of the fibrous coat, in which abundance of new lymphatic elements are to be seen, precisely similar to those observed in ordinary cirrhosis.

Many observers have been unable to find any epithelium lining the walls of these dilated bile-ducts. I doubt if this statement be universally true. In three cases which I have lately examined, in which the large ducts were dilated to the size of a man's little finger—in one case from disease of the head of the pancreas, in the other two from gall-stones—I was certainly unable to find any epithelium on the larger ducts, which measured ten millimetres when cut across. In those measuring only four millimetres, I found abundance. One source of fallacy must be guarded against. All washing or wiping of the ducts must be avoided. For, in a case of complete obstruction to the ducts by a hydatid tumour, followed by great dilatation, I found abundance of epithelium in all the preparations taken from the ducts immediately they were opened; but none could be found in the specimens taken after a stream of water had been poured on the ducts or their surface wiped with a sponge.

In those cases which I have hitherto examined, the left branches of the hepatic duct have always been much more dilated than the right. This appearance is probably due to the left lobe of the liver being less

bulky than the right, and thus offering less resistance to the dilating tubes.

The catarrh which is set up by the long continued obstruction sometimes goes on to suppuration of the duct; and a mixture of pus and mucus is found in the biliary canals. In another form, the suppuration becomes local and abscesses form. This result of obstruction seems to have been first noticed by Cruveilhier (*Anat. pathologique*, livr. 12, pl. 4 and 5; tom. ii, livr. 40, pl. 1) and Frerichs (*Hannov. Annal.*, 1845, Heft. i and ii, quoted in Canstatt's *Jahresbericht*, 1845, Band i, p. 81). The abscesses are usually multiple, near the surface of the liver, and, when cut across, their contents are seen to be a mixture of pus and bile. They are rarely larger than a hazel-nut in size. They greatly resemble the secondary abscesses seen in pyæmia.

The mode of origin of these little abscesses seems doubtful. Cruveilhier (*Archives générales de Médecine*, 1857, Janvier, p. 54) says that he satisfied himself that they had, in his case, their origin in the dilated bile-ducts. Joffroy (*loc. cit.*) speaks of two kinds: one, a saccular dilatation of the duct, filled with pus; the other, an abscess secondary to rupture of the duct. These two kinds may exist together in the same liver. Both are surrounded by an overgrowth of the connective tissue of the liver, containing nuclear elements. Bamberger also (*Krankheiten der chylopoietischen Systems*, Erlangen, 1864, 2te Aufl. p. 198) makes this division. Leyden, however (*op. cit.*, p. 123) considers that these abscesses may have another mode of origin. In one of his dogs, whose bile-duct had been tied, he found many small and large abscesses in the liver-tissue without any dilatation of the ducts, except of the large ones; and he argues from this that the first beginnings of the abscess must have taken place in the liver-tissue surrounding the abscess. This mode of explanation would seem to exclude rupture of the ducts as a source of abscess. There are some observations by Bristowe (*Transactions of the Pathological Society of London*, 1858, vol. ix, pp. 223 and 286) which support Leyden's view. He found, in a case of obstruction to the bile-ducts, an abscess of the liver, spherical, an inch in diameter, which shaded off into the surrounding tissue. Two considerable branches, somewhat dilated, passed through the substance of the mass. The cause of obstruction was a new growth springing from the inside of the ducts at the junction of the hepatic and cystic. It should also be noticed that there were several ulcers in the duodenum. In another place, speaking of the modes in which hepatic abscesses may be formed, he says that the abscesses were not positive cavities lined by a cyst-wall, but rather indistinctly circumscribed portions of liver-structure in which softening and rarefaction had taken place, and which blended insensibly with the surrounding healthier parts. In this case, the obstruction was a gall-stone.

I have not yet had the opportunity of examining any case of multiple liver-abscess arising from obstruction; and the mode of origin is still very obscure, as so little attention has been as yet paid to the histology of the disease. In the only case of abscess in the liver following obstruction to the ducts which I have seen, the abscess was a solitary one. It clearly did not arise from a saccular dilatation of the duct, for the cylindrically dilated duct opened into the floor of a depression the size of a walnut, near the surface of the left lobe, and one-half of the duct, not more dilated than before its entry into the abscess, formed part of the floor. In this case, I am inclined to think the abscess was formed by rupture of the duct, seeing that so much of the duct was preserved. The abscess afterwards found its way into the pericardium and pleura. The connective tissue throughout both lobes of the liver had undergone an increase, but especially in the neighbourhood of the abscess, where the growth of connective tissue had left only small groups of highly coloured many-sided cells as remains of the proper parenchyma. This case was read last November before the Pathological Society.

[To be continued.]

IMMINENT DEATH FROM INHALATION OF CHLOROFORM.

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JOSEPH HARRISON, aged 20, single, traveller, was admitted into the hospital on February 21st, 1874, the subject of external hæmorrhoids. On February 23rd, chloroform was administered (by Clover's apparatus) in the theatre by Mr. Beer; and there were present the house-surgeon and his assistant, the house-physician, a student, and myself. Mr. Beer noticed, amidst some struggling, that both pupils were dilated; but the respiration was not stertorous. The operation of slicing off the hæmorrhoids and applying the actual cautery was quickly finished by the house-surgeon, when at once respiration ceased, the features became