ON THE SYMMETRY OF THE PANCREAS AND SPLEEN :

DO THE SHOULDER-TIP PAIN AND OTHER SYMPATHETIC PAINS OCCUR IN DISEASES OF THESE TWO MEMBERS OF THE PNEUMOGASTRIC SERIES ?

By D. EMBLETON, M.D., F.R.C.P.,
Physician to the Newcastle Infirmary.

II.—THE SPLEEN.

THE same plan will be followed in investigating this organ as in that of the pancreas (see BRIT. MED. JOURNAL, Sept. 27th, 1873), and under the following six heads.

1. The idea entertained of the spleen, as to its unity, duality, or plurality, its symmetry or asymmetry, by descriptive anatomists, and its varieties, in man.
2. The account of its earliest foetal condition, as given by developmental anatomists.
3. Its comparative anatomy.
4. Its supply of blood-vessels and nerves.
5. The conclusion suggested by a consideration of the above four heads, and by a comparison of the spleen with the liver.
6. Lastly, the question, Do the shoulder-tip pain and other sympathetic pains occur in diseases of the spleen as in those of the liver ?

1. By descriptive anatomists, the spleen is either plainly defined as, or is assumed to be, normally a single organ, as is the case with the pancreas; its larger end is called "the head", its lesser end "the tail", and between the head and the tail is the "body", of which can be made "neither head nor tail". The quotations, given below in foot-notes,* express the prevalent idea of the unity of the spleen, and also detail the varieties to which this organ is subject in the human body.

In these extracts (and many more might have been collected had it been necessary) it is laid down and taught that the spleen is normally single, but that it is found from time to time to have from one to twenty-three supernumerary or accessory splenuli more or less near to it. No expression is given to an opinion that the spleen might possibly be a double organ, and have symmetrical relations with the median line

* a. Riolanus, jun., states that, "in respect to number it is wont to be singular; sometimes it has been observed to be double or threefold." (*Anatomy and Physic*, English translation, circa 1648, book ii.)

b. Bartholinus: "Though commonly single, it is seldom double, more rarely treble", and he has seen it "divided into five portions." (*Anat. Bartholinian.*, Lugd. Bat., 1674.)

c. Blancardus: "Splen . . . raro loco mutatur, sed magnitudo sæpe variat, aliquando in duas partes divisus duplicem quasi lienem representat." (*Anat. Reformat.*, Lugd. Bat., 1687.)

d. Gibson: "It is commonly but one in man, though some have found two—yea, Fallopius three. In dogs, there are sometimes two or three unequal in bigness." (*The Anatomy of Humane Bodies Epitomised*, Lond., 1697.)

e. Winslow: "The figure of the spleen is not always regular, and is as various as its size. Sometimes it has considerable scissures, both in its sides and edges, and sometimes it has appendices. I have sometimes found a kind of small distinct spleen more or less round, and connected separately to the omentum at some distance from the extremity of the ordinary spleen." (*The Anatomy of the Human Body*, translated by Douglas, Lond., 1764.)

f. Cheselden: "Sometimes it is divided into lobules; but for the most part has only one or two fissures on its edge, and sometimes more. I have twice in a human body seen three spleens, twice two, and once four; some of these were very small, and others equal; but altogether in any of these bodies were not larger than the one which is usually found." (*The Anatomy of the Human Body*, 13th edit., Lond., 1792, p. 167.)

g. Cruveilhier: "The spleen is single in the human subject. I have never seen more than two supernumerary spleens in man." He doubts, but does not deny, the possibility that there may be ten, twelve, or even twenty-three. (*Descriptive Anatomy*; Tweedie's *Library of Medicine*, vol. vii, 1842.)

h. Ribes: "La rate est ordinairement un organe unique, cependant il y en a plusieurs; en effet, Cabrol, Morgagni et Dominique de Marchettis en ont rencontré deux; Cluselden (Cheselden probably) et Fallope en ont vu trois; Fanton dit avoir observé des sujets qui en avaient quatre, Guy Patin et plusieurs autres anatomistes en ont trouvé jusqu'à cinq; mais alors il y avait constamment une plus volumineuse, et qui était située plus haut, lorsque les autres, plus petites, étaient placées plus bas, dans l'épaisseur de la partie supérieure et gauche de l'épiploon. Ces rates surnuméraires existent plus particulièrement dans le jeune âge et disparaissent probablement à une époque avancée de la vie, car on en trouve rarement chez les vieillards." (*Dictionnaire des Sciences Médicales*, tome xlvii, "Rate", 1820.)

i. Huschke: "Die Milz ist eine unpaare Blutdrüse," but has many varieties of supplementary spleens—generally one or two; but from four to seven, or even twenty-three, have been observed. (S. T. von Sommering *vom Baue des Mensch. Körpers*, fünfter Band, 1844.)

j. Kölliker: "The spleen is a single, so-called vascular gland; its outer surface oft exhibits a more or less deep and oblique incision." (Todd's *Cyclopædia*, vol. iv, 1847-1849.)

k. Quain, Ellis, and others, believe in its unity, and, with Kölliker, repeat the stock account of numerous supplementary splenuli. (See Quain's *Anatomy*, 7th edition; and Ellis's *Demonstrations of Anatomy*, 3rd edition.)

l. Bright: "It is by no means uncommon to find one, two, or three small spleens, from the size of a filbert to that of a walnut, quite separated from the large spleen." (*Clinical Memoirs on Abdominal Tumours*, New Sydenham Society, 1860.)

of the body. It is not stated, indeed, by any anatomist whose works I have been able to consult, that the spleen is double or symmetrical (more or less) in the same sense as that in which the heart, lungs, and liver are double and symmetrical. All through, it is a single organ, and we know that it is one lying on the left side; indeed, the constantly and literally sinister location of the spleen seems to have entirely excluded the idea that it could possibly be an organ with the same relations to the median line as the rest of the viscera of the thorax and abdomen.

Even when two spleens have been encountered, it does not appear to have been conjectured that one might possibly have belonged to the right, and the other to the left, side of the body; and in the cases of triple or multiple spleens, the lesser have been regarded simply as ununited portions of the largest one. The fact of their existence has been duly noted, and the note is that of a curious, unaccounted for, and barren fact.

2. What we know of the Development of the Spleen appears to be contained in the subjoined extracts from the best authorities on the subject.*

From these we learn that the spleen originates on the median line of the body, is gradually carried thence, during the progress of the development of the abdominal organs, to the left hypochondrium, and that it ought to be regarded as originally median, not belonging to the left side more than to the right. Not one of these authorities treats the spleen otherwise than as a single organ.

3. It may here be observed that, as the pancreas, in man, is liable to several varieties—and these are, as Tiedemann pointed out, found to occur in the lower animals—so, again, in the case of the spleen, there exist, in man, several varieties, which also are discoverable in the lower animals. Of both pancreas and spleen, however, varieties diverse from those that are human are to be met with in the lower vertebrata. The extracts, in the notes below, from the *Comparative Anatomy of the Spleen*, by Professor Owen and by Mr. Gray,† exhibit the principal varieties

* a. Johannes Müller (*Physiology*, translated by Baly, 2nd edit., vol. i, 1840) tells us: "This portion of peritoneum (the great omentum) passed originally from the spinal column to the middle line of the great curvature of the stomach, forming a mesogastrium, in which the spleen was developed. The spleen, therefore, is not an organ proper to the left side of the body, of which the fellow of the opposite side of the body is wanting, but it should be regarded as an organ originally situated in the middle line, just like the liver, which at first, when its two lobes were equal, did not belong to the right side more than to the left."

b. Quain (*Anatomy*, 7th edit., 1867, p. 888) says: "It appears in the fœtus about the seventh or eighth week on the left side of the dilated portion of the alimentary canal or stomach, and close to the rudiment of the pancreas. By the tenth week it forms a distinct lobulated body placed at the great end of the stomach."

c. Kölliker states: "It is developed at the end of the second month, in the fœtal mesogastrium, at the fundus of the stomach, from a blastema, which, derived from the middle layer of the germ, independently of the stomach, the liver, and the pancreas, collects in this situation." (*Manual of Human Histology*, vol. ii, p. 158, Sydenham Society, 1854.)

d. Sanders (Goodsir's *Annals of Anatomy and Physiology*, part ii) affirms that "the spleen is single, because it is originally developed on the median line."

e. On the other hand, Felix Plater (*De Corp. Human. Struct. et Usu*, Basil, 1583), quoted by Gray in the Historical Introduction to his well-known work on the Spleen, argued "that as all azygos parts are placed on the median line of the body, the spleen cannot be one, as it corresponds in situation and structure with the liver, and therefore it must be the liver of its own side—an opinion he attempted to prove by many arguments."

Not being able to consult Plater, I cannot state his arguments, or what he may have said further on the subject; but, from the above quotation, he appears to regard the spleen, as he does the liver, as a single organ, not a double one; symmetrical, not in itself, but as a pendant to the liver, its supposed fellow of the right side.

† In Fishes it is usually single; in the skate and all the highly organised Plagiostomes, as in the basking shark, it is subdivided into numerous distinct lobes. In the sturgeon there is an accessory spleen. (Owen.) In Birds it is single. (Owen.)

Among Mammalia, in the ornithorhynchus and echidna, the spleen consists of three lobes (Gray); in the former, of two only. (Owen.)

A small supplementary spleen is found at times, in addition to the regular one, in porcupines and agoutis, and in the *Dasyppus sex-cinctus* (Owen). Gray has found, in *Dasyppus*, the organ deeply divided into two lobes. In the great anteater the upper end, and in most Marsupials the lower end, is bifurcated.

In some Cetacea the spleen is remarkable for its subdivisions; the largest, in the porpoise, equals a walnut; the others, to the number of four, five, or six, are of much smaller size (Owen). Gray noticed six, Cuvier seven, Bartholin three, and Hunter two only. (Gray.)

In the hyrax, Owen found it broad, flattened, semilunar, with occasionally a narrow process from its middle, like a handle (indicative, perhaps, of a tripartite division).

In the seal the organ was a flattened body, with an irregular notched margin; and in the gastro-splenic omentum were situated a number of small dark glandular bodies, from the size of a horse-bean to that of a pea, resembling the omental splenuli in the porpoise: these were not found in a second specimen. (Owen.)

Gray states that "in the ichneumon, whilst it presents the elongate form most usual in the Carnivora, it has the singular peculiarity of being completely divided into two lobes, which are connected together through the medium of the peritoneum."

Owen says: "In the aye-aye it is an elongated trihedral body, bent at nearly a right angle upon itself, the lower portion being nearly half the length of the upper. It presents the like shape and position in the lemurs."

It shows a subtriangular form in the baboon, where one angle is attached to the stomach, another to the kidney, and a third projects freely into the epiploon."

"With some minor variations, the spleen is single in all other Mammalia."

of the spleen in those orders of animals in which the organ exists. In these extracts we find the spleen of the lower animals presenting a considerable variety of form; it is treated, on the whole, as a single organ, but also in detail as one that is double, triple, or multiple, according to the number of supplementary splenules, as a bilobed, trilobed, or multilobed viscus, and in these respects it resembles the liver and pancreas in comparative anatomy; but, in the two works from which the extracts are taken, we fail to discover any indication whatever that the spleen, whether single, double, or multiple, is regarded as double in the same sense in which the liver, lungs, and heart are double, or that it has any claim to be considered as in any way bilaterally symmetrical. In the ichneumon, in which the spleen is completely divided into two separate lobes "connected together through the medium of the peritoneum", it would be interesting to know whether these both belonged to the left side; whether, that is, they both received nerves from the same side of the body, or one set from the right, and the other from the left side, or what the actual distribution of the nerves was.

On the whole, the spleen of the lower animals, like that of man, is said to be a single, and it is a left-side organ. In its origin, we have seen that it is also single, but belongs not more to the left than to the right side of the body. The accessory splenules are, doubtless, in reality, portions of the larger body—some belonging perhaps to the head, others to the tail—that have been separately developed *ab initio*, or have failed to coalesce with it during growth, or have become detached from it at an early period during its migration from the median line of the body to the left hypochondrium, and represent a sort of tendency to diffusion of the organ, such as is seen in the pancreas of the Rodentia, and (may it be said?) in the lung of birds and the heart in Reptiles.

The entire normal spleen is nothing, as we know, but an aggregation of small splenules, each of which possesses its own blood-vessels and nerves. It appears, then, that the indication given by developmental anatomy that the spleen is originally a median, and therefore a symmetrical organ, and hence may be found to retain, even in its adult condition, some vestiges of its original state, appears to have been overlooked.

4. Let us now look at the blood-vessels and nerves of this so-called single and left-side organ as described in human anatomy.

a. Blood-vessels.—The *splenic artery*, from the coeliac axis, that is, from the median line of the body or front of the aorta, as it approaches the spleen, divides dichotomously; the upper and larger branches going to the "head", the lower or smaller to the "tail", each set supplying a part of the "body", the ultimate offsets being destined each for a distinct and separate portion of the organ. This being the case, it would appear to be matter of little real moment whether the spleen be aggregated into one large mass, or dispersed about in a number of small ones. In either case, the function of the organ would probably be equally well performed.

Veins.—These correspond in distribution generally to the arteries, but are of much greater calibre.

b. Nerves.—The proper nerves of the spleen constitute a portion of what is commonly termed the splenic plexus. The coeliac plexus, the first great offset from the semilunar ganglion on the median line, divides, speaking generally, into the gastric, hepatic, and splenic plexuses. The splenic follows the general course of the splenic artery; and that part of it which is destined for the spleen divides into offsets, which, together with those of the sympathetic, accompany the branches of the artery into the organ.

The question now arises, How is the proper splenic plexus made up? What nerves enter into its composition? This question is differently answered by different anatomists, and may be considered still to be an open one. The majority appear to hold that this plexus is made up of branches from the right and left divisions of the semilunar ganglion, and of one or two offsets from the right pneumogastric nerve. That the right pneumogastric, and not the left, assists in the formation of the splenic plexus, is laid down by Todd and Bowman, Quain and Sharpey, John Reid, Swan, Gray, Valentin, and Kollmann. Todd and Bowman give the left semilunar ganglion and right pneumogastric as forming the plexus. Sappey and Hirschfeld give no communication between the pneumogastric nerves and the splenic plexus. Cruveilhier says, "it has been stated that some terminal divisions of the pneumogastric have been seen distributed to the spleen".

The discrepancy of anatomical testimony is considerable; nor is it to be wondered at by those who have attempted the dissection of the parts.

The spleen, being an organ originally formed on the middle line of the body, ought, it may, *a priori*, and from its analogy of origin with the stomach, liver, and pancreas, be supposed to be provided with nerve-branches from both semilunar ganglia and from both pneumogastrics; and it is somewhat difficult to conceive how it can be otherwise. If the spleen be not so provided, it is the only exception to the rule which holds good for the whole series of pneumogastric organs.

Descriptive anatomy, however, as it now stands, is against such *a priori* and analogical supposition, for no one author allows to the spleen nerve-branches from the left pneumogastric, though the spleen lies conveniently, so to speak, on the left side of the body. May one be allowed to express an opinion that this intricate part of difficult anatomy demands, both in the human subject, and in the other Vertebrata, a careful reinvestigation, special attention being directed to the sources of nervous supply for the spleen? This opinion is expressed with diffidence in the face of the high authorities quoted.

We may now enter into a comparison of the spleen with the liver, and see what light it throws upon the former viscus. And first let us, as was proposed in my former paper with regard to the pancreas (BRIT. MED. JOURNAL, Sept. 27, 1873), alter, at least in imagination, the situation and position of the spleen. Let us lay it on the median line of the body, its original site, placing its outer and convex surface uppermost, and its hilus undermost, supposing the body to be erect, so that its posterior thick border shall be behind, and its thin fissured edge in front, and the fissure itself, or the principal fissure, when there are more than one, on the median line of the body; now, the larger end, or "head", will be on the right, and the lesser end, or "tail", on the left of that line, and they will correspond respectively in position, and somewhat in relative size to the right and left lobes of the liver, and also to the splenic and duodenal lobes of the pancreas. The hilus of the spleen will also correspond to the transverse fissure of the liver, and the fissure in the thin edge of the former to the longitudinal fissure of the latter. The splenic artery will, moreover, correspond to the hepatic, and the splenic veins in some measure, as in relative size to the arteries, to the hepatic veins. The nerves, lastly, of the spleen will, it is presumed, correspond, in distribution at least, with those of the liver, going to the right and left divisions of the organ with the arteries.

Further investigation of the origin of the splenic nerves may possibly show that they are derived from each side of the semilunar ganglion, and from each of the members of the par vagum; and that the nerves from the right side are distributed mainly to the head, or right end or lobe of the spleen, and those from the left side of the body to the tail, left end, or lobe, an arrangement corresponding with that which exists in the case of the other pneumogastric organs. It may be suspected that, as the part of the spleen below (in its ordinary position) the fissure is commonly much less than the other above it, so the nerves of the former may be fewer and smaller than those of the latter, and that thus, in the intricacy of the combinations of the nerves of the solar plexus and its offsets, the minute left-side twigs may have escaped detection. The portal veins passing into, and the bile-ducts issuing from, the liver have of course no counterparts in the spleen. Of the lymphatics of the spleen we know very little.

In comparative anatomy, as we have seen from Owen and Gray, the spleen is like the liver, either single, or bilobed, or trilobed, or multilobed, or has a still further tendency to disintegration and diffusion.

Lastly, the spleen and liver both arise on the median line of the body, and do not belong, then, more to one side of it than to the other. Thus, there is a parallelism approaching completeness between the spleen and the liver which I am not aware has been previously pointed out; and, viewed thus, the spleen is, in form, a curiously modified repetition of the liver, and, it may be said, to a certain extent also of the pancreas.

The spleen apparently is not, properly speaking, an azygos organ, neither is it the "liver of its own side"; it is a viscus that has arisen independently of the stomach, liver, and pancreas, and belongs in origin, as much as they do, to the mesial line; and was then probably double and symmetrical, as, in its adult state, it is, according to the above view, double and symmetrical in the same modified sense that they are, but in a manner and degree different from them.

These four organs, arising as they do, develop themselves differently in direction, form, structure, and function, and during the course of that development lose more or less of their original symmetry, and end in the perfecting of four viscera, each of which has its own peculiar morphological, anatomical, and physiological properties, and a common relation to the median line of the body. Of the four, the spleen is the most aberrant in form and position; but its original form is not so completely obscured that we cannot detect evident traces of it when we carefully study the organ, and compare it closely with its big brother, the liver; nor ought its sinister position in the adult body to deceive us when we are acquainted with its birthplace and migration.

5. If this parallel of the spleen and liver be correctly drawn, then there is no exception to the rule of double viscera in the abdomen any more than in the thorax—if we regard the alimentary canal, the bladder, and the uterus as made up of two lateral halves; and this much neglected and despised, insulted and abused outcast of a little organ has its obscured form and symmetry brought to light and vindicated, and it is

thus established in its legitimate place in the ranks of its abdominal congeners, and one of those mysterious difficulties in which it has hitherto been shrouded has been removed. It is no exception to the rule.

The exact functions of the spleen still await and invite the researches of physiologists.

6. If the spleen may, therefore, properly be regarded as an organ quasi-symmetrical in form, like the liver, it would be reasonable to expect, as already said, that it should also receive nerve-twigs from each pneumogastric and the sympathetic ganglia of each side; and that the shoulder-tip pain should consequently be found, when present, at times on one side, at times on the other side, at times, perhaps, on both sides; but, if the anatomy of the splenic nerves be correct, then the shoulder-tip pain, when present, should always be on the right side, together with all the attendant sympathetic phenomena.

The cases and quotations given below in notes exhibit sufficiently what has been observed to call the attention of studious members of our profession, particularly of those who have good opportunities of studying diseases of the spleen, to a discrepancy that exists between the results of pathological observation on the one hand, and of anatomical research on the other.

There is error on one side or the other; but I will only say that the observation and verification of symptoms of disease are much more easily performed and repeated than the dissection of the par vagum and the sympathetic nerves in the abdomen—a task which requires a skill, a dexterity, and a patience, with which few only are endued.

The cases, etc., are arranged in two series. The first contains what has been gleaned from different authors of works on splenic diseases; the second, cases from my own practice at the Newcastle-upon-Tyne Infirmary.

SERIES I. From Authors.—Grotanelli* (*Ad acuta et chronica Splenitidis historiam animadversionem*. Auctore Stan. Grotanelli, M.D., etc. Florentiæ, 1821) mentions the occurrence of pain in the left, not the right, scapula and shoulder, as well as in the spleen, in splenitis and abscess of the spleen.

The pain in the anterior part of the neck that occurs in cases of wounds of the spleen, and is mentioned in the *Dictionnaire de Médecine*, tome 18me, article "Rate", p. 221, by C. P. Ollivier, 1827, and in some later works, I suspect to be located in one of the pneumogastric trunks in the neck, though, unfortunately, the side on which it occurs is not mentioned. The passage from the *Dictionnaire* is given below.† The expression "partie antérieure du cou" is sufficiently vague to admit of such a suspicion, particularly as we know that pain in the trunk of that nerve does occur in some splenic diseases.

Cruveilhier, in his *Anatomie Pathologique*, tome i, 2me livraison, figs. 1 and 2, "Maladies de la Rate", gives us a very interesting case of splenitis.‡ In this case, the pain of the left shoulder was signally marked, and was taken by Cruveilhier to be of a rheumatic nature; and it had not appeared to him as worthy of being considered as a purely sympathetic pain. It is also worthy of note that, during the in-

* Page 4, Simple Splenitis: "Sitis permulta; tussis sicca; rara primum, dein frequens et molesta; ea enim exurgente acuto lateris et scapulae sinistrae dolore premi, et dolentem lienem magis sibi intumescere queri, gibbumque illius adsidentibus ostentare solebat."

Page 18, Splenitis, with evident tumour and tenderness: "Lecto repositus profundior in sinistra abdominis parte dolor et ad omniplatum sinistrum extensus dum eructaret vel tussiret."

Page 69, Splenitis, with rupture of abscess into peritoneum: "Corripitur longum post iter, pluvioso celo, pedibus velociter emensus, febri specie catarrhali, typo quotidianæ intermittentis, quartum circa diem splen acriter dolere et intumescere cœpit. Tunc nausea, vomendi nisus, sinistri humeris dolor, tussicula, sitis multa exsurgunt."

† "La direction de l'instrument en pénétrant dans l'abdomen, la sortie d'un sang très noir dans la plaie, le gonflement et la douleur à l'hypochondre gauche, une soif ardente, une douleur à la partie antérieure du cou, tels sont ordinairement les divers symptômes qu'on observe", etc.

‡ "Splenite-pusconcret combiné." (Extract condensed.)

"Le 3 Sept. N., æt. 28, d'une très forte constitution, cuisinière, était dans l'état suivant. Face très colorée, langue rouge, lisse, sans enduit; poulx médiocrement fréquent; sueurs abondantes presque continuelles; douleur rhumatismale assez vive à l'épaule gauche; d'ailleurs, nulle douleur. L'exploration la plus attentive des cavités thoraciques et abdominale ne me permit pas de découvrir aucun point de départ."

"Tout à coup, le 11 Sept., sur le soir, invasion d'accidens graves, frisson masqué, suivi de suffocation, d'angoisse inexprimable, de nausées, de vomissemens bilieux; ces accidens se dissipèrent pendant la nuit. Le 12 et 13, répétition des mêmes symptômes. Le 14, la douleur scapulo-humérale, qui avait entièrement disparu les jours précédents, reparait; l'abdomen est souple et indolent, la langue est très rouge, le poulx est peu fréquent, et sauf les envies de vomir, etc., la maladie est à peu près la même qu'avant l'invasion des derniers symptômes. Les jours suivans le 19, symptômes aux épaules pour remplir une indication à laquelle j'aurais dû peut-être obéir plutôt. Je ne pense pas que les douleurs aux articulations scapulo-humérales aient été purement sympathiques. Le 20. Jour de la mort."

After death, the spleen was found enlarged to seven inches in length, inflamed and covered with false membrane, which fastened it to the diaphragm. In its interior a varied discolouration was seen, white with red patches, and deposits of pus, most of them concrete, but one of them fluid.

tensity of the inflammatory disturbance going on in and about the spleen, the general circulation, or, at all events, the action of the heart, was not in this case materially quickened: the pulse was *mediocrement*, or *peu fréquent*. May this not have been owing to irritation or excitement of the cardiac branches of the par vagum, through their connection with the splenic branches, having heightened what is called "the inhibitory power of the pneumogastric", which state would thus keep down the action of the heart? This is a possible occurrence, and one which Cruveilhier could not at that time understand, any more than he could the violent shoulder-pain, which he called rheumatic, but which would appear to have been a pretty certain indication, taken with the other symptoms, that severe inflammatory action was going on in the spleen.

It is a well known fact that, in the most vital viscera, severe local inflammatory action may take place, and lead to abscess, with little or no important general disturbance until the bursting of the abscess take place; even the local mischief going on may not be suspected. But when we have a prominent symptom, like that of severe pain in the shoulder, as in the case quoted from Cruveilhier, we may feel confident, I think, that some one or other, or more than one, of the pneumogastric organs, is deeply engaged in an inflammatory process. In such a case, the state of the heart and of the general circulation would be a fallacious guide; whilst the shoulder-tip pain might be the best diagnostic aid we could possess.

Dr. Copland, in his *Dictionary*, vol. iii, part 2, notices, under the headings of Acute and Chronic Splenitis, the occurrence at times of pain in the left shoulder in adults and in children.*

Dr. Bigsby, in the *Cyclopædia of Practical Medicine*, 1835, vol. iv, p. 56, also notices the occurrence of shoulder-pain, probably of the left side, though the side is not specified, thus:†

SERIES II. Cases in my own Practice.‡—These, ten in number, are

* At page 894, to the symptoms enumerated of acute splenitis, he says, "are generally added nausea and depression, a sense of tension and fullness, extending from the epigastrium round the left hypochondrium, and sometimes vomiting. A feeling of weight, oppression, and tension, is soon followed by more or less acute pain, extending often to some distance around the splenic region, and sometimes to the left shoulder."

Again, at p. 897, in chronic splenitis in children, among the symptoms he names: "The pulse is frequent, especially in the evening, and a remittent or hectic form of fever is commonly present; general uneasiness, headache, slight difficulty of respiration, and occasionally palpitation, and pain in the left shoulder, are also complained of."

† In chronic splenitis, "when the pus is deposited in the parenchyma, the membranes being sound, or nearly so, the pain of the part is small; but there is uneasiness, and both strength and flesh waste gradually till the patient dies. As soon as the investing membranes are affected, the sufferings become varied and acute, frequently with a peculiar heat in the left hypochondrium. The pain often strikes to the spine, clavicle, or shoulder."

‡ CASE I (vol. iv, p. 72), August 16th, 1855.—W. J., 43, labourer, had for six months had dyspeptic symptoms, debility, and turbid urine. For six or seven weeks he had observed a swelling at the left side of the epigastrium, extending under the left ribs. It was now considerable—manifest to the eye, even, hard, tender on pressure, not reaching as far as the navel. His appetite was bad; he had nausea; the food lay heavy on the stomach for three or four hours. The bowels were usually costive; no blood was passed. He sweated much. He had pain at the back of the head, near the base. His urine was thick, and smelling badly. He never had ague. The left pneumogastric nerve was very tender in the neck on pressure; the right not tender. No pain was complained of in the shoulder. The above tenderness was several times verified during the patient's stay in hospital.

CASE II (vol. vii, p. 252), December 6th, 1858.—W. C. D., sailor, had pain and fullness over the abdomen, chiefly in front of the left lumbar region, where there were dulness and pain on percussion. There were dyspnoea and much œdema of the legs. Pulse 125, appetite bad, bowels open.—Dec. 20. At 9 A.M., he had a rigor for half an hour, followed by sweating. The anterior edge of the spleen was distinctly perceptible, and tender on pressure.—Dec. 27th. He was improving, but complained of pains behind the left ear.—Jan. 21st. The pain about the ear had gone, and was succeeded by pain in the left arm, from the elbow to the shoulder, with some induration and tenderness of the triceps extensor cubiti. There is no mention of shoulder-tip pain, or of tenderness of the pneumogastric nerves in the neck.

CASE III (vol. vii, p. 47), December 7th, 1858.—J. C., middle-aged, had the spleen much enlarged and hardened, with pains in the spleen and left shoulder, and tenderness of the left pneumogastric nerve. He was in general bad health.—Jan. 10th. In addition, he had pains in the calf of the left leg.—Feb. 4th. He had much pain over the liver, spleen, stomach, and bowels, with gripping, frequent desire, and tenesmus; surface pale, chilly, and perspiring. Pulse, 75; weak.—Feb. 7th. There was decided diminution of the size and tenderness of the spleen, which was more movable than before. He had pains in the epigastrium and right hypochondrium. The bowels were free; his appetite and complexion were better; the tenderness of the left pneumogastric nerve was nearly gone.—March 7th. He passed much flatulency at times from the bowels, which were open. His general condition was much improved. The tenderness of the nerve was entirely gone.—June 3rd. He was made an out-patient after several attacks of dysenteric diarrhoea.—June 10th. The spleen was smaller and less hard; there was some pain over the liver. There was tenderness over the left pneumogastric nerve, none over the right, and pain about the left scapula. The bowels were relaxed; the stools were like blue clay; the appetite was good.

CASE IV (vol. vii, and vol. viii, p. 106), December 29th, 1859.—J. C., 39, sawyer, had been previously an in-patient on December 2nd, 1858, having returned from the Crimea ten months before in bad state of health. He had pains in the epigastrium and in the legs, with diarrhoea and tenesmus. The stools were very mucous, but not bloody. There was great hardness over the splenic region, and a sensation as of something rising thence up the chest into the mouth, and occasionally pain on the left side of the head. He had pyrosis and flatulence, but the tongue was clean and the appetite sharp. His symptoms had been greatly relieved by free evacuation

taken from the records in my Infirmary case-books. Several other cases occur in them; but there is no entry of the existence of shoulder-tip pain in those cases, either because it had not existed, or because observation had not at the time been directed to that point. The cases are purposely much condensed, and the treatment omitted.

These two series of observations, so far as they go, answer in the affirmative the question proposed in heading 6 of this paper. The shoulder-tip pain *does* exist, though not always, in splenic disease. The proportion of cases in which it occurs is not known. But it is curious to observe that, instead of occurring on the right side, as one would naturally be led to conclude, from the book-anatomy of the organ, it would, it is most commonly found on the left side.

In the first series of observations, the pain is not noticed as being ever on the right side. Three of the authors specially mention the left side as its seat. The other two do not name the side; but it is fair to infer that one of them, Dr. Bigsby, means the left side; whilst the observation of M. Ollier may be taken as neutral.

In the second series, pain at the shoulder-tip was complained of by the patient in three cases only, Nos. 3, 7, and 9, of the ten, and was not complained of in the other seven. In these three cases, the pain was exclusively on the left side.

The left pneumogastric nerve was found tender on pressure in six of the ten cases, Nos. 1, 3, 4, 5, 7, and 9; the right nerve in two, Nos. 8 and 10; and both nerves in one case, No. 6. In the remaining case, No. 2, no mention is made of pain or tenderness in either pneumogastric; but there was pain in the left ear, and in the left arm from elbow to shoulder. The cases 7 and 9 were the best marked examples, and the most carefully noted, of the connection of the par vagum with

the spinal accessory, and of this with the painful spot at the top of the shoulder.

We have, moreover, in the second series of cases, instances of pains in the left scapula and left side of the chest, left loin and even left leg, left side of neck and head and left ear, temple, and part behind the ear.

In cases 8 and 10, in which the right nerve was tender, there were no other sympathetic phenomena noted as belonging to that side; but the sudden darting of pain, in case 10, from the compressed tender nerve down the chest to the spleen, was striking, and gave occasion to the remark that, in this case at least, the spleen received a branch or branches from the right pneumogastric nerve, according to the anatomical rule.

We know that all persons are not organised alike; and possibly all spleens are not nerved alike—some receiving their nerves from the right, some from the left side, and some from both sides.

The pain at the shoulder-tip, when present, varies greatly in intensity, and may coexist or not with the splenic pain. It appears to increase with the severity of the splenic affection, as is clearly seen in the interesting case quoted from Cruveilhier, and to decline with its subsidence; being thus in certain cases, and in some measure, an useful indication of the state of the disease.

When active pain at the shoulder is present, not only is the pneumogastric nerve of the same side tender on pressure, but also the external division of the spinal accessory, in its course from the base of the skull to the edge of the trapezius, where it enters that muscle; indeed, when no pain is complained of at the shoulder-tip, these nerves will not unfrequently be found tender, and the patient quite unaware of such tenderness. Some patients, indeed, with splenic disease appear

of the bowels. The urine was thick, and there was considerable loss of flesh and debility.—Dec. 13th to 20th. He had pain also over the liver and spleen, and tenderness on pressure, and a good deal of general swelling over the abdomen.—Jan. 10th, 1859. The spleen was gradually becoming softer and less tender. His health was better. He had pain in the calf of the left leg.—Feb. 4th. There was much pain over the liver, stomach, and spleen, and towards the middle and lower part of the abdomen. The spleen was more movable; it seemed to drop down when he got up. He had gripings and tenesmus. The left pneumogastric nerve was tender on pressure.—Feb. 28th. He had a chill, almost a rigor. On the whole, he is improving.—In March he had some dysentery, and also in May, when some blood passed; anterior border of spleen nodulated and hard.—June 1st. The spleen was not so hard, less in size, and less tender. There was some pain over the liver. There was tenderness of the left, but none of the right, pneumogastric. He had pain about the left scapula. The bowels were rather relaxed. He became an out-patient.—June 24th. He was readmitted, with dyspnoea and oedema of the legs, and mitral murmur at heart. He had pains between the scapula and in the chest, above the left mamma. In July, he had repeated epistaxis, severe abdominal pains, and purgings.—August 5th. He had cramps and diarrhoea, particularly if he fell asleep on his right side; afterwards epistaxis, cough, and bloody expectoration, and at times dysentery. In December, there were advancing prostration, abscess and bed-sore over the left hip, followed by hæmorrhage. He died on December 28th, after obstinate and uncontrollable purging.—*Post mortem* examination thirty hours afterwards. The body was much emaciated. Rigor mortis was present. The abdomen was distended; there was no oedema. There were extensive and firm adhesions of the right lung to the chest; none on the left side. There was serous effusion into the pleuræ. The lungs were crepitant and free from tubercle. The pericardium was free, and contained a little serum. There was atheromatous deposit on the aortic valves and ascending aorta, producing in life the bellows-murmur which was thought to have been at the mitral orifice. There was a little hypertrophy of the left ventricle. Two or three pints of serum were found in the peritoneum. The liver was enormously enlarged, weighing 7 lbs. 1 oz.; it presented a granular nutmeg appearance, and was friable, but there was neither tubercle nor abscess. The gall-bladder held a little bile; no calculi. The upper and back part of the liver was adherent to the diaphragm; at the under surface were strong adhesions to the colon. The stomach, larger than usual, contained a dark grumous fluid. The pyloric orifice was so much constricted that the little finger could hardly be pushed through it; a narrow, even, cartilaginous band forming the constriction. The intestines, examined at various points, presented no visible change of structure. The spleen weighed 3 lbs. 4 oz., and was adherent by its upper end to the diaphragm, and by its side to the descending colon. It was pyriform; its anterior edge nodulated. On section, its texture was firm, hard, and consolidated, containing little blood. At about the middle of the upper end, a portion about the size of a large walnut appeared to be tubercular. The blood from the splenic vein showed under the microscope a much larger proportion than normal of white cells. The kidneys were degenerated in the cortical parts.

CASE V (vol. viii, p. 72), May 24th, 1859.—P. S., 26, labourer, complained of violent headache and inability for any kind of exertion, pain in the spleen, and ague fits daily.—May 27th. He had a paroxysm daily, but that of the 26th was postponed from 8 A.M. to noon. He had pain in the head. The tongue was slightly furred; the bowels free. Pulse, 64; small. The respiratory sounds were feeble. He had tenderness of the left pneumogastric.—June 3rd. He had no more fits. There was pain of the middle of the back and of the legs.—June 4th. He was dismissed for disorderly conduct.

CASE VI (vol. xi, p. 50), August 14th, 1862.—C. F., 29, had been ill about ten weeks—at first with tertian, and latterly with quotidian, ague. The tongue was slightly furred; the appetite bad; the bowels regular. The anterior border of the spleen, uneven and hard, could be felt under the ribs of the left side, and became more distinct on full inspiration. It was tender on pressure.—Sept. 1st. He had great pain of the head, relieved by cupping on the nape. On the last visit, three days ago, he complained of tenderness, on pressure, in the neck, over the pneumogastric nerve of both sides, and some tenderness also over the liver.

CASE VII (vol. xi, p. 132), October 30th, 1862.—J. C., 42, labourer, strongly built, but sallow and debilitated, had been bled annually for twenty-five years, and had taken purgatives frequently. Two years ago, owing to rapid alternations of heat

and cold at his work, he became dropsical in the legs and belly, and got pains in the legs. He had never had ague. Three months ago he found a tumour, the seat of severe stinging pain, tender on pressure, and gradually growing larger, in the left hypochondrium. No ascites was present; but oedema of the legs, especially the left. The notched anterior border of the spleen could be easily felt within three inches of the navel; and its hard, smooth, external surface was distinctly traceable into the left hypochondrium. The organ measured at least six inches in length. The left loin was tender. The left front of the chest, and the left shoulder behind the acromion, often ached, and were painful; and there were some cough and dyspnoea on exertion, and palpitation of the heart. In the neck, the left pneumogastric and spinal accessory nerves were painful, under pressure, along their whole course; and there was a complete absence of pain and tenderness on the right side of the neck over the course of these nerves. There was heaviness of the head, vertigo, and noise in the ears, especially in the left. His appetite was generally good; the bowels costive. He had piles, but never diarrhoea or melæna. There was no albumen in the urine. An abundance of white cells were present in the blood; they were more numerous than the red discs.—Nov. 15th. He had dull pain in the spleen, nausea, griping, and purging of blood.—Nov. 28th. He was so much relieved that he was made an out-patient.—Jan. 9th, 1863. He was re-admitted. He did well for three weeks as out-patient. Very little pain existed in the spleen, which was much less, softer, and less tender on pressure. Pain passed up at times from the spleen to the left shoulder and temple, particularly at nights. The red discs were greatly multiplied, and the white cells relatively less numerous. He went out in February, much restored, with directions to use no more bleedings.

CASE VIII (vol. xi, p. 72), February 21st, 1863.—J. D., 50, pitman, six months since had a swelling over the hypogastrum, extending to the left hypochondrium over the splenic region, with pain and uneasiness passing to the back. He had been somewhat intemperate. He had had several severe rigors—one three days ago. Bowels costive; tongue clean; appetite bad; pulse 88, weak; urine plentiful.—Feb. 27th. He has been leeches, but not relieved. The pneumogastric nerve of the right side was more tender than that of the left.—March 13th. He was improving. There was little or no tenderness of the pneumogastric nerve.

CASE IX (vol. xx, p. 98), January 26th, 1872.—T. B., 60, had had quotidian ague for nineteen weeks, got in Canada. He had pain of the back, from the sacrum to the loins. There was no tenderness over the liver or front of the splenic region, but at the back and side of the left hypochondrium on pressure. There was no cough or sputum. When pressed in the neck, the left pneumogastric was painful. Tongue clean; bowels open; urine high in colour, and thick.—February 2nd. He was not so well. He had intense pain in the left side, on which alone he could lie. On close examination, dullness on percussion was found over the five lowest ribs of the left side. He had palpitation of the heart. There was pain in the neck along the left pneumogastric nerve, and the external division of the corresponding spinal accessory. This pain was worse when that of the spleen was more severe, and it was sometimes of a throbbing character. The blood-discs varied greatly in size; many were much smaller than normal, and others fragmentary. The white cells were scanty, smaller, and less granular than usual.—Feb. 9th. The pain in spleen and shoulder was diminished.—Feb. 12th. He had considerable pain up the left side of the neck, also on the left side of the head and in the left ear, but little in the spleen. He had pain in the small of the back.—March 22nd. There was a little return of pain in the left side. Bowels free; tongue clean. He had gained 10 lbs. in weight since admission.

CASE X (vol. xx, p. 123), July 11th, 1872.—J. M., single, 21, gardener, had never had ague till lately, though thirteen months ago he returned from America, where for twelve months he lived in an ague district. He had had a cold fit daily for three weeks, at 4 P.M., with headache, great thirst, etc., slight cough and expectoration, and night-sweats. There was tenderness over the epigastrum and left hypochondrium, which latter region was also the seat of pain. Splenic dullness extended vertically for six inches along the inframammary line, and horizontally for upwards of nine inches backwards from that line. He did not complain of pain in the shoulders; but on pressing the pneumogastric nerves in the neck, the left gave no sign of tenderness, whilst the right was decidedly tender; and the pressure gave rise to a darting pain, which went at once down the interior of the chest to the swollen spleen.—After July 13th, the fits were absent till the 28th; but on the 22nd, severe pain occurred in the stomach. After the 28th, the ague gradually left, and he went out on August 15th.

quite surprised that a tender place of which they were unaware should be made manifest to their feelings. These nerves normally are not tender on pressure, unless it be severe.

The shoulder-tip pain and the nerve-tenderness in these diseases are owing, as I believe they are in liver-diseases,* to an extension of irritation or inflammatory action from the diseased organ along its pneumogastric twigs to the trunk of the par vagum. In a case in which the morbid state of the spleen has been intense and continued for a time, this irritation or inflammation passes up the trunk of the nerve to the base of the skull, and even to the origin of the par vagum and the two divisions of the spinal accessory, giving rise there to pains and other disturbances.

There can be little wonder that the external division of the latter nerve becomes affected, when we recollect the intimate incorporation of the internal division with the pneumogastric, and the connections of the internal and external divisions with each other. When the irritation of the pneumogastric has reached the connection of this nerve with the external division of the spinal accessory, it appears to be "shunted", or diverted in part along that division, which it causes to be tender along its whole course to the shoulder-tip, and is at times manifested as pain at that part.

This shoulder-pain in splenic diseases will limit, on the left side most commonly, as it does generally in hepatic diseases on the right side, the respiratory movements of the sterno-cleido-mastoid and trapezius muscles, and thus the splenic side of the chest will be kept more quiet than it would otherwise be. When liver and spleen are both diseased, then both sides may be similarly affected in their movements.

The above morbid state of the pneumogastric trunk may and does, in its upward course, affect various branches, as those of the stomach, liver, heart, lungs, and even ear, giving origin to symptoms characteristic of disorder of one or other, or of more than one, of these organs; and an attentive observer may remark that many of the symptoms in cases of spleen-disease are attributable to parts which receive branches from the pneumogastric nerve. In fact, one has only to bear in mind the distribution of the offsets from that nerve to be able to say where pains and other morbid phenomena will in one case or another make their appearance.

There can be no doubt, however, that the morbid influence of a diseased spleen is felt and given notice of, not only by the pneumogastric, but by the sympathetic and spinal twigs of the organ, and through these several of the associated morbid symptoms are produced, especially those that arise in the spine and walls of the body, and in part also those that belong to the viscera themselves.

It is certainly worthy of notice how *unilateral* were many of these sympathetic affections in the majority of the cases given. It was most commonly the left side of the dorsal region of the spine, the left side of the chest, the left side of the neck, the left-shoulder-tip, scapula and arm, the left ear, the left side of the head, in front or behind the ear—even the left loin and leg, at times—that were the seats of suffering. Does it not seem very probable that in these cases the spleen derived its nerve-supply from the left vagus? The morbid influence, be it irritation or inflammation, which in these and similar cases constitutes the essence of sympathy of one diseased organ with another, appears to be conveyed from organ to organ along the nerves of the same side of the body more easily and naturally than from half organ to half organ along the nerves that cross the median line of the body.

There appears to be little doubt that, like the columns of the spinal cord, as they pass downwards through the medulla oblongata from the brain, the fibres of the par vagum and of the sympathetic, as they pass to the viscera, in part decussate on the median line, some from the right passing to the left side, and others from the left going to the right side, whilst the majority hold on a straight course on their own side. But we do not find anywhere described transverse commissural fibres passing direct from half organ to half organ across the median line of the body—such, for instance, as exist in the anterior and posterior parts of the optic chiasma, connecting together both sides of the optic parts of the middle brain behind and the two retinae in front. Now, between the eyes there appears to be a greater sympathy in disorder than between the halves of the other divided organs, perhaps on account of the direct nervous connection between the retinae; and it is perhaps on account of the want of such direct commissural fibres that sympathetic disturbance extends more easily along the nerves of one side instead of crossing the median line.

* See a paper on Shoulder-tip Pain in Liver-Diseases (BRIT. MED. JOURNAL, October 22nd, 1870).

DR. WHEELER, R.N., formerly attached to the British Legation at Yedo, has been presented with a testimonial and a flattering address by the English residents on his removal to Yokohama.

RETRO-PHARYNGEAL ABSCESS.*

By MARTIN G. B. OXLEY, L.K.Q.C.P.,
Physician to the Liverpool Infirmary for Children.

RETRO-PHARYNGEAL abscess has been frequently and fully described, but cases of this disease are comparatively so rare and difficult to diagnose, that I think your time will not be wasted by my relating a case which has recently come under my notice, and also making a few remarks as to its nature and treatment. Dr. West, who mentions four cases which came under his observation—two being idiopathic, and the other two secondary to disease of the cervical vertebrae—has been able to find records of only twenty-six cases of this disease in children under ten years. Dr. Abercrombie, in the *Edinburgh Medical Journal* for 1819, under the head of cases of severe dyspnoea in children connected with a singular affection of the throat, relates three well marked cases of this disease. Dr. Fleming also, in the *Dublin Medical Journal* for 1840, under the heading—"Practical Observations on Peculiar Affections of the Throat, arising from Abscess between the Pharynx and Spine, and occurring in Children and Adults, exemplified by Cases", gives two examples of this complaint. Since then, attention has been drawn from time to time to this troublesome form of abscess by various writers.

The case which I am about to relate is as follows. E. M., aged two years, was admitted into the Liverpool Infirmary for Children on March 3rd, 1874, suffering from great difficulty of breathing. The mother stated that the child had scarlet fever five months before, and since then had not been doing well. Two weeks before admission, she noticed that the child held her head rather stiffly, and breathed badly at night. This difficulty of breathing gradually increased; and the night before she was brought to the Infirmary, the mother "thought she would choke every moment".

On admission, I found a strumous-looking child, with wasted limbs and enlarged cervical glands, labouring in her breathing, and making a croupy sound at each inspiration, but not seeming in very much distress, able to swallow and cry. I considered it at first sight to be a case of enlarged tonsils, but was unable to get a very good view of the throat, on account of the large quantity of tenacious mucus which filled the larynx. I ordered the throat to be swabbed out with a strong solution of nitrate of silver. The next day, there was slight improvement; and, on examination of the throat, nothing could be seen to account for the dyspnoea. The same treatment was continued for some days, the child in the meantime being neither better nor worse, and taking food comfortably. On the 14th, eleven days after admission, the general condition remaining the same, I examined the throat with my finger, and found, at the back of the pharynx, on the right side, a firm elastic swelling, nearly filling up the throat. This swelling I punctured with a bistoury, and evacuated a large quantity of healthy pus. This was followed by immediate improvement in the breathing. The child continued better for two days, when the breathing again became laborious; and, on examination with the finger, for it was impossible to see anything, I found that the abscess had refilled. I again punctured it, and each day afterwards, for a short time, I took the precaution of pressing on the wall of the pharynx from below upwards, so as to empty the abscess. This latter is a very necessary precaution, as the abscess is very apt to refill. Since that time, she has had pus evacuated from the enlarged glands on each side of the neck. I had to cut very deeply to reach matter which was perfectly healthy, containing no cheesy substance. She had shortly after this an attack of scarlet fever followed by dropsy, from which she has made a fair recovery. I suppose the attack called by the mother scarlet fever must have been measles.

Retro-pharyngeal abscess may arise idiopathically, or from caries of the cervical vertebrae, or as the sequela of acute exanthems. When it arises from disease of the spine, which is very rare, it is slower in its course, and there is often paralysis of the upper extremities. When it is idiopathic, or a sequela of scarlet fever or measles, it forms more rapidly, and gives rise to greater difficulty in swallowing and breathing. The diagnosis is extremely difficult unless one is on the look out for it, as ocular examination gives us little or no assistance in a young child. We must suspect it if a child have difficult breathing or dysphagia, and a croupy cough, and if it hold its head stiffly. We must feel with the finger, when, if we find an elastic swelling filling up the pharynx, we may be certain of the nature of the disease. The difficulty of breathing is always aggravated on lying down. The disease differs from croup in this particular, as also in its lasting longer without destroying life; the child is also able to cry, the voice not being as a rule interfered with;

* Read before the Lancashire and Cheshire Branch.