THE GULSTONIAN LECTURES

ON
ANÆMIA.*Delivered before the Royal College of Physicians.*

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LECTURE II.—PART II.

Idiopathic Pernicious Anæmia: Illustrative Cases—Analysis of the Different Forms of the Disease—The term "Idiopathic" not applicable to a considerable proportion—Preponderance in the Swiss Cantons (especially Zürich) largely dependent on Mode of Life—Influence of repeated Pregnancies, Gastro-intestinal Disease, Hemorrhage, Malaria, and Nervous Disorders in determining a "Pernicious" Anæmia—Pathogeny: Is it due to increased Blood-Destruction or want of Blood-Formation?—Changes described in Blood and in Bone-marrow (Pepper, Cohnheim, Osler)—Its relations to Leukæmia, to "Pseudo-leukæmia", to Chlorosis.

I WILL now proceed to detail to you the leading features of cases of idiopathic anæmia which have occurred in the Middlesex Hospital during the past ten years. They are not numerous, and they do not comprise all the forms in which this condition occurs, but they will serve to illustrate my subject.

CASE I.—This has already been published,* and I will content myself with a brief abstract of it. S. D., aged 27, a pale, delicate-looking, but not emaciated woman, married five years, but childless, was admitted, under the care of Dr. Greenhow, on September 7th, 1871, complaining of pain between the shoulders, palpitation, great weakness, vertigo, depression, and coldness of the extremities. The skin was as white as wax, and there was a faint jaundiced tint of the conjunctivæ. The lips were colourless, and the tongue pale, clean, and moist. There was a loud double murmur over the præcordial region, having a friction-like character, and a maximum intensity at a point just inside and a little above the left nipple. There was no enlargement of the liver or spleen, but slight epigastric tenderness, attributed to frequent retching. The pulse was 128, very weak, small, and compressible; respiration shallow; no cough; temperature 100.4° Fahr. The urine was acid, of specific gravity 1013, free from albumen or bile-pigment. Her history was as follows. There was no tendency to hereditary disease; she had had the usual diseases of childhood, and was always rather delicate and subject to palpitation. The catamenia appeared at fourteen, and since then she had had more or less menorrhagia and leucorrhœa. She never, however, had any serious illness till about a year ago, when she began to suffer from diarrhœa and vomiting, with occasional vertigo, but did not complain of pain after food, nor did she vomit blood or pass any *per rectum*. The palpitation now became worse, and was accompanied with pain between the shoulders. These symptoms continued for two or three months, when she got better; but, three months afterwards, she was attacked in the same manner, with the addition of a slight yellow tinge of the skin and conjunctiva, and was again laid up for two months. After this, a second remission occurred, and she remained comparatively well till two months before admission, when the old symptoms returned. The progress of the case was marked by increasing debility, constant nausea, and occasional vomiting. On September 20th, there was some diarrhœa; but neither at this nor at any other time was blood observed in the motions. The pulse, respiration, and temperature remained much the same throughout, the latter never exceeding 102°, and only once descending as low as 98.8°. On October 3rd, she vomited during the afternoon and frequently during the night. The sickness continued, and she sank exhausted on October 5th. At the *post mortem* examination, minute ecchymoses were found studding the inner surface of the dura mater, and a small quantity of slightly turbid fluid coated the surface of a portion of the hemispheres, and dipped in between the convolutions. The brain itself was completely bloodless. There were also ecchymoses on the pulmonary pleuræ, a few old adhesions, and some recent lymph on the right side, but the lungs were healthy. The pericardium contained

three ounces of fluid, and showed no traces of inflammation. Not more than an ounce of thin, pale, and watery blood could be obtained from the heart and large vessels, and that was perfectly fluid and did not coagulate. All the other viscera were examined, but showed only intense anæmia. Dr. King, in his comments on the case, raises the question of the anæmia being caused by a derangement of nervous function—supposing, from the analogies supplied by the act of secretion, that the sympathetic system directly controls the act of blood-formation. He draws a parallel between such cases and those of Addison's disease, where the symptoms are similar (except the pigmentation), and where the existence of a nerve-lesion is more evident. It is interesting to find Addison stating that, "in the case last examined, the heart had undergone such a change" (he is speaking of its fatty degeneration), and "that a portion of the semilunar ganglion and solar plexus, on being subjected to microscopic examination, was pronounced by Mr. Quekett to have passed into a corresponding condition". But I do not know of any other facts which can be called in support of Dr. King's reasonable hypothesis.

CASE II.—Emma H., aged 29, unmarried, a domestic servant, admitted, under the care of Dr. Greenhow, on April 20th, 1875. One of her sisters had died of consumption. She herself had enjoyed fairly good health till six weeks before her admission, when she began to feel very tired at her work, which was hard. She had also suffered from occasional vomiting and attacks of fainting; whilst becoming, in addition, paler, and attacked with shortness of breath on slight exertion. She was well nourished, but very anæmic, the skin having a somewhat tawny tint, especially about the neck, axillæ, and back. The mammae were ill-developed. The heart's action was exaggerated, impulse diffused; visible pulsation of carotids; radial pulse jerking, 120. A soft systolic murmur was audible at the base of the heart, and a well-marked *bruit* in the jugulars. There was slightly impaired resonance at the anterior apices of the lungs, and wavy respiratory murmur; but elsewhere the breath-sounds were normal. There was no enlargement of liver or spleen. The urine was of specific gravity 1025, acid; no albumen. The blood showed a deficiency of red corpuscles, but no excess of leucocytes. The predominant symptoms were vomiting and diarrhœa, accompanied by increasing languor and debility. The temperature was irregular, the highest point reached being 102°, on the evening of admission, and the general range being between 100.2° and 99°; the evening temperature being mostly lower than the morning. The pulse ranged between 120 and 140, and was very feeble, during the last two days maintaining the more rapid rate, whilst the temperature fell to 97.8°. She sank exhausted on May 2nd. At the *post mortem* examination, the general surface and the mucous membranes were noticed to be extremely pale; the skin of the neck, axillæ, and groins being of a pale-brown colour. The mammary areolæ were not pigmented, and no pigmentation occurred at the root of the nails. There was a fair amount of subcutaneous fat, and much in the omentum. The pleural and pericardial sacs contained dark-coloured serum. There were a few subpericardial ecchymoses at the back of the heart, which was fairly covered by fat, its muscular substance being pale and flabby. Both sides contained much thin fluid blood; whilst in the right ventricle a thin, pale, soft clot was met with, diminishing towards the auricle and pulmonary artery. The lungs were pale and bloodless, slightly puckered and indurated at the apices, the posterior part of each lower lobe being engorged with frothy serum. The liver and kidneys were anæmic, but healthy. The spleen was small, pale, and tough. The suprarenal bodies were natural. The semilunar ganglia appeared healthy, but were not examined microscopically. In the stomach the mucous membrane in the pyloric region was thicker and firmer than elsewhere, white, perfectly smooth, and free from mammillation. The only remark I would make upon this case is, that it might as well be described as a case of fatal chlorosis, which it resembled in the mode of its onset; and that the predominance of gastric symptoms was very marked, again suggesting a neurotic basis for the whole disease.

CASE III.—Henry A., aged 43, single, a potman, was admitted under Dr. Cayley's care on September 18th, 1878. His mother had died of consumption, but he had a healthy brother and sister. When ten years of age, he was ill with rheumatic fever for eight weeks, and had been subject to rheumatic pains in all parts of the body. For the past three or four weeks, he had, however, been becoming more sallow and short of breath, and within the past week his feet began to swell. In spite of his occupation, he drank moderately. When admitted, he was extremely prostrate, but free from pain. His skin and mucous membranes were intensely anæmic, and there was considerable œdema of the lower extremities. There were bronchitic *râles* in the lungs. The heart was not enlarged, and no *bruits* were audible; the spleen and liver were not enlarged. There was some diarrhœa. The urine was of specific gravity 1015, acid, but free from albumen. After a week's rest, the

* By Dr. R. King, BRITISH MEDICAL JOURNAL, November 25th, 1871, p. 613.

œdema had almost subsided, the diarrhoea ceasing also. The temperature varied slightly, being often above 99° ; on September 26th, it was 101.8° in the morning. On the night of October 9th, he was attacked with temporary aphasia and slight deviation of the tongue to the left, but no other paralytic symptom. The temperature was then 100° ; pulse very weak, 120; the heart's action was tumultuous, and a systolic murmur appeared at the base. Next morning he could speak well, and the tongue was protruded straight. Temperature 101° ; pulse 108. But the same afternoon he had a similar seizure, when his speech became indistinct, the tongue deviated to the left, and slight paresis occurred on the left side of the face and left arm. Temperature 103° ; pulse 120. The parietic condition passed away in a few days; but he became more prostrate and drowsy, and died on October 13th. At the *post mortem* examination, no lesion was found in the brain, which was very anæmic. Hæmorrhagic foci were found in the retinae. There were some old pericarditic adhesions, much fat on the surface of the heart, and extreme fatty degeneration of its muscular fibres. There were a few subpleural ecchymoses on the surfaces of the lungs, which were engorged in their dependent parts. The liver was paler than natural; the spleen was pale, but soft; the pancreas and suprarenal capsules were healthy; the kidneys were rather tough. A transient hemiparesis was observed in one of Immermann's cases, to which I have referred. In that case, also, no lesion was discovered in the brain. Possibly, in both instances, the cause of the nervous symptoms lay in an undetected minute hæmorrhage. In the foregoing case, also, the large amount of dropsy was unusual, and the kidneys were certainly indurated, but not wasted or fatty. There have been cases where it has been more difficult to decide whether one was dealing with chronic Bright's disease or anæmia simply; and on this ground I have excluded one case, which occurred in 1876, of a man, aged 50, whose symptoms were those of pernicious anæmia, but where the kidneys were more obviously diseased than in the present case.

CASE IV.—Caroline F., unmarried, cook and housekeeper, was admitted under Dr. Cayley's care on June 2nd, 1879. Beyond an attack of "inflammation of the bowels", at the age of twenty-four, she had enjoyed good health, but for the past two years had been ailing, losing colour, becoming thin, and suffering from shortness of breath for the past six months especially. She was considerably emaciated, feeble, and anæmic; but her appetite and digestion were good. Beyond unusual visibility of the cardiac impulse, there did not appear to have been any cardio-vascular signs. The anæmia, certainly, was most intense. On June 9th, the hæmoglobin was estimated at 28 per cent., and the red corpuscles were 550,000 per cubic millimetre, or 11 per cent. of the normal. The temperature only rose to 100° and 100.4° on three occasions, being generally normal. There was diarrhoea with occasional vomiting, but neither occurred to a considerable extent; there were no retinal hæmorrhages. Under arseniate of iron, she rapidly improved. On August 23rd, the number of red corpuscles was 37.7 per cent., and on September 22nd, the day before her discharge, 2,080,000 per cubic millimetre, or 41.6 per cent. She remained fairly well for more than twelve months—namely, to Christmas 1880, when her weakness returned. She began to suffer from shortness of breath, palpitation, and occasional vomiting, and was admitted again on March 2nd of this year, having kept her bed for two months. Her skin and mucous membranes were intensely pale, and she complained of great exhaustion, but had a fairly good appetite. The heart's impulse was diffused and thrilling, and a rough systolic murmur was audible at both apex and base, the second sound at the pulmonary cartilage being accentuated. There were also *bruits* in the carotids and in the jugular vein, there being further marked pulsation of the latter. Pulse small and compressible; no retinal hæmorrhages. The urine was of specific gravity 1020, acid, free from albumen. The temperature had not risen above 99° , nor the pulse above 100. The case is still under treatment, principally good diet, rest, and arseniate of iron being prescribed. As yet not much progress has been made; for although, on admission, the red corpuscles numbered only 520,000 per cubic millimetre, or 10.4 per cent. of the normal, and increased nine days later to 620,000, or 12.4 per cent., yet the percentage of hæmoglobin has fallen from 30 to 21. With the increase in the red corpuscles there has been a change in the number of leucocytes, which were to the red as 1 to 52 on admission, and on the 11th 1 to 124. This case must be regarded as one of idiopathic anæmia, although it is lacking in some of the distinctive features, especially the existence of retinal hæmorrhages. The chief point of interest is the improvement which took place during her residence in the hospital eighteen months ago, an improvement which was maintained for upwards of one year. The ultimate prognosis must be considered as uncertain.*

* This patient became rather rapidly worse, and died on March 25th.

CASE V.—Emil M., an Italian boy, seven years of age, was admitted under Dr. Cayley's care on January 6th, 1880. His father was alive and healthy; and he had one brother, also very healthy. The mother had died of puerperal fever after her second confinement. This boy had never been a strong child, and had had scarlet fever four years ago. In the summer of 1879, he began to grow very weak, and continued in a weak state until Christmas, when he complained of headache, became listless, objected to move about, and did not care to play. At the same time, he lost appetite, and suffered from a slight cough. He was well-nourished, but extremely bloodless; face of a waxy appearance; lips pale. There was marked œdema of the conjunctivæ. The heart's apex impinged in the normal position, and a soft systolic murmur was there audible. There was also a whirling *bruit* in the carotid, and a well-marked hum in the jugular. There was a slight cough, and some scanty moist crepitation at the bases of both lungs, where also resonance was impaired. There were also signs of some ascitic effusion. The urine was of specific gravity 1015, free from albumen. The pulse-rate throughout was very rapid, from 140 to 160; and its volume small and compressible. The temperature was irregular, falling from 100.6° on the day of admission to 98.2° the next morning, and then varying between 98.4° and 99.8° until the 12th January, when it rose to 102.6° , falling to 99.8° , to rise again to 102.6° , after which it oscillated between 100.6° and 100.2° until his death on the 17th. Restlessness, varied by great drowsiness; frontal headache at times severe; and, towards the close, cramps in both legs, marked the progress of the case, and vomiting occurred on the last two days. There was constipation; never any diarrhoea. There were extensive retinal hæmorrhages and swelling of the optic discs, and on the last day of life he became quite blind. Iron and its arseniate were the remedies employed; and transfusion was entertained, but discarded, as the case seemed beyond recovery. At the *post mortem* examination, the heart was found to be advanced in fatty degeneration; the change being most marked in the left ventricle, the general wall of which was very friable and of a yellow-red colour; whilst the layer of muscular tissue immediately beneath the endocardium—both on the papillary muscles and the parietes—was speckled and streaked by whitish spots and lines. A few opaque patches occurred also in the mitral valves. Both lungs were engorged and purplish in their posterior two-thirds, numerous ecchymotic patches occurring beneath the visceral pleura and in the substance of each organ; whilst the bronchi contained some blood-stained tenacious mucus. The spleen was pale; its follicles were large, prominent, and white. The liver was large, firm; its lobules well defined; the central part of each lobule appearing as a whitish-yellow ring, giving the organ a curious speckled appearance visible through the capsule. This was due to fatty degeneration. The kidneys were simply bloodless. This was a pure case of idiopathic pernicious anæmia, and is interesting on account of the extreme youth of the patient.

CASE VI.—Elizabeth Y., aged 21, unmarried, a nurse, was admitted under my care on January 20th, 1880. She had had no serious illness, but for some years had had very little colour, and had gradually become paler. The catamenia, which commenced between the ages of fifteen and sixteen, became abundant and frequent in August 1879; and at the same time she became gradually weak, suffered from giddiness, palpitation, and shortness of breath on exertion. She was well nourished, but extremely anæmic, and complained of great weakness and thirst. There was a marked thrill with the impulse of the heart, and a loud, almost grating, *bruit* at the pulmonary cartilage. The apex-beat was in the normal position. Temperature 100° ; pulse 146. The temperature rose to 102.8° in the evening of the 21st; and with remission to 101° next morning, was 103.4° the following evening; the pulse still being very rapid, and the patient having sore-throat and headache. The red blood-corpuscles numbered 2,490,000 per cubic millimetre, or 49 per cent. The catamenia, which had been flowing for ten days before admission, continued, passing into profuse hæmorrhage—so much so, that in five days the corpuscles fell from 49 to 20 per cent. (Jan. 28th). Dr. Hall Davis was consulted; and, on the failure of plugging to arrest the flow of blood, the long continuance of which was assuming alarming proportions, endeavoured to check it by the injection of perchloride of iron; ergot being given by enemata, as it could not be retained by the mouth. She became drowsy and apathetic; the cardiac *bruit* increased in intensity; and, in spite of all efforts, she continued to lose blood; a very marked rise in temperature being noticed as the anæmia became more and more profound. She died on February 5th, a petechial eruption appearing about the trunk and limbs shortly before death. There was a large amount of subcutaneous fat, and the dark red colour of the muscles contrasted with the thin and watery blood. There were extensive subpericardial ecchymoses on the surface of the heart, the muscular substance of which,

especially of the left ventricle, was very pale, speckled, and extremely fatty. There were purpuric spots also over the kidneys. The ovaries were rather large and fleshy, and contained cysts; in the right was a rather recent corpus luteum. The uterine mucous membrane was pale and smooth; a minute sessile polypus, of the size of a pin's head, showing no evidence of ulceration, occurring at the entrance of the left Fallopian tube. The idea that this was the cause of the hæmorrhage was quite untenable. Indeed, the case might be interpreted as the development of the hæmorrhagic diathesis in a chlorotic subject. The chlorosis preceded the menorrhagia, which in its turn intensified the anæmia; and the uncontrollable loss of blood thus arising could not be repaired. Transfusion was clearly out of the question, until that constant bleeding could be stanchcd.

As I have already remarked, the field of view has been so widely extended since the time of Addison, that one is embarrassed by the attempt to analyse the cases which have been recorded as progressive pernicious anæmia. Some of these clearly belong to the category of Addison's cases, others obviously do not; so that in perusing them one is continually being confused by the assumption that we are speaking of the same things. Undoubtedly it will be a great gain when we can once and for all rid ourselves of the term "idiopathic" in medicine. There must be an underlying cause for every departure from the normal mechanism. But the time has not yet come. So far as I can gather, then, the term "pernicious" has been used in different senses: some simply employing it to serve as the expression of the severity of any case of anæmia, no matter how arising; others stamping it with a specific character, going behind the strict meaning of the word, and implying by it that it deals with a form of anæmia which is wholly peculiar, and only lately known. What wonder, then, at the mystery and obscurity which veil the subject? One by one the criteria attempted to be established between this form of severe anæmia and other forms nearly but not quite as severe, have been or are being broken down; the one that most resists explanation being the intractability of the disease by ordinary therapeutic measures. But there are problems concerned in it which remain to be solved. At present I think we are in a position to take this view, that to a considerable number of cases the term "idiopathic" is inapplicable, there being, in other words, a sufficiency of causes in operation to establish the anæmic condition, but that its *pernicious* and *progressive* characters are impressed on it by changes of which we know nothing, or nearly nothing. It may be urged that this is but begging the question, and removing the idiopathic origin a step nearer. It is hardly so, for I think it justifies us in establishing such a classification as this:—

Anæmia	{	Symptomatic	{ Simple.
			{ Pernicious.
	{	Idiopathic	{ Simple.
			{ Pernicious.

Such a classification would be warranted by our present knowledge, and would distinguish between the two main forms of pernicious anæmia, destined, like the simple forms, to be merged again into one, when etiology shall be perfected. "Idiopathic" and "pernicious" are not, then, alternative terms, although a large number of the latter fall under the former class. Out of the 110 cases whose records I have studied, in forty no cause has been attributed, or the record is silent on it; in others, the alleged cause is too remote and too slight to have influenced the case at all, but the chief causes which were sufficient and which stood in sufficiently close relation to be regarded as causes were these. 1. *Bad living and food* occurred in eleven cases, often conjoined with other more immediate influences, as pregnancy and lactation, or gastro-intestinal disturbance; the latter no doubt produced by these bad circumstances. It has been pointed out that the great prevalence of pernicious anæmia in the Swiss cantons, especially in Zürich, is related to the impoverished condition of the peasant folk, amongst whom the cases of the disease are most frequently found. They live chiefly on potatoes and coffee, a diet not conducive to healthy blood-formation, and sufficient of itself to lead to anæmia, even of this fatal kind; and the supervention of further debilitating influences nearly sufficiently explains the occurrence of such anæmia. It is objected to this, that the same causes are in operation elsewhere without such results, and that an endemic influence is quite a gratuitous hypothesis; that, when removed from such influences, other subjects recover from their anæmia; not so these, who become progressively worse, uninfluenced by treatment. Looking, however, to analogies from other diseases, and our knowledge of etiology in general, it seems hardly warrantable to prolong a vain search after other causes in the face of such self-evident ones as these; and remarkable as is the fact of this concentration of fatal anæmia to small districts, it is not more remarkable than other facts concerning the geographical distribution of many diseases.

2. An even more potent cause, often associated with the first, is *pregnancy*, especially if the woman be submitted to the exhausting influences of rapidly repeated pregnancies. It was the starting-point of the pernicious anæmia in twenty, or rather less than one-fifth, of the 110 cases. Abortion is liable to occur, and its occurrence is generally followed by the death of the parent, although there may not have been any great loss of blood. Sometimes repeated vomiting in pregnancy is followed by anæmia of this extreme kind, which may also supervene upon flooding in labour, prolonged lactation—causes often enough of a simple symptomatic anæmia, fortunately seldom of a pernicious. Menorrhagia is a sequel as well as a cause of anæmia, and one of the cases appears to have commenced at the menopause. 3. *Digestive and intestinal* disorders appear to be at the foundation of several cases, and this, independently of bad diet in many; but clearly the records show that dyspeptic symptoms, vomiting, and diarrhoea, have troubled the patient at the very outset, before the subjective or objective symptoms of anæmia have developed. Frequently, as we have seen, the same gastro-intestinal symptoms appear during the course of a pernicious anæmia. Dysentery and typhoid fever may be followed by an anæmia which becomes pernicious in degree. 4. Malarial influences have been supposed to play a great share in determining the pernicious character, but it is singular in how few cases a distinct history of previous intermittent fever has been obtained; and many of the patients have not lived in malarial districts. Then there are cases in which the profound blood-change has been set on foot by direct nervous shock, by fright, grief, or worry. In a word, the *known* etiological factors of pernicious anæmia are those of simple anæmia. The symptoms of pernicious anæmia are those of simple anæmia aggravated and intensified. The effects of pernicious anæmia are the same as those of simple anæmia, carried to an extreme degree.

If we turn now to those cases where it is impossible to detect with our present knowledge any etiological factors for the anæmic condition—if we deal, that is, with purely idiopathic cases, we are bound to seek for causes within the organism itself. That search has been only in part successful. As in all cases of anæmia a cause must be sought in one or two directions, that of diminished activity of formation of blood, or excess of activity in its destruction, attention must be paid to each of these points, especially as regards the blood and the blood-forming organs. Of these I shall shortly speak.

The degree to which the hæmoglobin may be diminished has not been much estimated; but Quinquaud found that, when it reached 26.5 grammes per 1,000 cubic centimetres of blood—i.e., about one-fifth of the normal quantity—the case was invariably fatal; and then there is also a diminution in the solids of the serum. In this, as in other forms of anæmia, it has not been shown that there is any relation between the number of corpuscles and their richness in hæmoglobin. One of the cases I have related, it will be remembered, gave a diminution of corpuscles to 530,000 per cubic millimetre, or 10.6 per cent., whilst the colour-test for hæmoglobin showed that there was 30 per cent. of that substance. The case is proportionately grave, therefore, when the corpuscles and hæmoglobin are *pari passu* diminished. Quincke is inclined to doubt the value of observations on the amount of colouring matter in this disease, believing that some of it is in an inactive state, occurring as the detritus of the corpuscles. Most of his numerations are remarkably low—e.g., in four cases, one-eighth, one-tenth, one-fifteenth, and one thirty-fifth of the normal, the last being a case in which recovery took place, and the temperature-chart of which is before you. Many observers have met with variations in the size and form of the red corpuscles. Such variations include corpuscles larger than natural; others much smaller and spherical—the so-called microcytes, at first regarded by Eichhorst as pathognomonic of pernicious anæmia, but since abundantly disproved, for they may be absent, and certainly occur in simple anæmia; and numerous smaller and misshapen bodies. Quincke laid especial stress upon alterations in shape; and I place before you a copy of his drawing, which gives an illustration of the multiplicity of shapes and variations in size which the corpuscles may be found to undergo. Similar changes are described and figured by Dr. Finny, and have been observed in other cases, of which I may mention one, for the notes of which I am indebted to Dr. Pye-Smith. Irregular massing of corpuscles, rather than a tendency to form rouleaux; rapid appearance of crenation; pear-shaped, biscuit-shaped, globular forms; an excentric position of the depression on the surface of the globule, or the readiness with which the colouring matter accumulates in the corpuscle at one part, so as to give the corpuscle a nucleated appearance, are amongst the alterations observed after the blood is shed. They indicate a greater proneness to form-changes than in healthy blood, perhaps determined as much by altered quality of the serum as by any integral change in the corpuscles themselves. At the same time, the predominance of small forms and what appear to be broken fragments of corpuscular matter point either to an

accumulation in the blood of imperfectly formed elements allied to M. Hayem's hæmoblasts, or, on the other hand, to evidences of the disintegration of the corpuscles.

Since neither the spleen nor the lymphatic tissues show any evidence of change, the discovery of the blood-forming function of the bone-marrow by Neumann has naturally led to its examination in cases of pernicious anæmia, but with results both positive and negative. Dr. William Pepper of Philadelphia, in 1875, was the first to offer this explanation of this obscure disease, and described definite changes, chiefly of small granular cells, in the marrow of the radius and sternum in one case. Cohnleim in the following years also described a condition of hyperplasia of the bone-marrow, fat being almost entirely absent, and the marrow of a red colour. Besides ordinary marrow and lymphoid cells, he found a large mass of small red corpuscles, a few fully formed ones, and an abundance of nucleated red corpuscles of various sizes, some of which were found in the blood itself. The next most important contribution, is that by a member of this College—Dr. Osler, of Montreal—who in two cases, one in conjunction with Dr. Gardner, and the other with Dr. Bell, made a very thorough examination, not only of the blood, but of many of the bones of the skeleton. The marrow was of a violet-red colour, and almost destitute of fat, containing besides the ordinary elements a large number of nucleated red corpuscles, similar to those described by Neumann as transitional forms between lymphoid cells and red corpuscles. Dr. Osler,* in examining the marrow of the long bones in fourteen cases of chronic disease, found evidences of a similar hyperplasia in only one case. Others have not confirmed these observations; and others, again, have not been able to show any such changes in the marrow, whilst Eisenlohr (*Deutsche Arch. für Klin. Med.*, xx, 1880), finding that the alterations in the blood and marrow, similar to those described, were met with in a case of cancer of the stomach, as well as in one of pernicious anæmia, is inclined to regard these conditions as dependent on the cachectic state rather than the cause of it; and a similar opinion has been expressed by others.

The question, however, cannot yet be entirely disposed of, and there is no *primâ facie* reason against a myelogenic anæmia sometimes occurring. If it do occur, then it points to defect in the normal evolution of the corpuscles, and we have the strange concurrence of appropriation of material by a blood-forming organ and development of the corpuscles up to a certain point, but no further. Meanwhile, research is also being prosecuted in the other directions—viz., increased destruction of blood-elements, Quincke finding large quantities of iron deposited in the liver, kidneys, and pancreas, in one or two cases of this disease; but his observations, as well as the solitary observation of Dr. Finny, as to excess of iron in the urine, require further confirmation before being finally accepted. Further, I may remark that, in two cases of Quincke's the total quantity of blood was estimated by a simple process of calculation of the corpuscular richness before and after transfusion, and it was found in these cases to have fallen to 5 per cent. and 4.34 per cent. of the body-weight, the normal being 8 per cent.

In conclusion, one cannot fail to be struck by the broad resemblance in the midst of difference that exists between the course of a fatal idiopathic anæmia and leukaemia and Hodgkin's disease (or pseudo-leukaemia, as it is called)—a resemblance due to the factor common to all of them; the diminution of the oxygen carriers of the blood. In leukaemia there may be both an increased production of white corpuscles and an incomplete conversion of them into the red. In Hodgkin's disease, or pseudo-leukaemia, there may or may not be any leucocytosis, but there is certainly deficient formation of red corpuscles; and in idiopathic anæmia there must be either such deficient formation or an excessive consumption of these same elements, so that there is no sharp line of demarcation between the two. Similarly in chlorosis we have a disease, the characteristic of which appears to be an imperfect evolution of the blood, and except in a few instances it does not seem possible to distinguish chlorosis from idiopathic anæmia. I must not, however, be contented with this mere assertion, and propose, therefore, to speak of chlorosis in its relation to idiopathic anæmia at the commencement of my next lecture, when I hope also to enter more fully into the effects of the anæmic state.

* Gardner and Osler, *Case of Progressive Pernicious Anæmia*. Montreal: 1877.

THE Committee of the "Frank Buckland Memorial Fund" have decided that the memorial shall take the form of a bust to be placed in the Fish Museum at South Kensington; the purchase of an annuity to be presented to Mrs. Buckland; and, if there be any surplus, it will be applied in some way to promote the welfare of the fishermen of this country. The honorary secretaries are Colonel Bridges and Mr. T. Douglas Murray, to whom subscriptions may be sent, at 34, Portland Place.

ABSTRACT OF LECTURES ON THE ANATOMY, PHYSIOLOGY, AND ZOOLOGY OF THE CETACEA.

Delivered at the Royal College of Surgeons of England.

By W. H. FLOWER, F.R.S., LL.D.,
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LECTURE I.

THE primary object for which these lectures were founded was the illustration of the contents of the extensive and valuable Museum of the College. The large additions which have been made since the time of John Hunter its founder, especially during recent years, to the collection of human osteology, rendered it desirable that attention should be directed to the scientific information to be derived from a study of the materials preserved and displayed in that department. Accordingly, for the last four years, the comparative anatomy of man has formed the subject of this course. The osteological characters of various races of Asia, Africa, Polynesia, and America have been discussed as far as the material at disposal would allow. There still remain the characters of the various races of Europe to be considered, and some general conclusions to be drawn regarding the different races which inhabit or have recently inhabited the world, before the subject can be said to have been completed. The acquisition of the Barnard Davis Collection in the early part of last year has more than doubled the materials illustrating the comparative anatomy of the races under consideration, besides supplying others hitherto unrepresented in the museum. The work of removing, cleaning, arranging, and cataloguing the numerous specimens of this collection has absorbed so much time, that little has been left as yet for their scientific examination. As any attempt at the exposition of the variations of the osteological structure of man from the evidence afforded by the newly acquired specimens would be very incomplete, it has been thought advisable to postpone the consideration of the subject to a future time.

The anatomy of the Cetacea, which has been selected for consideration this year, is particularly well illustrated in the museum—better, perhaps, than in any other museum—and is of great interest, though there is, perhaps, no group of animals so difficult for study. The cost of transporting and mounting these large specimens is very great. The anatomy of the soft parts is also difficult to investigate, from the large size of the structures, as well as from the difficulty of getting them dissected, the animals being, for the most part, putrid before the anatomist hears of them, thus rendering the task a very disagreeable one. The disputes which almost always arise as to the ownership of any whale's carcass cast or brought ashore have greatly deterred the scientific study of those animals. The Government, the owner of the land upon which the animal has been stranded, and the fishermen, all claim it; the result being, that not unfrequently the law has to be appealed to before the ownership can be determined, and before matters are settled the animal has become useless to everyone from decomposition. When a whale is stranded on our coasts, it is usually some species of fin-whale, the oil of which is small in quantity, and the whalebone of little use on account of its being so short in the blade; the Greenland whale is never seen so far south as this country.

A great difficulty in treating the subject of whales has arisen from the complication of the nomenclature, different writers using different names for the same species, as well as confusing one species for another. The earliest and one of the best works on cetology is that on the Dolphin by Dr. E. Tyson, written about two hundred years ago. After the lapse of a hundred years, we have the well-known memoir by John Hunter, who devoted much attention to this group, entitled "Observations on the Structure and Economy of Whales", which he published in the *Philosophical Transactions* for 1787. Hunter secured and dissected a specimen of the smaller fin-whale or Rorqual (*Balaena rostrata*), seventeen feet long, caught off Dogger Bank. The skeleton of this whale he afterwards mounted, and it is still preserved in the museum. It is interesting to note that this is the second recorded instance of the skeleton of a whale being mounted, the first having been articulated and placed in the town-hall of Bremen in Germany one hundred years before. The picture of the animal still exists in the town-hall of that city; but the skeleton has been removed to the museum. Besides mounting the skeleton of his whale, Hunter made forty-six