I have united the ligaments by end-to-end approximation often enough to be convinced of the feasibility and utility of the operation.

Fig. 12.—Complete abdominal hystero-myomectomy. The broad ligaments are brought together from side to side and united by end-to-end approximation. The upper extremity of the vagina is also closed by suture introduced from side to side so as to fasten it to the lower part of the broad ligament wound at the point where the ligatured uterine arteries are approximated.

ANEMIAS SECONDARY TO GASTRO-INTESTINAL DISEASE, WITH REPORT OF TWO CASES.*

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The complex relationship and function of the blood stamps it as a tissue unique in the animal economy. As the common carrier of the body, it is compelled to transport every molecule which passes to and from the tissues, into and out of the organism. It is thus subjected to widely varying influences of both a physiologic and pathologic character to an extent equaled by no other tissue in the body. It is able to maintain the integrity of its function and a distinct autonomy by what may not inaptly be termed its own inherent elasticity of structure. Its cellular elements may be reduced in number under pathologic conditions to 25 per cent. or less of its physiologic standard, and yet perfect recovery be possible. Their most important chemical constituent—hemoglobin—may be reduced in each individual cell to a similar degree, with the same possibilities of restoration to a condition of perfect health.

Among the most important factors influencing the function and structure of the blood may be mentioned the digestive organs with their widely varying conditions of health and disease. The integrity of the blood, as of every other organ of the body, is, of course, obviously dependent upon the function of the digestive organs. The theory that numerous blood diseases, and especially the anemias, are frequently the direct or indirect result of morbid conditions of these organs has been formulated many times in diverse forms, and substantiated by a large amount of clinical evidence. Facts of an experimental character, bearing upon these questions, are exceedingly difficult to procure for many reasons, a few of which I will endeavor to point out. In the first place everything indicates the search for a specific organism, the metabolic products of which would

produce anemia with the same constancy that the organisms of diphtheria, syphilis, etc., produce their characteristic results, will be quite as futile in the future as it has been in the past. The conclusion seems at present justifiable that such hemolytic effects as may result from bacterial processes are to a large extent the common result of varied and indifferent toxins, using this term in its broadest sense, although some may, of course, be more active in this direction than others. The results will further depend upon the vulnerability of the blood itself as well as the blood-making organs, to the morbid influences of varied character under discussion. This vulnerability will not only vary widely in different individuals, but in the same individual at different times. In this respect it constitutes no exceptional phenomenon in pathology. That the etiologic factors of disease may be active or otherwise, according to that unknown and undefinable factor which we are pleased to term the resistive power of the organism, is a fact so well known as to scarcely need mention. Thus it happens under many conditions that a cause which has been existent for years will suddenly, owing to some change in environment or internal conditions, produce results of a most striking character. That such phenomena occur in the blood is a fact which has been abundantly illustrated in my own clinical observation, and is in fact shown by the cases which will be later reported. With regard more especially to the action on the blood of poisons formed in the gastro-intestinal canal, there are many conditions by which they may be modified aside from the vulnerability of the blood itself. The epithelium of the intestinal canal, and the entire structure of the liver, stand as important intermediate laboratories between the gastro-intestinal contents and the blood. The ordinary peptones of digestion, for instance, are toxic if introduced into the blood, but are so modified by the epithelial structures above referred to, and by the liver, as to lose their toxic properties and be assimilable by the organism. The observations of Kottnitz¹ on gastro-intestinal mucosa in cases of leukemia sustain this proposition.

So far as the direct actions of poisons on the blood are concerned, clinical observations of an explicit and demonstrable character are not entirely lacking. Ehrlich, for instance, says explicitly that the resistance of the blood cells as tested by the action of dilute salt solution and electric discharges from Leyden jars, etc., is increased after many intoxications. The degree of virulence which will be manifested by gastro-intestinal toxins when they find their way into the circulating fluid will be obviously dependent, 1, upon the degree of virulence of the micro-organism itself which for the same species varies greatly at different times, and 2, upon the integrity and functional activity of the defensive mechanism above referred to which nature has placed as a barrier for the protection of the blood and, of course, all the organs which it supplies. It may thus happen that the colon bacillus, which is constantly present in health in the large intestine, may under modified conditions become exceedingly virulent and its action upon the blood and other tissues suddenly become of a severely toxic character. Such a change has, in fact, been experimentally demonstrated to take place with this particular organism. Finally, I wish to call attention to a fact that I do not remember seeing emphasized, viz., that some agents, such as potassium chlorate, which produces a leucocytosis, also produces destructive changes upon the erythrocytes in the circulating fluid.

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1. Ewing: Pathology of the Blood, 1901, p. 201.

I have found moderate leucocytosis in a large proportion of the cases of intestinal toxemia wherever the reaction to the organism was sufficiently strong to produce it, and I believe that there is good reason for assuming a hemolytic action upon the erythrocytes under many, if not most of the conditions which produce a leucocytosis. Of course this does not exclude the possible hemolytic action of certain toxins such as those of tuberculous, which do not produce a leucocytosis.²

In this connection, the recent experimental and clinical observations of White and Pepper³ on the granular degeneration of the erythrocytes produced by lead are exceedingly suggestive as to possibilities of chemical poisons acting on the erythrocytes. I have frequently observed the granular changes which they describe, but have regarded them as artefacts, due possibly to errors in technique, although that technique was apparently uniform. It seems reasonably certain that there are other structural changes in the erythrocytes which are not demonstrable by present methods of research, produced by a variety of chemical agents circulating in the blood. The resistive power of the red cell to different dilutions of normal saline solutions, as well as its varied resistance to other destructive agents—such as a shock from a Leyden jar, etc.—can only be due to variations in the construction of the cell, the nature of which can not at present be determined. The recent studies of Ehrlich and Morgenroth, an excellent summary of which has recently appeared in Meltzer's⁴ article, also point to the same conclusion. The hemolytic actions of certain alien serums is a remarkable phenomenon, and points to the probability of there being many chemical agents which may find their way into the blood, as factors in lowering the resistive power of the red cells, and leading to premature senescence and decay.

The following cases are briefly outlined as furnishing clinical evidence in supporting the views already set forth:

CASE 1.—I. D. M., a patient of Dr. Wright of Convoy, Ohio, consulted me June 11, 1901, complaining of extreme weakness, loss of appetite, pain in the back, palpitation of the heart, dyspepsia, and disturbance of the stomach function.

The stomach symptoms were of long duration, his health having been somewhat impaired in this respect for a number of years. Three months before my examination he began to run down in strength until within a few weeks the exhaustion had become extreme. It was progressive up to the time of his visit to my office.

The blood examination showed 1,500,000 red cells, 4300 white, 30 per cent. of hemoglobin.

Examination of the urine gave the following result: Total quantity per 24 hours, 950 c.c.; specific gravity, 1022; total solids, 25.63; urea, 2 per cent. or 19 grams. Indican and skatol were both present in moderate amounts; no albumin or sugar.

Stomach examination, Ewald test breakfast, removed in one hour, gave the following results:

Total quantity, 20 c.c.; no free HCl; total acidity, 85. Lactic acid was present in considerable quantities. Starch digestion was good; biuret reaction faint. The fasting stomach contained large quantities of cellular debris. There was also severe colitis, evidently chronic in character.

Physical examination revealed a somewhat large and indurated liver; heart normal in size, but with a mitral systolic bruit.

Examination of the dried and stained blood films showed the red cells to be of normal size with very few normoblasts and no megaloblasts. There was a very severe poikilocytosis, the

cells assuming different sizes and shapes. Measurement of less than 100 cells gave less than the normal average, about 6.5 microns.

The case was regarded as one of secondary anemia, probably resulting from disease of the digestive tract, and treatment instituted accordingly. He was placed upon Fowler's solution, with bitter tonics, and a 5-grain dose of double citrate of iron and quinin three times a day. This was not materially different from previous treatment. In addition he was given local stomach treatment every day, consisting of lavage, pneumatic gymnastics according to the method of Turck, and electricity. He was also given colon lavage for the colitis, with general hydrotherapeutic measures, particularly in the form of hot and cold douches.

Improvement was manifested in a week, and the red cell count and the hemoglobin showed progressive improvement from this time on until August 7, less than two months from my first examination, when the red cells numbered 5,000,000 and the hemoglobin 100 per cent. The patient's general condition was also very good, and he was discharged cured, with the exception of the gastritis, which was greatly improved, but not well.

CASE 2.—A. B. M., referred by Dr. S. E. Mentzer, Monroeville, Ind. Farmer, aged 31, complains of stomach and bowel trouble of about 5 years' duration. Health always good until that time. He once had an attack of bloody flux, and since then has had occasional bloody stools. After a couple of years he began to have stomach symptoms, and for the last two years his health has been in bad condition. Shortly after eating he has abdominal distress, followed by thin, watery movements mixed with particles of unchanged food. He has lost 40 pounds in weight. His limbs were covered with purpuric spots in varying grades of intensity, some deep purple and others much faded, from the size of a silver dollar up to the size of one's hand. For two weeks before examination he has had extreme dyspnea on slight exertion.

Physical examination shows enlarged spleen, liver and heart with systolic bruit, most marked over the apex. Blood examination showed 1,700,000 red cells, hemoglobin about 25 per cent. Examination of the urine; total quantity, 250 c.c.; specific gravity, 1030; total solids, 24.36; urea, 4 per cent. or 14 grams; skatol and phenol in abundance, but no indican and no albumin or sugar.

A somewhat similar line of treatment, modified with special reference to the altered pathological conditions of the intestines, was instituted. The patient was unable to leave his room in the hospital, the exhaustion was so extreme.

Improvement was very slow in appearance in this case, although an increase in the red blood cells and hemoglobin was manifested after a week or ten days. After this time improvement was progressive, and in three and one-half months from the time of treatment he was discharged with the anemia cured, the red cell count having reached 5,000,000 and the hemoglobin 100 per cent. The chronic gastro-intestinal disease was much improved, and the general physical condition very satisfactory, the patient being able to do light work on his farm. He is still continuing treatment for the gastro-enteritis under the care of his family physician.

So far as one can judge the histo-chemical pathology of the blood, these cases were certainly secondary anemias, and whatever view may be taken of the precise pathological processes involved, the previous history of the cases, and the therapeutic test appear to establish the etiologic roll of the gastro-intestinal disease. This is the practical clinical fact, and, in attempting its explanation we may freely admit the debatable character

2. Clinically, leucocytosis is commonly found in phthisis, but it is due to a mixed infection.

3. American Jour. Med. Sciences, September, 1901.

4. New York Medical Record, Aug. 3, 1901.

of the ground upon which we stand. Indeed, it seems to me that to insist upon any single factor as playing an exclusive rôle is to take too narrow a view of the situation. We should, for instance, recognize, 1, the importance of the varying grades of subnutrition encountered; 2, the chemical factor, the precise nature of which can not usually be determined, but the existence of which, as a factor in morbid hemogenesis, is substantiated by a mass of clinical and experimental evidence, quite conclusive in character, and includes, in its broader relations, not only the products of digestion unmodified by the physiologic functions of entero-hepatic structures and bacterial ptomains, but the leucomains of normal or morbid metabolism, and the products of bacterial growth on all mucous surfaces or parenchymatous structures; and last, but perhaps not least, because of its greater permanence, that intangible something, the expression of a hereditary or acquired vice, which determines what has been called the vulnerability of the tissue or organ. Such, it appears to me, is the broad view which clinical medicine should take of these cases, and in calling attention to the rôle of gastro-enteric disease, with a report of a couple of selected cases, I would especially emphasize the importance of not losing sight of the other factors to which attention has been called.

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THE ANATOMIC FACTOR IN THE PRODUCTION OF BALDNESS.

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Cunningham, in opening his chapter on the dissection of the scalp, says: "Strictly speaking, the term 'scalp' should be restricted to the soft parts which cover the vault of the cranium above the level of the temporal ridges and the superior curved line of the occipital bone"; whilst Treves states it is convenient to consider the term "scalp" as limited to the structures formed by the union of the first three layers, viz., the skin, the subcutaneous fatty tissue or superficial fascia, and the occipito-frontalis muscle and its epicranial aponeurosis.

How strikingly does the scalp area of Cunningham correspond with the area of baldness as seen in most individuals the subjects of this condition! But still more precisely and accurately does the area of baldness correspond to the area of the epicranial aponeurosis, a structure in which there are no muscular fibers nor yet any underlying muscular fibers between it and the bone. That the production of baldness has an anatomic factor, I propose now to discuss more in detail.

The skin of the scalp is intimately connected with the underlying epicranial aponeurosis by the superficial fascia. In fact these two structures are so firmly attached by dense fibrous bands that it is a difficult undertaking for a dissector to essay their separation. Among these meshes lie the fatty tissue, the nerves and the vascular structures before they break up to supply the skin. Similar superficial fascia is found in the palms of the hands and the soles of the feet; and it may be significant to note that of the three regions of the body supplied with this dense superficial fascia, the overlying skin in the two latter is altogether destitute of hairs, whilst the third, the scalp area, very often becomes similarly destitute in later life.

Any one who takes the trouble to examine and observe closely must be struck by the fact that baldness occurs on the top of the head and rarely if ever extends

below the temporal ridges latterly, or even down to the superior curved lines of the occipital bone posteriorly. It will be noticed also that baldness extends lower in the middle line behind than it does an inch or so on either side of the middle line posteriorly. This, of course, corresponds to the fact that there are no muscular fibers in the middle of the occipito-frontalis muscle at its attachment to, or rather origin from, the external occipital protuberance and the adjacent parts of the superior curved lines.

The skin of the scalp, therefore, overlying the epicranial aponeurosis, has no underlying muscles to exercise it, and has only to depend upon the action of the occipito-frontalis muscle to which it is closely adherent, and only moves when that muscle is put into action; and how often that muscle is moved in twenty-four hours, I leave any one to conjecture. In no other region of the body is there such an extensive area of skin which does not receive adequate exercise either through underlying or adjacent muscles.

The skin of the area of baldness is abundantly supplied with blood; the scalp is very vascular. There is nothing anatomic or mechanical to interfere with or retard the arterial supply, unless it be the proverbial constriction of the hat assumed by the male portion of the population. As far as this acts upon the arterial trunks, it is infinitesimal, but upon the return flow in the lymphatics and veins the hat has its influence.

The lymphatics and veins drain the area of baldness in five different directions. On either side of the middle line anteriorly, there is a lymphatic stream down the forehead past the nose and over the face to the submaxillary glands. Latterly these vessels lead to the lymphatic parotid glands; posteriorly, into the post-auricular and suboccipital glands. The fifth is along the path of the emissary veins through the parietal foramina when present in the parietal bones, into the superior longitudinal sinus. I have recently taken the trouble to examine a number of parietal bones. In a great many of these the parietal foramen, which when present is generally situated about an inch or so anterior to the posterior superior angle on either side of the sagittal suture, was absent altogether; and it was in the smaller and thinner bones that it was present. It would be, perhaps, an interesting point to know whether this parietal foramen with its emissary vein, were more constant in women than in men, as its presence must add materially to the draining facilities of this region.

Whilst the skin of this area of baldness and consequently the hair follicles may have a good nourishing supply directed towards them, the functions of the hair papillæ may be stunted by the slow return flow through the veins and lymphatics. What is there to accelerate that flow? Nothing but the inactivity of the epicranial aponeurosis, and, perhaps, to a slight extent, gravity. There is no active muscular exercise in the part whatever, to hurry along the waste products and the deoxygenized blood in the vessels. These structures being superficial and more compressible than the arteries, their compression by the rim of the hat will further retard their flow. In their passage outwards from the center of the dome, the rate of flow is dependent entirely on the gradual fall, that is, to gravity. When they approach the borders of the dome, however, the fall is precipitate. Here, also, the influence of underlying muscular structures comes into play. One can easily demonstrate this by placing the hand on the back of the head and noting the extent of skin exercised in the nodding