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Publication/Creation

Baltimore, Maryland : Publisher not identified, 1910.

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AN HISTORICAL SKETCH OF BLOOD-LETTING.*

By JOSEPH T. SMITH, SR., M. D., Baltimore, Md.

The practice of blood-letting is one of the oldest; it has been used to combat disease for more than two thousand years, and the earliest medical writers make mention of it, but its origin is unknown.

Hippocrates drew blood from the arm, feet, legs, forehead

* Read before The Johns Hopkins Hospital Historical Club, February 14, 1910.

PAM 615.811.1
and from under the tongue, employing the measure as a simple evacuant, as a derivative for the purpose of giving the blood and animal spirits free movement in cases of apoplexy and palsy because stagnation was believed to exist and to cool the body. He recommended its use in violent and acute diseases in the strong, particularly those in middle life, but thought it harmful in the very young, the old and feeble. If the occa-

Johns Hopkins Hospital Bulletin, vol.21, 1910, pp.311-6.

sion seemed to require it, he did not hesitate to take enough blood to produce complete syncope, taking as his guide the color of the flowing blood; if this changed from red to dark or from dark to red, the flow was stopped. His bleedings seem to have been done only for the relief of pain, a vein being opened as near as possible to the part affected, no matter how high, or ardent as the expression was, the fever ran, blood was not drawn unless inflammation was present. It is of interest to note that Hippocrates makes no mention in his writings of the amount of blood necessary to be drawn. He does not appear to have practiced arteriotomy nor to have known the use of leeches.

Erasistratus and his followers caused the practice to fall into disuse; they thought the loss of blood, in addition to abstinence, would weaken the patient too much, that it was often difficult to discover the proper vein to open and there was danger of opening an artery; they furthermore believed that it was not possible to know what quantity of blood to take—if too little, good results would not follow, if too much, the patient might die and lastly they feared lest the escape of the blood might be followed by that of the animal spirits.

Asclepiades brought blood-letting to the front. He believed that all phenomena of living bodies were dependent upon the motion of corpuscular atoms through corresponding pores and that disease consisted in a want of correspondence between those corpuscles and pores; hence he used scarification with cupping to open the pores. Pain seems to have been his guide in the use of the lancet; in cases of inflammation without pain no blood was taken; thus pleurisy called for blood-letting, not pneumonia.

Areteus and Celsus were very favorable to the practice; the former used small and frequent bleedings rather than one large one. He seems to have been among the first to draw blood from the arteries, and he bled to produce relaxation of the solids in order to facilitate the passage of urinary calculi, etc. Celsus made a critical and extensive study of the subject and was bold in the practice in that he did not consider the age, only the strength of his patient, and he determined the strength by the quantity and quality of the blood; he would not bleed before the second day, as the humors were still crude and not ripe for evacuation, nor after the fourth, as by that time the bad humors would have been spontaneously dissipated or have made their full impression upon the system; he confirmed the observation of Hippocrates, that a change in the color of the flowing blood meant harm.

Phlebotomy seems to have held its own down to the time of the vain but meritorious Galen, who appears to have been the first to note the amount of blood which should be drawn, the largest quantity he speaks of being one pound and a half and the smallest seven ounces; he bled when the fever was lowest and on the affected side.

Avicenna and the Arabian physicians followed the Greeks. They took issue with Hippocrates, as they believed, in cases of pleurisy that blood should be drawn from the side opposite the disease, a trivial matter from our viewpoint, but at the time it caused many great and earnest discussions in the

schools of physic. Volumes were written and published in support of the two sides and the dispute became so great that the University of Salamanca issued a decree that no one should dare to let blood from the side affected and to add authority to the decree, endeavored to procure an edict from Charles the Fifth alleging that the contrary practice was as prejudicial to the community as Luther's heresy itself.

Among the Egyptian physicians blood-letting was practiced to a very great extent, both arteries and veins being opened. They had no dread of opening an artery, although they exercised great care. A ligature was applied and when the artery was distended, the smallest incision possible to admit the flow of blood was made with a very sharp instrument; after sufficient blood was taken, lint was placed over the wound, on this a coin and the whole was firmly bound down for three days.

The history of blood-letting is a long and interesting one; we learn from it that the practice has failed to secure a firm and well-defined position. In 1830, in the June number of the "Baltimore Monthly Journal," three pages are devoted to a selected review of a proposed "plan for the investigation of the due administration of blood-letting, by Marshall Hall, M. D." The review says: "No remedy is now more general—not even calomel or blue pill—and this fact may assure us that no remedy is more abused."

A review of blood-letting during the ten years, 1830-1840, when it was extensively practiced and at a time when medical practice was to a large extent freed from the myths and legends of the ancients, will give us the best insight into the subject, and for that purpose we have made free use of the books before us: "Lectures on Blood-letting," by Henry Clutterbuck, M. D.; "The Blood," by F. Magendie, M. D.; "Curiosities of Medical Experience," by J. G. Millenmen, M. D.; "The Baltimore Monthly Journal of Medicine and Surgery," 1830; and "A Treatise on the Blood, Inflammation and Gunshot Wounds," by John Hunter, with notes by James F. Palmer.

It may be of interest to note first the earlier opinions held in regard to the blood and circulation. One of the controversies was in regard to the life characters of the blood, was this fluid in whole or in part endowed with life or was it merely a dead fluid material from which the living matter was formed? John Hunter seems to have been the first to establish a rational system and a reference to his beliefs and opinions may not be out of place. He thought that life existed in every part of the body and studied the blood with that understanding. He says: "The difficulty of conceiving that blood is endowed with life while circulating arises merely from its being a fluid and the mind's not being accustomed to a living fluid." Hunter thought coagulation a life action, as in union by the first intention particle unites with particle by cohesive attraction, for he says: "Union by the first intention is no more than the living parts separated—forming a reciprocal attraction of cohesion with the intermediate coagulum."

¹ J. G. Millenmen: *Curiosities of Medical Experience*, p. 234.

² J. Hunter: *A Treatise on the Blood, etc.*, p. 43.

The fluidity of the blood in the vessels was attributed to some unknown inherent principle. This coagulating lymph he considered the essential part of the blood, because it is to be found in all animals, and because, under certain circumstances, it is capable of "undergoing spontaneous changes, which are necessary to the growth, continuance and preservation of the animal."¹ The serum, he believed, common to the blood of all animals, but was most abundant in those which had red blood; it was lighter than other parts of the blood and the stronger the coagulation of the lymph the more serum could be obtained; it might be found without being separated from coagulating lymph, as in dropsy, and the fluid in which the fetus swims. The function of the serum he considered was to keep the red corpuscles suspended and prevent their solution; it also served to suspend or dissolve coloring matters and foreign substances, as is seen when the coloring matter of the bile is found in the blood in cases of jaundice or after the administration of rhubarb. He seems to have attached much importance to a "wheyish" appearance in the serum, which he observed most frequently "in the blood of breeding women" and which upon setting "often throws up a white scum like cream." In viewing this cream under the microscope it was "plainly globular." "The globules of white serum differ from the red globules in color, specific gravity, size and in not dissolving in water."² The red part of the blood he thought the least important; the red globules, he believed, had a determined shape and size and that they were regular so that two could not unite as could two drops of oil. He did not seem able to account for their peculiar properties, as he says: "What this property in the red part is I do not know, for it has something like the nature of a solid body; yet the particles seem not to have the properties of a solid, for to the touch they yield no feeling of solidity. When circulating in the vessels they may be seen to assume elliptical forms, adapting themselves to the size of the vessels; they must, therefore, be a fluid with an attraction to themselves while in the serum which forms them into round globules, yet without the power of uniting with one another, which may arise from their central attraction extending no further than own circumference."³ As to their use, he says: "Whatever may be their utility in the machine, the red globules certainly are not of such universal use as the coagulating lymph. . . . Their use would seem to be connected with strength."⁴ The red globules, he thinks, give the color to the blood and the influence of air upon that color greatly interested him. "Many substances," he says, "change the color of the blood . . . as the air produces this effect in the living body and as we find that without air the animal dies, great stress has been laid on this change of color, whereas it should only be considered as a sign that the blood has been in contact with the air, but not that it must be fit for the purpose of circulation. . . . Most probably the effect of air upon the blood is greatest on the coagulating

lymph; and this conjecture is rendered more likely when we consider that in animals which have no red globules of any kind respiration is as essential as in any other."⁵ The blood, then, as Hunter knew it, consisted of three parts, the serum, the lightest; the lymph, or solid portion; and the red globules, the heaviest. A word in regard to his views of inflammation. The "act of inflammation," as he calls it, is attributed to increased action of the vessels, chiefly, if not altogether, in the smaller ones; these, when the stimulus causing the trouble is applied, are distended beyond their normal limits and size, this being an active dilatation, the blood has no change impressed upon it in passing through from the arteries to the veins; the increased redness was attributed not only to the fact that more blood reached the part by means of the dilated old vessels, but that new vessels were formed in the extravasated lymph. The swelling, he thought was due to extravasated lymph, the serum not being thrown out, as in dropsy, but squeezed out from the coagulating lymph. The pain was thought to be caused by increased nerve action brought about by the enlarged blood-vessels and the thrown-out lymph, the nerves themselves not being inflamed. Heat was regarded as a sign usually of strength and power of constitution and that it meant positive action, but the actual increase of the heat in inflammation he does not think as great as it seems to the senses; he says: "As inflammation is the principal instance capable of producing local heat I have taken the opportunity of examining inflammations . . . I have also made several experiments . . . and cannot say that I ever saw . . . a case where the heat was really so much increased as it appeared to be to the sensations."⁶ Magendie, in his lectures on the blood, delivered in 1837-1838, follows much in the line of Hunter's teachings; he speaks of fibrin and discusses the phenomena of coagulation. The red corpuscles he thought lost the ability to pass through the capillaries if modified in form or size. He treats in detail of a property of the blood, he terms it "viscousness," because by it the fluid is able to pass through the minutest capillaries which otherwise would be impossible. He uses as proof the experiment with water, which cannot be forced through the very minute vessels unless gum, gelatine or albumen are added "when the attempt at injection becomes successful immediately." He strongly disapproves of bleeding from points of election, the matter which gave rise to such a serious discussion as noted in the history. He says: "No one would have had hardihood enough to deny the excellent effects ascribed to bleeding practiced in those points of election, as they are called, while the theory which led to their adoption seemed so logically established. I confess I myself formerly shared in the belief professed by a majority of medical men on the point; but if you reflect on the matter, you will see that such a notion is utterly devoid of foundation. If the circulation were formed of a series of rings, mutually independent of each other, we might rationally open one vessel rather than another, according to the site of the disorder we had to com-

¹ Idem: p. 44.


² Idem: p. 62.

³ Idem: p. 65.

⁴ Idem: p. 72.

⁵ Idem: p. 79.

⁶ Idem: p. 323.



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...; but the chain formed by the arterial tubes is perfectly continuous throughout the frame. The pressure cannot diminish at one point without doing so to the same extent in every other. Whether you bleed from the temporal or the tibial artery, the effects will be mechanically the same in respect of the circulation of the brain. The preference given the former of these vessels is justified by its superficial position which renders it easily accessible; but as regards the therapeutical influence of its division, it can lay claim to no real superiority. If you represent by five the diminution of pressure in the temporal, you must represent by five also that in the tibial artery."* That his belief was not universal is seen where he says: "Further, it is a common inquiry, whether in cases of pneumonia of the right lung we should bleed at the right side; and in cases where the left organ is affected, at the left? Opinions are still divided on this point. . . . But there is another method of blood-letting which is reserved for great and important occasions . . . I mean cross-bleeding. . . . Suppose a case in which a variety of therapeutical measures have proved unavailing. . . . A consultation of medical celebrities is, of course, held and upon what do you suppose the deliberations sometimes turn? Upon the propriety of opening a vein in the right arm, at the same time as another in the left foot! Is there, I would ask, such a very great difference between the employment of amulets . . . and the confidence attributed to bleedings the jets of which cross each other in the form of an X.""

The blood during the period, then, of ten years was regarded as a living fluid, composed of serum and red corpuscles; upon withdrawal from its vessels coagulation took place by the organization of fibrin, which formed the clot, this clot enmeshing the corpuscles and squeezing out the serum; the circulation of the blood in the minutest capillaries was made possible by the viscousness of that fluid and the fact that the corpuscles were able to conform themselves to the shape and size of the tubes, and lastly, although the belief was not universal, that the point of election was only one of convenience.

The changes induced in the healthy body by the withdrawal of blood were classified as primary and secondary, importance being attached not only to the quantity but to the rapidity of its withdrawal, six or eight ounces taken slowly producing no very striking effects, while 12 or 20 ounces taken rapidly would cause a feeling of languor, a weakening of the pulse, a pale, cold skin with cold sweat ending in syncope. Fainting was regarded as a very important indication, and Dr. Hall, in the review noted above, devotes a great deal of space to a discussion of the subject, as did most of the writers of that day. The review says: "It is certain that if several persons be bled deliquium in the erect posture, they being of apparently similar strength but affected with dissimilar diseases, they will be found to have lost very different quantities of blood before fainting is induced. Dr. Hall has known a patient, not apparently very feeble, to faint on losing four ounces

of blood, while he has seen other patients bear the loss of 50, 60 or even 70 ounces of blood without syncope. How is this to be explained? Its rationale is to be found, I believe, in connection with an equally interesting fact, that different diseases induce" (in) "the constitution different powers or susceptibilities in regard to the effects of loss of blood. Each disease appears, indeed, to possess its own peculiar and intrinsic virtue in this respect. This is determined by placing the patient perfectly erect and bleeding to incipient syncope; the quantity of blood which flows is the measure of the protective influence of the disease in one class of cases, and of its influence in superintending a susceptibility to the effects of blood in the other.

"An interesting scale of diseases may be formed representing these properties. It would begin with congestion of the head or a tendency to apoplexy; inflammation of the serous membranes and of the parenchymatous substance of various organs would follow; and lastly, inflammation of the mucous membranes. This part of the scale would be divided from the next by the condition of the system in health. Below this would be arranged fever, the effects of intestinal irritation, some cases of delirium, reaction from loss of blood and disorders of the same class with hysteria, dyspepsia, chlorosis and cholera morbus." Again: "In inflammation much blood should be taken and much blood will flow before deliquium is induced; in irritation little blood should be drawn; and there is early syncope from blood-letting" (Balt. Month. J. M. & S. p. 208, etc.).

The immediate effects of blood-letting were believed to be caused by the rapidity of the withdrawal and the after effects by the quantity withdrawn. Nutrition was thought, in many cases, to be markedly improved, as when blood was carefully withdrawn the appetite improved as did also digestion and assimilation; small and frequent bleedings served to calm the circulation and this condition favored the deposition of fat; absorption from cavities and the interstices of the body was increased, hence the relief of dropsies and inflammatory exudates; the brain was thought to have its sensibilities to all kinds of impressions increased, while the power to act with effect and continuously was diminished, the mental powers were not thought to be impaired. It was considered "highly necessary to attend to the state of the mind and feelings of the patient" as "in persons of a timid disposition, the bare proposal of the operation of bleeding or even expectation of it will sometimes occasion such general disorder of the system and in the pulse more especially, as may lead us to form an erroneous opinion as to the existing malady and its treatment."

Blood-letting was used for a threefold purpose, as a curative, as a palliative and as a preventive. "In regard to its curative powers, blood-letting is capable of removing, with more or less facility, though never perhaps with absolute certainty, a great number of diseases, which but for its aid, would endanger or destroy life, and which cannot be effectually combated by other

* Magendie, F.: *The Blood*, p. 96.

¹⁹ Idem: p. 97.

²⁰ H. Clutterbuck: *Lectures on Blood-letting*, p. 25.

means. Considered in the light of a palliative merely, it is still of no small value . . . there are scarcely any that do not admit of more or less palliation; and blood-letting is often the best means we have of effecting this purpose. An instance of this is afforded in the case of phthisis pulmonalis, where the acute pain that occasionally arises in the chest, even in an advanced stage of the disease, and when the case is altogether hopeless, seldom fails to be relieved by a small bleeding; and (provided this be done under proper limitation) without any increase of weakness, or other inconvenience. On the contrary, not only is the pain relieved, but the hectic and night sweats also; while the appetite is usually improved by it, and sleep rendered more refreshing. The same remedy is also, on many occasions, preventive in its effects; by lessening if not destroying the tendency to certain diseases, of which apoplexy, hemorrhage and inflammation may be cited as examples sufficiently well known."¹² It was believed to be capable at times of controlling spasm, to act as an anodyne in the relief of pain and as a narcotic inducing tranquil sleep. It was used to influence disease in one or more of the following ways: by merely reducing the mass of blood, by a general weakening of the system and as a sedative by diminishing vascular activity and excitement. The first was used to overcome that factor which was thought to hold such a very important position in the cause of disease, regardless of its nature, namely *plethora*; the second to overcome what was known as the *sthenic* condition, which was thought to call for a weakening of the system, and in cases of fever and vascular excitement blood was drawn for its sedative effect.

Blood was obtained in one of four ways and much discussion was indulged in in regard to their relative values; phlebotomy or the opening of a vein, arteriotomy or the opening of an artery, scarification, either with or without cupping, and by the use of leeches. Phlebotomy and arteriotomy constituted what was known as general, and scarification and leeches what was known as local or topical bleeding; the former was supposed to produce its remedial effect "either by sympathy or through the medium of the general system" and in the latter "the blood is taken, or presumed to be taken, immediately from the vessels of the diseased part or those in its immediate vicinity." Two conditions were chiefly relied upon in determining how and in what quantity blood should be taken, the strength or weakness of the patient and the condition of the pulse. Dr. Clutterbuck concludes a very interesting discussion of the pulse as a determining factor in blood-letting as follows: "There is, nevertheless, a state of pulse that is always extremely unfavorable to blood-letting, if not altogether prohibitory of it: I mean, where it is at once small, soft and compressible by the slightest force. But this is sure to be accompanied by other unequivocal signs of extreme weakness that cannot well be mistaken.

"Upon the whole, I may observe, that there is hardly any condition of pulse, either in regard to strength or weakness, fullness or smallness, hardness or softness, frequency or slow-

ness, regularity or irregularity, which taken singly and in all cases, either absolutely calls for, or prohibits, blood-letting. Much attention, doubtless, is due to all of them. Each may serve as a guide, in regard to the quantity of blood to be drawn, the repetition of the operation and the like; while, taken in conjunction with other circumstances, it may serve to determine the propriety of the evacuation altogether."

The questions to be answered in each case, after a bleeding was decided upon, was how much and in what manner the blood should be taken. Much discussion took place as to whether there should be one large bleeding or several small ones, and the celebrities of that day were frequently called in consultation to determine the point.

In adults of good general health, from 8 to 12 ounces was considered a moderate and 16 to 20 ounces a large bleeding. The large bleedings were, as a rule, resorted to in the acute and violent types of disease and the smaller in those types of a more chronic character.

Dr. Rush, of Philadelphia, says that 90 ounces were taken at one time from his friend, Dr. Dewees, and with advantage. The latter physician, Dr. Dewees, himself states that he took 80 ounces of blood within a few hours from a young and delicate woman, who had been seized with convulsions towards the end of pregnancy; and from another similarly affected, at the commencement of labor, he drew 120 ounces within five or six hours, and 20 more the following day. The patient, notwithstanding, he says, recovered rapidly, but became blind and continued so for a fortnight and did not perfectly recover her sight for six months."¹³ "Dr. Barlow . . . mentions the case of a feeble and emaciated boy, who was laboring under diabetes, and from whom 209 ounces (13 pounds) were taken at 12 successive bleedings, in the space of 51 days, which is at the rate of 19 ounces each bleeding; he was bled twice a week on the average. The effect, Dr. B. says, was striking; from a state of feebleness, hardly admitting of an erect posture, the lad acquired a degree of vigor which enabled him to hold the plough for several hours a day."¹⁴

Blood-letting, above all, was used in that strange series of phenomena which grouped together were called inflammation. Dr. Clutterbuck says, p. 60: "Among the diseases to which blood-letting is particularly adapted inflammation undoubtedly claims the first place, for it is here that the power of the remedy is most strikingly displayed, and its employment the most frequently called for." Again, p. 65, he says: "Different circumstances appear to influence the result, in the application of blood-letting as a remedy for inflammation, and which, therefore, require to be considered. The following are the chief:

- "1. The degree of the disease.
- "2. The stage of it.
- "3. The part in which it is seated.
- "4. The nature of the inflammation itself."

Hemorrhages of the so-called active type were treated to a very large extent by blood-letting, as were also dropsies. Many

¹² Idem: p. 27.

¹³ Idem: p. 51.

¹⁴ Idem: p. 52.

forms of cerebral disease were thought to be very favorably influenced by the drawing of blood, notably apoplexy.

This imperfect sketch may be fittingly concluded by a quotation from Dr. Clutterbuck; he says, p. 36: "There is no one function, either mental or bodily, that is not more or less under the immediate influence of this agent, according to the manner in which it is applied, and the extent to which it is carried. It quickly and powerfully disturbs the heart and whole vascular system; as is evident not only from the changes induced on the pulse but from the capillaries, in extreme cases, suddenly ceasing to contract, so as to allow their contents to escape in the form of cold sweats; respiration is disordered by it—the

alimentary canal and urinary organs often discharge their contents involuntarily—and lastly, the cerebral functions of sensation, voluntary motion and thought, are impaired, disordered or even wholly suspended, by a sudden and copious abstraction of blood. Nor are morbid actions by any means exempt from this influence (for disease is only a modification of healthy action, and is more or less under the influence of the same agents). In short, blood-letting, in checking or suppressing violent diseases of any kind, appears to act upon a principle very analogous, if not identical with, what is called counter-irritation, but which in this case is, perhaps, better termed counter-impression."

