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THE

# UPPER CANADA JOURNAL

OF

## Medical, Surgical and Physical Science.

### ORIGINAL COMMUNICATIONS.

ART. LIII.—*The Hip-joint: Considerations on its injuries and diseases, deduced from the anatomy.* *By* S. J. STRATFORD, M. R.C.S. England, Toronto. *Continued from No.* 8.

DISLOCATION OF THE FEMUR UPON THE DORSUM OF THE ILIUM.

*Continued.*

In our last communication we entered fully into the consideration of the action of the several muscles which operate upon the thigh-bone; we especially indicated their position and influence, when dislocation upon the dorsum of the ilium had taken place—and if we shall have duly appreciated their condition, we shall be able to deduce from them the symptoms which indicate the nature of this accident, and serve to distinguish it from every other affection to which this joint is liable.

In the first place, the limb is shortened—the position of the head of the bone is placed in a line considerably superior to the cotyloid cavity, in some instances, several inches above it; secondly, the toe is turned inwards by the head and neck of the femur, being bound down upon the dorsum of the ilium—thirdly, the limb is flexed upon the body, and kept in an advanced position by the action of the psoas magnus and iliacus internus muscles. Its fixed immobility in this position serves to distinguish it from fracture of the neck of the thigh bone. If we turn the patient on the belly, and examine the region of the articulation, we find a great deficiency in the prominence of the hip, which does not correspond with the opposite side. Should we extend the knee, place the hand upon the hip-joint, and use the foot as a lever, then try to rotate the joint, we shall find

this impossible, and may observe the head of the bone and trochanter major stationary, and resting upon the pelvis, while the head of the bone may be observed removed backwards out of its true position. Should we measure the limbs, having duly marked the line of the anterior superior processes of the ilium, we measure from this point to the inferior margin of the patella, then we shall find the dislocated thigh considerably shortened, often by several inches, and this shortening we are unable to diminish by any ordinary traction of the limb.

Having by these means ascertained the nature of the accident, that it is truly a dislocation of the thigh bone, upwards and backward, we set ourselves to consider the cause that placed the bone in this position, and the course which the head of the bone took to arrive at it. When we have reflected upon this point, we shall clearly perceive that the route which the head of the bone took to arrive at its present location must be exactly reversed to enable it to return into the cotyloid cavity. When we undertake truly to reverse this course, it will be found that it relaxes all those muscles which now serve to render the bone immoveable in its new position. The posture of the limb forcibly adducted, rotated inwards, and flexed upon the pelvis, was the position it assumed at the moment the head of the bone started from its cotyloid cavity; this position continued the same after the capsular and triangular ligaments were lacerated, and while the head of the bone was driven upwards upon the dorsum of the ilium. It was not until an attempt was made to straiten the limb, that the powerful action of the muscles came into play, fixed the bone and rendered it immoveable. To reduce this dislocation, then, we return the limb to this same position, flex it powerfully upon the body and adduct it at the same time; now we have relaxed the pyriformis, the gemelli, the obturator internus, and quadratus muscles. By sweeping the trochanter major round towards the back of the pelvis, we have freed the joint from the constricting power of these muscles; and by rotation of the foot outwards, we shall have relieved the obturator externus: now traction forward, assisted with continued rotation of the foot outwards, will bring the head of the bone opposite to the cotyloid cavity—when abduction of the limb, assisted by the action of the muscles, will replace the bone in the socket.

Should any difficulty be experienced in the traction of the bone forwards, or should the spasmodic influence of the muscles still bind down the bone, so as to prevent its forward movement; the long lever, the thigh bone, may be

employed to adduct the limb, so that the upper extremity of the shaft of the bone, or the trochanter minor, may be made to act upon the edge of the cotyloid cavity, or on the bones of the pelvis, as upon a fulcrum; when gentle traction, and continued eversion of the foot will surely bring the head of the bone into the true position for reducing the dislocation. Among other points that must not be neglected in all these attempts at reduction is the employment of chloroform—this will not only obviate the pain natural to such an operation, but will greatly facilitate the reduction, by depriving the muscles of all power of resistance; so that it seems almost impossible to fail in our endeavours, after this method of practice, provided we have a just appreciation of the true course to be followed in our attempts at reduction.

During the employment of this method to reduce the dislocation of the thigh bone, the amount of traction necessary to restore the head of the bone in apposition with its cotyloid cavity, will be found trifling, comparatively speaking, with the power that is required to reduce the dislocation by direct force. In the one instance, a correct knowledge of the anatomy of the part enables us quietly to replace the bone in the position the most favorable for its reduction—while in the second, when we use the pullies, the force necessary to overcome the retractile power of the muscles acts as a stimulus to their more powerful contraction, and often forms the chief impediment to the object we have in view. Let us compare the ease and facility of these attempts at reduction to the formidable array of extension and counter-extension—the employment of pullies and use of violent traction. Even Dr. Ferguson confesses that such means had often failed, even after continuous and oft-repeated attempts—while in a few minutes afterwards he had known the dislocated bone easily relieved by hand; he says, "in some persons, after the pullies have been used for a considerable time, and when, perhaps, the rope has been relaxed in despair, a kind of collapse has supervened, when the muscles will become so flaccid, that a very slight degree of force, compared with that previously applied, will produce the desired effect." What can be more plain than in this case, that the violence of the muscular action was the cause of failure? and had the surgeon but truly considered the anatomical peculiarities of the part, and have been directed by them, it is clear that he could have produced this effect—muscular relaxation—simply by position, without having recourse to the pullies, to overcome the muscular action by continuous and painful traction sufficient to produce fatigue. I think that this view of

the case must also present itself, not only in the dislocation of the hip-joint, but in every variety of such displacement that shall occur in practice; and that it is a principle that should be thoroughly studied by every surgeon who hopes to follow his profession with comfort to himself, or benefit to his fellow-creatures—at all events, it is an axiom not to be forgotten in all these cases of dislocation, that the main object is always accurately to reverse the course which the head of the bone took to arrive at its abnormal position.

If, after we have prosecuted our efforts at reduction, and presented the head of the bone to the cotyloid cavity; we observe a sudden jerk or snap; we may be pretty certain that the reduction has been accomplished; added to this a facility of movement, and a loss of that deformity which was lately to be observed—when we see that all distortion has disappeared, that the two hips are symmetrical, there can no longer exist a doubt of our success, when our efforts may cease, and the patient may be conveyed to bed. The subsequent treatment of this injury to the joint consists in the applications of the means required to relieve the inflammatory action of the part; should this occur to any extent, general bleeding, leeches or cupping, assisted with nauseating doses of tarterized antimony, may be employed: perfect rest, or only the most subdued motion of the joint, is all that should be allowed until this condition has been relieved. Should chronic swelling, with pain, continue, friction, with stimulating liniments, may be used, or should this remain obstinate with any indications of chronic disease within the joint, the use of blisters, issues or seatons may be advocated. These means will generally restore the parts to health, unless some constitutional influence interfere to prevent it, such as gout or rheumatism, when, of course, this condition must be submitted to due consideration, and treated accordingly.

DISLOCATION OF THE FEMUR INTO THE ISCHIATIC NOTCH.

The head of the thigh bone may be removed from the cotyloid cavity, and lodged in the sciatic notch. This variety of dislocation is produced by causes and influences very similar in character to those which produce the removal of the bone from its socket and placed it on the dorsum of the ilium. In this variety the flexion of the thigh upon the pelvis must have been less extreme than in the preceding case—its adduction was so great that the bones of the pelvis acted as a fulcrum for the long lever, the thigh bone, and the head of the bone was raised from the cotyloid cavity by these means, while the continued oper-

ation of the force lacerated the ligaments, and forced the head of the bone into the ischiatic notch,—here it rests upon the pyriformis muscle, sciatic vessels and nerves. Lying upon the same plane with the acetabulum, the head of the bone sinks into the soft parts, and the trochanter minor does not appear to be rotated so far inward and backwards as in the former variety. The influence of all the muscles detailed in the former variety of dislocation here produce similar results, save that they are not so extreme; for, although the head of the bone has taken the same direction, it is not elevated to the same level, and the muscles are, consequently, not so powerfully upon the stretch. The consequence of these facts is, that although the dislocation of the head of the femur into the sciatic notch has been described as backwards and downwards, the limb is but little lengthened, for the ischiatic notch is nearly upon the same horizontal plane with the cotyloid cavity. The fixed inversion of the toe is, in this instance, not so extreme, because the soft parts on which the head of the bone rests yield to a certain degree, while the spasmodic action of the muscles confining neither the head of the bone nor the trochanter major, are not pressed so forcibly against the haunch bone, a slight mobility may be felt upon using the foot as a lever, but no rotation of the limb outwards can be permitted. When we attempt to restore the limb to the strait position, it is not found to be so powerfully flexed upon the body, because the psoas magnus and iliacus internus muscles are not placed so greatly upon the stretch, their point of insertion not being carried so far backwards or so greatly elevated. If we examine the hip, we find a great hollow, where the prominence of the trochanter major used to appear and upon careful manipulation, the head of the bone may be found resting in the sciatic notch.

As we have said, the result of the position of the thigh bone upon the action of the muscles inserted into it, in its present abnormal situation, differs but slightly from the effects caused by the variety of dislocation previously described—the fibres of the pyriformis, gemelli, obturator internus and quadratus femoris muscles, would be still excited, but not so violently as in the preceding instance; for, although the head of the bone now lies in a line parallel to its original position in the cotyloid cavity, it is removed considerably backwards, while the obturator externus and pectinalis would be greatly upon the stretch, confining the bone with considerable power. The psoas magnus and iliacus internus, will also act considerably upon the thigh bone, but not so powerfully as in the preceding kind of

dislocation, because their insertion is not raised so high or thrown so forcibly backwards, as when the head of the bone is placed upon the dorsum of the ilium. The action of the glutei muscles will also be partially excited, especially those fibres which proceed from the anterior portion of the pelvis, and help to rotate the toe inwards—I have said the influence of the displacement of the bone in its present position is that all the muscles are similarly but not so powerfully excited into action, as in the preceding variety of displacement; while individual muscles of the hip-joint do not suffer so exceedingly, all are still obnoxious to the least movement of the parts in any direction, and would hold the bone with a certain amount of spasmodic action that powerfully confines it in its new position; even did not the head of the bone sink down among the soft parts, so as in some degree to become hooked under the ischiatic notch, and hence to be confirmed in the situation in which it had fallen, these facts will be sufficient to distinguish dislocation backward and downwards, as it has been called, from fracture of the neck of the thigh bone.

The process necessary for the reduction of this displacement of the head of the thigh bone, and its removal from the ischiatic notch, must be perfectly consistent with the principles already evoked under the former head of displacement upon the dorsum of the ilium—viz., that the head of the bone must follow a course exactly the reverse from that which placed it in its abnormal position. When we attempt this reduction, the thigh must be bent upon the pelvis to a greater extent than is necessary in the preceding variety—this movement of the limb will give a greater facility of action, will permit the head of the bone to roll in its new situation, and, in a great degree, free it from the spasmodic influence of the muscles—when powerful adduction, acting upon the extremity of the thigh bone, as upon a lever, and this resting upon the pelvis, will raise the head of the bone from its new situation in the sciatic notch, while traction forwards, assisted with rotation of the bone outwards, will bring the articulating surfaces into immediate opposition, then the actions of the muscles will generally restore the parts into their true situation with an audible sound. These means, we maintain, will accomplish the reduction of the head of the bone into the cotyloid cavity, without the use of pullies, without submitting the patient to the horrid pain and terrible severity of forcible extension of the limb; under such an operation the force must act upon the muscles already strained to their utmost, or acted upon with spasmodic violence, so as, in many instances, to

cause their laceration, thereby increasing the great injury, which has already produced no little danger to the articulation.

There is a point, however, in regard to the reduction of dislocation upon the dorsum of the ilium that it would be well here to point out, and is exemplified by the treatment we have just recommended ; it is, that if, in changing the position of the head of the thigh bone, we flex the limb too powerfully upon the pelvis, we must be careful that we do not carry it beyond the right angle, otherwise we may be liable to change the position of the head of the bone from the dorsum of the ilium to that of the sciatic notch—such accidents we believe to have happened, especially in those cases in which the reduction of the head of the bone was expected to be accomplished simply by the relaxation of the muscles and traction upon the limb, without looking to the extended limb as the powerful lever which caused the dislocation, and was able by a similar influence to raise the bone from its abnormal position, and place it in the cotyloid cavity. This is a point that should be particularly attended to in our attempts to reduce the dislocation of the femur when the bone is lodged upon the dorsum of the ilium; and when the accident we have above suggested shall occur, it will be a clear demonstration that the simple relaxation of the muscular apparatus has been insufficient, that the true principle which should have effect in all these operations is the employment of the powerful lever, the thigh bone acting upon the pelvis as its fulcrum ; to accomplish the return of the head of the bone to its articulation. Doubtless, proper position, inducing muscular relaxation, will be a potent aid in our attempts ; but, although an essential element, it must not be set down as the main feature in this new operation for reducing dislocations ; we advisedly say for reducing dislocations, for we maintain that the principles that we have endeavored to set forth are universally applicable to all and every variety of these accidents, and we believe that at a future day the use of the pullies will be completely discarded in all such cases.

DISLOCATION OF THE HEAD OF THE FEMUR INTO THE THYROID HOLE.

This variety of displacement of the head of the thigh bone is, as in the preceding kinds of dislocation, invariably the result of the application of indirect force applied to the limb, or to the trunk of the body—a force that constitutes the femur a lever, while the fulcrum on which it acts is still the bones of the pelvis ; by these means it raises the head of the thigh bone from the cotyloid cavity, and the same force being continued lacerates the capsular liga-

ment, and lodges the bone upon the obturator muscle in the thyroid hole. A man, for example, puts his shoulder to a falling load, the extended limb slips from under him, and falling at an angle, he is crushed under the load, and his thigh bone is dislocated into the thyroid hole. When we examine the injured part, we find the dislocated limb some two inches longer than the other; the knee is raised, and the thigh cannot be extended in a strait line with its fellow; it is forcibly abducted, and the foot is turned somewhat outwards. If we place the patient in the erect position, we find that the trunk is bent forwards to accommodate the extended limb—the trochanter major is less prominent than on the opposite side, and the head of the thigh bone can sometimes be felt if we make pressure in this region with the hand, it will be observed at the inner part of the thigh towards the perineum, upon the rotation of the limb—in this position, a slight movement of the head of the bone is, in these cases, always permitted—still a power of rotation is necessarily prevented. Should we now measure the anterior superior spinous process of the ilium, and the trochanter major, and compare it with the opposite side, it will be a sufficient test of this variety of dislocation—and serve to distinguish it from inflammation within the joint, with which this variety of displacement has been occasionally confounded.

In this displacement of the head of the femur into the thyroid hole, the increased length of the limb is dependent upon the change of position of the bone; the head of the bone is now placed in a plane considerably below that which it had previously occupied in the cotyloid cavity. The forcible abduction, and the flexion of the limb is also caused by the action of the muscles, now morbidly influenced by the unnatural position of the bone. As soon as the head of the thigh bone has been forced from its normal position, and has arrived at the thyroid hole, the head of the bone is thrown forward, nearer to the median line, and the trochanter major approaches the acetabulum; so that while it has descended considerably below its natural position, it has approximated to the bones of the pelvis—not standing out from the cotyloid cavity at its natural angle; we find the usual prominence which it produces in the hip to have disappeared. By the descent in the position of the femur, those muscles which arise from the interior and back of the pelvis, such as the pyriformis, the gemelli, the obturator internus, and the quadratus, are all placed upon the stretch: of these, the fibres of the pyriformis, from their arising in a line far above the trochanter major in its pre-

sent position, suffers the most; still all exert an action upon the thigh that assists to keep it in a permanent state of abduction, and to evert the foot. As to obturator externus, this from the advance of the head of the bone towards its origin, will be found in a state of complete relaxation. Not so with the fibres of the pectinalis muscle, which is inserted below the trochanter minor, almost in a direct line downwards; this, from the descent of the femur, will now be considerably acted upon. Such, also, is the case with the adductor brevis. But from the advance of the head of the bone towards the medium line, approximating, in some degree, their origin and insertion, these muscles will only serve to assist in producing the eversion of the limb. The psoas magnus and iliacus internus muscles are also placed in a somewhat similar predicament, by the descent of the thigh bone; they also tend to keep the limb rotated outwards. The three glutei muscles situated upon the back of the hip are also now placed very considerably upon the stretch—these muscles are inserted into the trochanter major and linea aspera, the bone having descended to a plane considerably below its normal position; hence the distance of their origin and insertion is increased, thence their inordinate action; but the approximation of the trochanter major to the pelvis may, however, somewhat diminish their tension. These muscles, by their spasmodic action, serve to keep the thigh bone fixed and immoveable, but do not counteract the action of the flexor muscles. The fibres of the gluteus maximus, especially those which arise from the back and lower parts of the pelvis, such as from the posterior portion of the semicircular line of the ilium, from the vertical sacro-iliac ligament, and from the crest of the sacrum and are inserted into the linea-aspera: these, no doubt, serve greatly to keep the limb in a state of abduction. Doubtless, it is the great strength of this muscle which is permanently able to counteract the powerful action of the pectinalis and adductor brevis muscles that would otherwise serve to adduct the thigh; and, as a proof of this position, it is worthy of remark, that the two last named muscles are not unfrequently torn during the accident which gives rise to this variety of displacement. In addition, we find, as a necessary consequence of the descent of the femur, that all those muscles which arise from the pelvis and are inserted into the lower parts of the femur and bones of the leg, are now considerably upon the stretch, and not only assist to abduct the thigh, and bend it upon the body, but also to flex the leg upon the thigh. In this variety of dislocation into the thyroid hole, all the muscles of the hip and

thigh suffer more generally than in the preceding varieties, hence a more compound and complicated influence acts upon the bone in this abnormal position, and serves to keep the thigh abducted, and the toe everted when the body is inclined forwards; but when the line of the pelvis and vertebral column is strait, the thigh must be flexed upon the body, and the leg upon the thigh, with a similar amount of abduction and evertion of the limb.

To accomplish the reduction of the dislocation of the femur, when the head of the bone is placed in the thyroid hole, our duty must be directed to the principles which have formed our guide in the other varieties of the displacement. We must, in the first place, restore the limb to the position in which it was placed at the moment of the accident; consequently, the limb will be flexed upon the body, and powerfully abducted. This movement will relax all the muscles acting most powerfully upon the bone in its abnormal position. At the same time we may constitute the thigh bone a lever; while the trochanter major, acting upon the margin of the cotyloid cavity as upon a fulcrum, will serve to raise the head of the bone from the thyroid hole. We should gently invert the toes during this movement; when, as the inversion of the limb is slowly accomplished, these combined actions, assisted by the influence of the muscles, will raise the head of the bone, and bring it opposite to the cotyloid cavity, almost without any exertion upon our part. The psoas magnus, the iliacus internus, the glutæus maximus, and pyriformis muscles, are those which principally serve to raise the head of the bone from the obturator foramen, when we have, by appropriate position and influence, given them an opportunity. If the employment of these means, under the influence of chloroform, are not sufficient to accomplish the return of the bone into the acetabulum, we may use gentle pressure at the knee, after we have accomplished the movements of adduction and inversion,—have brought the head of the bone to the inferior margin of the cotyloid cavity; or at that moment, judicious extension, calling into action the influence of the muscles, which we have relaxed by position, will speedily elevate the head of the bone directly upwards, and it will be forced into the cotyloid cavity, with an audible noise. When in this position care must be taken that we do not too forcibly adduct the limb, do not carry it beyond its normal position, or we may cause the head of the bone to pass round to the back of the pelvis and lodge it in the sciatic notch, before the muscles have a chance to raise the head of the bone from the lower level at which it is placed in disloca-

tion into the thyroid hole. In all such cases it must be observed that in these means we have a most powerful instrument of good or evil in our hands, and we must be careful to use it judiciously. We think it is plain, then, that by this concentration of movement, that the head of the bone will, on reducing this dislocation in the thyroid, be made to follow a course diametrically opposite to that which placed it in its abnormal position, and that by these means it may be returned into the acetabulum with the very greatest facility, without the use of pullies, and without the pain and all the paraphernalia of extension and counter-extension.

When we consider the nature of this displacement of the thighbone, it can scarcely be necessary to point out the absurdity of endeavoring to reduce the dislocation of the head of the thigh bone in the thyroid hole by violent extension of the limb. The muscles are all now in powerful action, in consequence of the descent of the femur, and by further extension, we shall not only further increase the malposition and dreadfully aggravate the patient's sufferings, but we may lacerate the muscles; and if we powerfully adduct the limb at the same time that we make this extension, the head of the thigh bone may slip under the acetabulum, and find itself lodged in the ischiatic notch: a point from which Sir Ashley Cooper says it could not be reduced. Doubtless it could not, under the usual mode of action employed in these cases; but, if we reflect upon the course, the bone has taken in this kind of accident, to arrive at the sciatic notch, we shall plainly see that a precisely reversed movement, assisted with the muscular relaxation we have before suggested, will carry the bone back again into the thyroid hole; the original course of the dislocation being duly considered, and the movements being properly directed, will again place the bone in its natural position. In all these cases, it is really astonishing how much more easily the spasmodic rigidity of muscular action may be allayed by relaxation, and the reduction accomplished, than it can be overcome by main force; when this last has been employed, it has been usual to expect to overcome the muscular rigidity by the employment of means that influence the whole system—by producing syncope and general relaxation of the whole frame, either by bleeding or tartarized antimony; but by the judicious employment of position in all these cases we may obviate the necessity for all such violent and debilitating remedies, especially if we use Chloroform.

*(To be continued.)*

ART. LIV.—*Estimated comparisons in Normal and Abnormal Anatomy: or data for the prosecution of morbid investigations; by* DR. GOTTLIEB GLUGE, *Professor of Physiology and Pathological Anatomy, in the University of Bruxelles; member of the Royal Academy of Science of Bruxelles, &c. Translated from the German, by* JOSEPH LEIDY, ESQ., M.D., *Philadelphia.*

TABLE V.—CHOLERA FROM MAY 10 TO JUNE 1, 1849.

| CASE. | FEMALE. | | | | MALE. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I. | II. | III. | IV. | I. | II. | III. | IV. | V. | VI. | VII. | VIII. |
| Age | 2 yrs. | 6 yrs. | 35 yrs. | 44 yrs. | 10 yrs. | 31 yrs. | 37 yrs. | 40 yrs. | 40 yrs. | 46 yrs. | 60 yrs. | 73 yrs. |
| Size | 0, m 670 | 1, m 870 | 1, m 600 | 1, m 570 | 1, m 170 | 1 m, 690 | 1, m 740 | 1, m 580 | 1, m 480 | 1, m 700 | 1, m 667 | 1, m 660 |
| Weight of Brain | 1230 gr. | 1250 | 1350 | 1270 | 1400 | 1475 | 1500 | 1370 | 1300 | 1480 | 1430 | 1370 |
| Weight of Lungs | 160 | 450 | 580 | 600 | 360 | 1070 | 1250 | 670 | 1000 | 1200 | 900 | 1000 |
| Weight of Heart | 50 | 80 | 220 | 230 | 150 | 330 | normal | 290 | 270 | 400 | 320 | 350 |
| Weight of Liver | 200 | ..... | 1150 | 1150 | 1000 | 1850 | 2480 | 1400 | 1400 | 1450 | 1250 | 1270 |
| Weight of right Kidney | 30 | 100 | 120 | 90 | 60 | 250 | 150 | 230 | 150 | 150 | 120 | 230 |
| Weight of left Kidney | ——— | | 130 | ..... | ..... | 200 | 150 | | 120 | 150 | 120 | |
| Weight of Spleen | 30 | 70 | 150 | 130 | 80 | 200 | 480 | 190 | 100 | 200 | 100 | 150 |
| Duration of the Disease | 12 hours | 18 hrs. | 12 hrs. | 16 hrs. | ..... | 7 hrs. | sev'l days | 12 hrs. | 15 hrs. | sev'l days | 15 hrs. | 9 hrs. |
| Occurrence of the rigidity of death after the post-mortem examination. | 24hrs.not present. | 28 hrs. present. | 15 hrs. present. | 38 hrs. present | ..... ..... | ..... ..... | 15 hrs. present | 24 hrs. present | 12 hrs. present | 35 hrs. present | 13 hrs. present | 25 hrs. present |

OBSERVATIONS TO TABLE V., ON THE CHOLERA.

If we direct our attention to the pathological phenomena and truly characteristic anatomical alterations in Cholera, we observe under the operation of the morbific cause the following:—

1.—A retardation and final paralysis of the contractions of the heart, as also of the contractility of the large arteries.

2.—A diminution in the quantity of blood exposed to the influence of atmospheric oxygen in the lungs, indicated by a decrease in weight of the latter.

3.—A diminution or cessation of all secretions, probably induced by a retardation of the circulation.

4.—A gradual cessation of all contractile power in the organic muscular fibres of glandular ducts. Those which convey the bile, and the gall-bladder, no longer discharge their contents; the ureters do not expel the milky liquid contained within the pelvis of the kidneys; and finally, even the intestines cease to empty themselves. A similar paralysis, in visible degree, is exhibited by the muscular fibres of the bronchi; and it is alone to this cause, with a reduction of the moisture of the vocal cords, that I ascribe the diminished voice and the peculiar hoarseness of the disease.

5.—A decrease of the temperature, continuing parallel with the commencement of cyanosis, according to my examinations, in the hand, falls rapidly to 75° F. in the axilla, to 88°.

6.—If, upon the other hand, in the integrity of the brain and spinal marrow, the cramps appear only as reflex phenomena, nevertheless the sympathetic nervous system must be viewed alone, and primitively, as effected by the cause of the disease.

7.—The medium between the latter and its operation upon the nervous system appears to be the blood. The absence of the phenomena of coagulation, even if not always complete, indicates an alteration in the character of the blood.

8.—An innoculation of the disease through the blood or by the stomach, by means of the intestinal discharges, I have tried, in all stages, upon rabbits and frogs, without success.

9.—The anatomical alterations observed by me are as follow:—*

The rice water, or whey-like discharges from the bowels,

* The preceding table, with short notes appended upon the post mortem appearances, was originally published in the Mém. de l'Acad des Sciences de Bruxelles, and is here reproduced with some additions.

put in a tall glass vessel, separated into a sediment, and a clear serum, always albuminous. As a general rule, the sediment consisted of nuclei (mucus corpuscles) of epithelial cells, such as fill the simple glandular follicles, but never contained perfect epithelial cells. Cryptogamic plants were never observed in it. Once only did I see infusoria (monas, navicula),* and rarely the filaments first noticed by Bæhm, and regarded by him as probably resulting from the transformation of epethelial cells. Evacuations by vomiting, when consisting of a rice-water-like liquid, presented the same components as the former, in addition to epithelial cells of the stomach; but when greenish in color they contained but few epithelial nuclei or cells.

In all cases, the brain exhibited considerable peripheric hyperœmia, and sometimes, also, an augmentation of the sub-arachnoid fluid.

In all, too, the bronchia were distinguished by diminution, and frequently absence of mucus, and the lungs were remarkably impoverished of blood, so as to produce a considerable reduction in their weight. In the normal condition, in the adult, both lungs weigh about 1200 grammes; but in cholera cases, which had proved fatal in the course of a few hours, they mostly fell far short of this number. In a longer duration of the affection they again increased in weight, but never reached the normal standard.† Besides the anemic condition of the lungs, ecchymoses of various sizes were sometimes found either in their parenchyma or beneath the pleura. At times, also, the upper surface of the lungs appeared more inflated than usual; that is, the air-cells contained a greater quantity of air without being torn, and this condition has been indicated as emplysema, which it is not, but the result of the diminished or paralyzed contractility of the bronchi during life.

Ecchymoses were sometimes found upon the heart, and its cavities always contained a variable quantity of blood of the consistence of syrup, in more than half the number of cases coagulated; but the coagulum was usually in small quantity. The fibrine of the latter sometimes included a remarkable quantity of lymph-corpuscles, or spherical milk-white globules, covered with minute granules, but in other cases these did not exist.

*The monas, even in myriads of millions, is entirely harmless as a parasite; and the naricula, also harmless, did not belong to the intestinal canal, but most probably was taken in the drink of the patient.—Trans.

†The weight of the lungs in cholera approaches that observed in beheaded criminals.

The endocardium generally was normal, and rarely of a clouded blood-red hue.

The aorta, and principal venous trunks, usually contained a liquid syrup-like blood. The blood-corpuscles were normal, and retained this appearance for several days after post mortem examination.

The stomach commonly contained a rice-water-like liquid, sometimes in small quantity, and ordinarily colored, more or less albuminous, and usually consisting of serum and epithelial fragments. Frequently there was a considerable accumulation of gas.

The gastric mucous membrane was pale, and presented ecchymoses in the cul-de-sac, but was not softened.

The contents of the small intestine were commonly milk-white, or of a clear gray color, and rarely yellowish or reddish, and consisted of a serous liquid and a sediment, composed of the exfoliated cylindrical epithelia of the mucous membrane and its villi.

Sometimes the intestinal mucous membrane was strongly injected, and the villi throughout its entire extent were always deprived of the epithelium, but the follicles of Lieberkuhn only partially.

The glands of Brunner, the solitary glands and plaques of Peyer, frequently were swollen with their natural milky liquid;* and it is worthy of remark that although this tumefaction sometimes did not exist in those who died within twenty-four hours from the commencement of the disease, yet, generally, it was absent only in such as had been longer ill—tumefaction of the glands was absent in five cases out of eleven. Sometimes the isolated glands were burst, and then exhibited a distinct central opening, and when those of the plaques of Peyer were burst, the latter presented a reticulated appearance. I view the tumefaction of these glandulæ as the result of retention induced by the disease of the normal liquid, which is produced in chylification. In typhoid, a dry exudation is deposited in the glandulæ, consisting of well-known nuclear structures.

The contents, likewise, of the large intestine consists of a rice-water-like liquid, composed of a strongly albuminous serum and a sediment; in which, however, epithelial cells are scarcely any longer visible. The mucous membrane is mostly pale, and the epithelium only partially exfoliated.

The serous investment of the intestinal canal was some-

*The same appearances I have observed in executed criminals, who were healthy.

times injected, and at others pale. The mesenteric glands were sometimes yellowish, of the size of a hazel nut, tumefied and infiltrated with an albuminous liquid.

The liver contained blood only in its large venous trunks, and in the first victims of the epidemic—drunkards and scrofulous children—was fatty; but this condition was rather the result of former disease.

The gall-bladder was filled with black albuminous bile, and the biliary ducts with epithelia without bile. The spleen was generally soft.

The kidneys contained liquid blood in their venous trunks, and sometimes exhibited ecchymoses upon their surface.

The calyces and pelvis were filled with a milky liquid, consisting of serum and epithelial cells, and a similar fluid, containing the separated epithelia of the tubuli uriniferi, was compressible from the papillæ renales.

The cortical substance sometimes was anemic, at others vascular.

The bladder mostly contracted contained a small quantity of turbid liquid, rendered so by flocculi of epithelium, from the mucous membrane, which was ecchymosed.

Sometimes no albumen was detected in the urine, at others a small quantity, but rarely in that contained within the bladder.

No opportunity was presented to me to examine cholera cases in which cavities existed in the lungs, although persons in such a condition died in this place. In a few instances only did I find tubercles in the mesenteric glands.* Some pregnant women also died of cholera, but of these I have indicated no case in the table.

*Phthisical patients were not exempt from cholera, although most observers remark the small number or even absence of such among the first victims of epidemic; but it can be readily understood that so soon as the disease becomes more prevalent, tuberculous cases will be found among them.

# REVIEW.

ON RHEUMATISM, RHEUMATIC GOUT, AND SCIATICA, *their Pathology, Symptoms, and Treatment.*—By Henry William Fuller, M. D., Cantab: *Fellow of the Royal College of Physicians, London: Assistant Physician to St. George's Hospital, &c., &c. New York: Samuel S. and William Wood,* 261 *Pearl Street,* 1854. *Toronto: H. Rowsell.*

Among the diseases which flesh is heir to, rheumatism holds a very prominent part; and often entails among its consequences and results some of the most formidable of human ailments. Cold from time immemorial has had the credit of causing this complaint. The effects of cold upon the human constitution are, however, vastly different from the symptoms of rheumatism; while Dr. Fuller clearly and unequivocally proves that the sudden change of atmospheric temperature, although it may be occasionally an exciting cause, cannot of itself produce the disease. When the true cause is present, cold may serve to develope the local symptoms; but even these are shown continually to happen without the possibility of such influence having effect—hence we must look to the peculiar condition of the blood—we must call in the aid of organic chemistry to assist in demonstrating the fact, that rheumatism depends upon a *poisoned* condition of the sanguineous system. It is certainly well said, "that there is nothing new under the sun," for in the nineteenth century we have recourse again to the humoral pathology—a materies morborum—a load of peccant humours plainly involved in the consideration of disease. At the same time that we hope to steer clear in this matter of the wild mazes and theoretical conclusions of our ancestors, we must not shut our eyes, or refuse the sanction of our senses, to the positive deductions of science. The certainty that rheumatism depends upon a poisoned condition of the blood, is a fact that involves an immense amount of important considerations. It presupposes a possibility of demonstrating the true state and condition of normal blood; and this will require not only a lengthened analysis of the blood, in a great variety of healthy individuals, but would involve a lengthened comparison of their several peculiarities and conditions of life; while it also indicates the certainty of two great facts, that the mass of the blood may be rendered abnormal—may be poisoned;

either by the character of the materials absorbed into the circulating system, or from the delayed excretion of matter that should have been removed from the body.

Physiology teaches us that the circulating system, the heart, the arteries, the capillaries, and the veins—which although infinitely extended and often extremely minute, are perfectly continuous one with the other—and the fluids and solids which they contain, naturally find no exit or entrance, except through the walls of these vessels, by endosmotic, and exosmotic action—hence we find that this system of blood vessels bears all the characters, and assumes all the attributes, of a shut sac. Without doubt, certain independent living animal cells are formed in the blood, grow in the circulating fluid, and perform certain indispensable functions necessary to the animal economy, such as formation of fibrine and the development of animal heat; that after a time they die, are disintegrated and broken up, when the ingredients of which their cell walls were composed must be removed from the system as effete and useless matter. In no case is the circulating system more than a ready means of conveying to the various organs of which the animal body is composed the means of nutrition, and this is more immediately effected by the capillaries; while each and every one of the organs have, however, a distinct and separate nutritive apparatus peculiarly its own, while the blood, properly so called, never enters into them. In the nervous ganglia, the muscles, the cartilages, the bones, the mucous and serous membranes, and the glands, the circulating system does no more than present to the structures the ingredients, which each appropriates by its own peculiar apparatus to develop the organs, or assist them to perform their functions; hence in all these cases a constant change is progressing in the blood. All these organs are supplied by exosmotic action with the ingredients used in their construction, or employed in their functions—and when they have been used, they are returned into the circulating system, to be removed from the body by the exosmotic operations of the several excretory organs—the kidneys, the liver, the skin, and the lungs. Without doubt, a very considerable compensative action is often permitted to each of these organs; but a continued deficiency in function will, sooner or later, produce an accumulation of matter that should have been excreted from the blood, and this may become a source of poisoning to the whole system. At an early stage of this abnormal condition, the symptoms produced might be indistinct, scarcely appreciable to common observation as resulting

from such a cause; but when they are considerably augmented they will surely produce certain powerful effects upon the whole system, that not unfrequently terminate in death—hence we are perfectly warranted in saying that there are ingredients acting as poisons that may be taken into the circulating system, by the intestinal canal, by the lungs, and by the skin; that there are others which may be generated in the body from the matter intended for excretion, modified by chemical influences, but producing its effects upon the blood, or from the undue accumulation of this matter that should have been removed by the excretory organs, causing great irritation of the whole system. To enter into a full and comprehensive view of the subject of blood poisoning, all these points should fairly enter into our consideration; but to do so at this time would occupy more space and time than we can properly allot to the subject. It will suffice to show that Dr. Fuller clearly proves that these diseases—rheumatism, rheumatic gout, and sciatica—are plainly produced by one or other of these varieties of blood poisoning, and that cold and other exciting causes are only the means of calling forth some of the most prominent symptoms of these diseases.

The true nature of the cause of some of these diseases, long since suggested by Dr. Prout, has been adopted by Dr. Todd, and is now sanctioned and confirmed by Dr. Fuller; it is, that this disease is dependent upon an abnormal quantity of lactic acid in the blood. At the same that we can agree with these celebrated physicians, that in many cases of acute rheumatism they are perfectly correct in their inductions, still we must dissent from the idea that this material can be considered as the universal cause of all the diseases so admirably treated of by Dr. Fuller. Dr. Garrod has plainly demonstrated that in rheumatic gout, the urate of soda may be found in the blood; while in sciatica, in very many cases the oxylate of lime, which may be distinguished in the urine, and without doubt often exists in the blood, is the cause of these neuralgic complaints. Abundance of the crystals of uric acid, urate of ammonia, or the oxylate of lime, constantly present themselves in the urine of persons subject to, or recovering from attacks of these diseases, proving the existence of morbid materials in the blood; demonstrating that this excretory function is removing a chemical result, if not a positive cause of the disease.

It has been established that lactic acid is a normal element in the animal body. It is a substance when concentrated inodorous, and thick like syrup; it cannot be

solidified by intense cold, while it dissolves readily in water, alcohol, and ether, has a powerful acid reaction, and displaces not only the volatile, but even the mineral acids from their salts. With the basis it forms mitral salts, all of which are soluble in water, but cannot be made to crystallize. The chemical composition of the acid salts is $C_6 H_5 O_5$; the analogy which it bears to sugar in this point of view is particularly striking. Another fact worthy of consideration is, that lactic acid may be extracted from the "juice of flesh"—that is, from muscular fibres. It has been observed that some slight difference may be shown to exist in the properties of its salts under these circumstances, hence it has been distinguished as lactic acid a., in contradistinction from lactic acid b., which is shown to be present in the gastric juice.

The lactic acid b., as a constituent of the gastric juice, may be observed in the stomach of carniverous, as well as herbiverous animals—hence it is shown to be a secretion from the blood; while in the small intestines of herbiverous animals it is shown to exist in a vastly increased amount, the excess being dependent upon the direct transformation of amylaceous matters in the alimentary canal. The presence of lactic acid has not been clearly demonstrated in the blood; but as Lehmann remarks, "the simplest induction proves that it must be present in it, even if it remains but for a short period." The presence of lactic acid in the muscular substance, in the gastric juice, in the urinary and cutaneous secretions, indicates that it pervades the system very generally, and shows that it must occasionally exist in the great medium of communication among all these structures—the blood. Mr. Carpenter declares that "the fact appears to be, that, in the healthy state of the system, lactic acid is decomposed by the respiratory process, or is eliminated from the blood by the secretory operations, as fast as it finds its way into the circulation; and thus, as in the case of urea, it never accumulates in the blood in such a degree as to make its presence evident, unless it be introduced in undue proportion, or its elimination be checked." It seems probable that when the "blood presents an acid reaction, as happens in some diseases, this is to be attributed to an excess of lactic acid, since this substance, although not distinctly detected in such blood, has been clearly made out in the fluids excreted from it." The presence of lactic acid a. in the juice of flesh is certain, and its amount would appear to be in a considerable degree proportioned to the amount of exercise to which these structures have been submitted—activity of function

induces increased vascular circulation, and an augmented amount of the changes which proceed from it—hence it may be one of the means of accumulating this material in the blood. The conclusions which Mr. Carpenter arrives at with regard to the presence of lactic acid in the human system are the following: "On the whole, then, it may be positively affirmed, that lactic acid is a normal constituent of the human body, and that it is to be looked upon under two aspects, both as to its origin and its destination. Its origin may be attributed—1st. To the direct transformation of the amylaceous and saccharine constituents of the food. 2nd. To the metamorphosis of muscular, and probably other azotized tissues. On the other hand, its destination may be considered as being—1st. To supply a pabulum for the combustive process, and thus to contribute to maintain the heat of the body; and 2nd. To take part in the reduction of the albuminous, and the other constituents of food in the stomach, either by itself acting as a solvent, or by decomposing the chlorides of calcium, or sodium contained in the gastric fluid, and by thus setting free hydro-chloric acid. Its presence in the urinary secretions may be regarded as exceptional; the kidneys affording (so to speak) a safety valve, whereby the accumulation of lactic acid in the blood is prevented." The importance of these considerations with regard to lactic acid must be sufficiently obvious, when it is shown to be the cause of acute rheumatism—in all probability dependent upon a delayed excretion of this material from the system—where its presence can be demonstrated as abounding in almost every part of the system. Under these circumstances it may be clearly shown to act as a poison—the symptoms demonstrate it—and the intensity of these symptoms can be shewn to bear a close relation to the amount of the material in the blood; when not excessive, the symptoms will commonly appear anomalous, and difficult of interpretation, which will be cleared up only on the first attack of acute rheumatism.

It has been shown that the blood circulating in the vessels is merely a vehicle for the conveyance of the nutritive material to each organ of the body; when a poison shall exist in this circulating fluid, it will be conveyed to all parts of the system, and may prove a source of irritation to every structure. Some poisons appear to have more partiality for one organ or tissue, some for another. We always find it attacking the weakest points in the human body—parts that are most exposed, have been overworked, or otherwise injured. The structure to which lactic acid seems most obnoxious is the white fibrous tissue; this

enters into the formation of the aponeuretic sheaths, the fascia, the capsules of the joints, the ligaments, the tendons, and the fibroserous membranes of the body; hence the joints and their surrounding structures, the valvular apparatus of the heart, the lining membrane of the arteries, and the external covering of the heart, the pericardium, &c., are most commonly implicated in this disease. There may be recognized some slight difference in the modus operandi of the poison in some of these parts. The lining membrane of the heart and arteries, as a matter of necessity, suffers from proximity to the diseased fluid; while the fibrous tissues appear to have anatomical peculiarities that induce the attack.

The symptoms of acute rheumatism, as laid down by Dr. Fuller, serve to demonstrate and confirm these facts; premising however, that the acute character of the attack will in a great degree depend upon the previous healthy condition of the blood, in which the poison has been accumulated. When this fluid contains an abundance of fibrine, and abounds in the red corpuscles—the system is in tone—the constitutional excitement will be great on the admixture of this poison; but when the blood is degraded, the powers of the constitution depressed, then will the intensity of the constitutional symptoms be of a lower grade, and the complaint will not demonstrate so great an intensity of action, upon the admixture of the same amount of poison. The detail of the symptoms, as given by Dr. Fuller, are very characteristic, and demonstrative of the condition we have been endeavouring to exemplify (see page 54.) "Acute rheumatism, as its name imports, is characterised by symptoms of acute disease. It is generally ushered in by a smart attack of fever, accompanied with a quick bounding pulse, a foul tongue, loaded urine, profuse acid, sour smelling perspiration, and wandering pains in the limbs. After a varying duration, the pains fix on one or more of the larger joints, which become hot, red, swollen, and exquisitely tender on pressure. Unlike inflammation arising from truly local causes, this rheumatic inflammation shifts repeatedly, and oftentimes rapidly, from joint to joint, displaying in each great apparent intensity, yet rarely producing permanent mischief; so that the joint which to-day seems to threaten suppuration, may to-morrow evince no mark of the violent invasion it has undergone. Sometimes the swelling extends a considerable distance from the joint itself, and is evidently chiefly external to the articulation, for there is a puffiness about the parts affected, and the hollows and depressions in the vicinity of the joints

are filled up by effusion into the areolar tissue. At others the inflammation is less superficial; there is less redness, and the swelling, which is more defined and limited in extent, is evidently due in a great measure to inflammation of the synovial membrane, with effusion of fluid within the joint, for the distended capsule projects at those parts where the surrounding tissues offer least resistance. In most instances the two varieties of swelling are intimately blended, the diffuse fibrous symptoms predominating at one period of the disease, the synovial symptoms at another; but in proportion as the synovial symptoms become more prominent, and the diffuse fibrous symptoms less marked, so does the case assume more and more the characteristic of that form of disease, which I purpose describing under the title of rheumatic gout.

"From first to last, the disease may run its course without the implication of any internal organ; but not unfrequently it is accompanied by inflammation of the pericardium, or the lining membrane of the heart, as also, by inflammation of the lungs and pleura.

"The second variety presents characters of gout, more or less blended with those of rheumatism. It is frequently met with in persons who have a taint of gout in their systems, and seldom otherwise occurs in early life. It is not accompanied by the profuse sweating of rheumatism, very seldom involves the heart or its membranes, but not unfrequently attacks the eye, the stomach, and the lungs. The articular inflammation is usually confined to one or two joints, very generally affects the smaller joints, is wholly within the capsule, is much less migratory than in true rheumatism, is marked by less external redness, and is accompanied by less active symptoms of fever. But it is more obstinate in its continuance, more apt, when in an acute state, to induce disorganization of the joints; more prone, even in a less active form, to give rise to permanent thickening and enlargement, and often to frightful and irremediable distortion."

We consider that the distinction which Dr. Fuller here draws between acute rheumatism and rheumatic gout is just the reverse of the common acceptation of these terms. In our experience, the synovial variety is far more frequently attended with the concomitants of endo-carditis and peri-carditis, than the affection of the fibrous texture of the joint, which spreads externally. We consider that it is necessary that the distinction between these two varieties of disease should be clearly diagnosed, and left without confusion in the mind of the practical physician; as it is more than

probable that organic chemistry will at some future period clearly demonstrate a variety in the causes that produce the difference of the symptoms, and may perhaps lead to a distinction in the treatment of each. At all events, it is clear that the fibrous structures of the joint—the ligaments—are the primary seat of these complaints; that in the one variety, the inflammatory action spreads to the synovial membrane; while in the other the surrounding areola tissue is implicated in the disease. It is clear that in the varieties here spoken of the poison appears to evince a peculiarity of action, that would hypothetically demonstrate a variety in the cause.

In the case of acute rheumatism, the primary influence of the poison is without doubt experienced by the ligament; but that in this case the inflammatory action soon spreads to the nutritive apparatus of the synovial membrane—effusion of serum transuding the capillary vessels and passing the basement membrane, quickly distends the cavity of the joint; the epithelial structures are also shed in considerable quantity, and might be found floating in the fluid. The nutritive apparatus of the ligament has this peculiarity, that in a state of health it is possessed of very minute transparent vessels, that carry but a serous fluid, which is all that is required to moisten the fibrillæ of this structure, and now the ligament is white and glistening; these vessels are in connection with the general system of capillary vessels of the body; consequently, under inflammatory excitement they will admit a much more dense blood, containing a small proportion of the red corpuscles: hence is derived the pink colour plainly observable in similar structures, while under such a condition. The supply of fluid distends and swells the fibrous element, causing a dull heavy pain in the part; without doubt the accumulation of the poison in this structure is the irritating cause which produces this grade of inflammatory action—a hyperœmic condition of the vessels—which in ligamentous structures is seldom exceeded. When lactic acid is the cause of the disease, the capillary vessels of the synovial membrane seem speedily to participate in the condition, and from the nature of their functions, quickly yield an increased amount of serous fluid, which constitutes the rapid swelling of the joint—and these same vessels will also often facilitate by endosmotic action its speedy removal—presenting a rapidity of translation from one joint to the other, which constitutes a marked feature of this complaint. The serous effusion is also a most marked complexity of acute rheumatism; while it is frequently a ready means of

unloading the capillary vessels, or staying the progress of inflammatory action—acting as a safety valve to the ligament—that leaves but little permanent change in the fibrous element and vastly facilitates a return to health. Occasionally, however, this condition of inflammatory action may be exceeded, fibrine or blastema may be thrown out, and more permanent and destructive disease of the joint be the result.

When the symptoms of rheumatic gout present themselves, the vascular structure of the ligament is still the primary seat of the disease; a similar condition of vascularity presents itself; the fibrous structure is swelled and softened, and becomes of the same pink colour; while the pain of distension is sufficiently marked. Now, however, the poison is shown by Garrod to be composed of the urate of soda; and this substance appears to have a most marked affinity to the fibrous element. During the formation of bone, the carbonate and phosphate of lime seem to be incorporated into the fibrous elements—so as the result of gout, especially of chronic gout, the ligamentous structures of the joint appears to receive a deposit of the urate of soda; it is incorporated into the fibrous element in the form of tophi or chalk stones; hence the presence of this substance in greater or lesser amount during an attack of rheumatic gout, constitutes the more permanent and firmer swelling that exists in this disease. The denser character of the exciting cause likewise seems less to dispose it to influence the synovial apparatus, while the areola tissue surrounding the joint seems more disposed to participate in this change. From these facts, and the character of the symptoms in these diseases, we think that it is natural to conclude that there are two poisons—that these may act in conjunction—may vary in their individual amounts; hence the explanation of the several varieties that occur in these two complaints—acute rheumatism, and rheumatic gout. If, then, we can at this early period hypothetically show the probability of the variety in the cause of these diseases, we feel but little doubt that organic chemistry will ere long be able to demonstrate their individuality, and will in all probability show a separate and distinct cause for chronic rheumatism, as well as the various kinds of neuralgic affections besides.

*(To be continued.)*

# EDITORIAL DEPARTMENT.

## MEDICAL REFORM.

Among the medical reforms which we would desire to press upon the notice of the Government is one of vast importance to the community and of considerable interest to the Medical Profession: it is the care and medical treatment of the indigent poor in the country districts.

With regard to the medical treatment of the poor when they become sick, there are no legal means in Canada whereby they can claim necessary assistance at such a time. Should the poor man who procures his bread by his daily labour, happen to be overtaken by sickness, or meet with an accident, he has to trust to individual charity and philanthropy, as well as to the generous feelings of the medical practitioner. Heretofore, in Canada, land and labour have been abundant, and a home was to be obtained by the labouring man with great facility; but now, from the high price of land, and its more complete settlement in all the better agricultural districts, that facility will be greatly diminished; so that in process of time riches and poverty will show as marked a distinction as is to be observed in Europe. At the present moment the middle classes vastly predominate in Canada; there is little or no distinction of rank, for almost all have abundance—few are particularly rich;—but a change is coming over the spirit of the dream, and as riches abound, abundance and splendour will more clearly show itself, while poverty and distress will increase in a similar ratio. The large fortunes that are now being made by engineers and contractors upon our public works; the sudden wealth that is accumulated by our speculators in land and provisions; to say nothing of the slower processes by which fortunes are made by our farmers and manufacturers—all tend to the same end: the accumulation of money into the hands of the few. These, as in other countries, will soon make a marked distinction between rich

and poor. Even now, although it may be an exception to the rule, very many persons are in a state of poverty—many, doubtless, from accidental circumstances over which they had no control; while in a vast majority of cases it is to be feared the cause originated in their own improvidence or vice. Still, under any circumstances, it is the duty of the State, it is an implied contract in the civil compact of the social condition, to watch over and protect the helpless, the infirm and impotent, as well as to punish and reform the vicious. The latter has been abundantly provided for, but the wants of the former are unheeded and uncared for; and this is a lasting stain on this Christian country, and a disgrace to the civilized times we live in. When a poor man becomes sick, or meets with an accident, in any of the larger cities of Canada—such as Toronto, Kingston, &c.—he has a public hospital to apply to, and he can there get that gratuitous relief and assistance which his sickness demands. Not so in the country parts: when sick in such a place, he is under the necessity of applying to a private medical man for assistance; and, be it said to their praise, the vast majority of country practitioners readily yield the poor sufferer all the aid and assistance that their skill can command; medicines are freely supplied, and often the pauper is indebted to his medical attendant for a considerable portion of the necessaries of life.

Under these circumstances, we respectfully urge that this is a most unjust condition of affairs,—a state of things that inflicts a very heavy and unjust burden upon the medical practitioner in the country,—in a great degree shifting the public burden of caring for the poor, and supplying his wants during sickness and disease, upon him. This unfortunate condition involves one of two dilemmas—either that the medical attendant goes unpaid for his services, or that the poor patient goes unattended, and lacks that surgical care and attention that would in all probability speedily restore him to health and vigour. Nor is this all; for it frequently happens that the poor man has a wife and family dependent upon his daily exertions: these also suffer. To the poor man it is misery and death—to the country medical

practitioner it is an injustice at present most heavily felt, in consequence of the depressed condition of the Medical Profession, and the high price of all the necessaries of life. At the present time, in very many instances, it is as much as the medical practitioner can do, with all his anxiety and labor, to obtain a sufficient remuneration for his services, to enable him to live and supply the wants of his family: hence it is rank injustice that his generous sympathies should so often and so largely be drawn upon by the indigent poor, without chance of receiving any remuneration for his services. Is there any other trade or profession in Canada that would be willing to be continuously spent in the service of humanity, save the Medical Profession? We would say to the public, forget not the old adage—"Drive not the willing horse too hard;" and from the Government we would claim that some means be devised to remedy this unjust condition of affairs. At least things should be placed upon this footing—that the poor man goes not unheeded and uncared for in sickness and distress; and if the public services of the medical man are required in the attendance upon the poor, that he should not go unrewarded for his services. It should also be remembered that medicine is not the only want required in the condition we speak of; there are many other necessaries and comforts required, without which the skill of the physician is often comparatively useless. Even these should not be withheld; for in far less civilized and favored countries than Canada, these calls of humanity are not disregarded. It is therefore a positive disgrace that proper means are not adopted by the body politic, whereby the poor sick man may get proper medical assistance, and the indigent and impotent pauper may be taken care of at the public expense.

There is another point, also, in which we would view this case: it is, that the poor man finds it necessary in many cases to employ the quack—first, because he thinks that he can get his services cheaply, and even then would not be compelled by law to pay him. The fear of debt and difficulty makes him place his confidence in uneducated persons,

and in consequence, his powers of labor or the condition of his constitution are not unfrequently irreparably damaged or destroyed, when the patient becomes a helpless weight upon the charity and kindness of his neighbours, if death is not the speedy termination of his case. We maintain that the poor man should have the best advice in such cases that the country could afford, and that the public should pay for it. It would be a certain means of encouraging the talent and industry of the Medical Profession, while it rendered the presence of the quack in the country places uncalled for and unnecessary; the poor man would get speedy and effectual relief, and neither he nor his family would be thrown a burden upon the public.

If these facts are true—and we challenge their contradiction—it certainly behoves the Government to take some steps to counteract so disgraceful a position of affairs. In the first place, we would suggest that the Government introduce a law compelling the municipal councils of every city numbering upwards of 10,000 inhabitants to establish a public hospital, and that all county towns and larger villages should be obliged to support a public dispensary and a poor-house, where the wants of the poor during sickness might be gratuitously relieved. Every township should be required to appoint a medical officer, who should visit and attend the destitute poor, and be paid by the municipality. Such natural and necessary relief and convenience would place the poor man, labouring under sickness, or the effects of accident, in a position that would in the generality of cases enable him readily to return to his duties, and would save many a valuable life to the community; and, what is of not a little consequence, shift the burden from off the shoulders of the charitable medical practitioner, who has commonly to bear it.

In all such cases none but the licensed medical practitioner should be permitted by law to be employed: this would be some encouragement to a proper and efficient study of the science, and it would prevent the quack from engaging in the public services of the poor, getting all the benefits, and then casting the weight and responsibility upon the Medical

Profession. We may be excused mentioning a case in point. A certain railroad company, not 100 miles from Toronto, it is said, employ a noted Homœopathic to attend their servants; they hire his services by the year for a good round sum, and in all cases in which the natural powers of the constitution are able to struggle out a cure, he is perfectly successful; but in all those cases demanding serious medical or surgical treatment, he sends the patient to the Toronto hospital. If this is not the climax of imposition and humbug upon the poor employé, we know not what is. It is a clear demonstration that the Medical Profession are badly treated, and are likely to continue so to be, unless some remedial means are adopted by the Government that shall place the profession in a better and more respectable condition. Without doubt the only means that can be available under such circumstances is the incorporation of the Medical Profession, with sufficient powers to manage their own affairs, while it will encourage the learning and promote the talent of its members.

While we are upon this subject, it will be well to warn the Government that in all probability the cholera will again visit the country this season, and that it is not improbable the lines of the numerous public works now progressing in Canada will be the scene of sad sickness, destitution, and trouble, unless some efficient means are adopted to prevent or counteract it. To our mind, the next session of the Provincial Parliament would be the most appropriate period for introducing some general law upon the subject that should efficiently meet and overcome all the public difficulties we have here pointed out.

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## THE MEDICAL BOARD.

We copy the following extract, on the subject of the Medical Board of Canada West, from the *Carleton Place Herald;* it is a part of a long communication sent from Toronto to the editor of that journal, on the passing events of the day, and as it is well and temperately written on the subject, we commend it to the attention of our readers.

"During the past week the Provincial Medical Board met for the examination of candidates for license to practise physic, &c., and as this body bears an important relation and a deep responsibility to the Canadian public, a few remarks in reference to it may not be uninteresting to your readers. The board is composed of members of the profession from various parts of the province, but few attend except the local residents, on whom the whole labor devolves.

"The hon. C. Widmer, venerable for his years and high standing in the medical profession, is chairman of the board; and the other members present are chiefly the professors of the two medical schools now in operation here, and the ex-professors of the late University Medical School. Formerly the proceedings were carried on with closed doors, but medical men and students of medicine are now permitted to witness the examination.

"In order to prevent a pre-arrangement and 'priming up' on the subject of examination, no candidate is examined by his own teachers, but by some of the other members present, who are chiefly connected with rival institutions. Such being the composition of the board, it is easy to imagine that when rival animosities run high the candidate may be sacrificed on the shrine of jealousy or party feeling. It is lamentable that such should be the case, but that it is so is undeniable by all who are familiar with the proceedings.

"This medical board has the reputation of being the strictest as regards qualification, &c. on this continent, and that it is so is shewn by the fact that many who enter the profession in the cities of the United States are unable to obtain license here; and some who are doubtful of success, or have been rejected, find it easier to pass through the hands of the medical board of Lower Canada.

"This strictness on their part is commendable, and if persisted in will gain for them the respect and confidence of the people of Canada, as well as elevate the character of the profession in this province.

"During the present meeting of the board fourteen candidates presented themselves for examination, six of whom passed—four from the Toronto School of Medicine, and two from the Trinity Medical School. A daily paper has remarked that "the examinations are very rigid," he might have added that some of them were very unfair. These remarks are not made by one smarting under a sense of conceived injustice; on the contrary, the writer is perfectly

unprejudiced from any such cause, but such was the unanimous opinion of those witnessing the examinations, and it is well known that the proceedings were at times characterized by the absence of harmony, and much unpleasant feeling."

It will be but fair to remark that one of the two gentlemen who are set down as belonging to the medical department of Trinity College was actually educated at the Toronto School of Medicine; but from some quarrel among the students of that school, purposely excited by political party spirit outside its walls, quitted that institution during he Session, and hence has given the rival school the credit of his education. With regard to the strictness of the Medical Board, we can vouch for its truth, and are perfectly certain that either of the students that passed the examination above alluded to, could have gone before the examiners of the Royal College of Surgeons in London, and have answered their examination with far greater ease than the one that was put to them, on this occasion; and what is more they would not have been subjected to the antagonistic animus exhibited at the time. Indeed it must be a matter of surprize to all, that with so large a majority of the members of the Medical Board—nearly double the number—certainly opposed to the Toronto School of Medicine, that so many of its students should have passed their rigid examination. It certainly does great credit to the students, and must be a matter of congratulation to their teachers. When these facts are contrasted with the statements so often made during the past winter in the Toronto *Patriot*, with a desire to injure and destroy the school, it must be a clear demonstration either that the Editor of that Journal was really ignorant of the truth in this matter, or was deceived by some interested parties, who hoped to make political capital out of it.

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## THE MEDICAL PROFESSION.

The following honorable tribute to the English Medical Profession, is copied from the London *News*. In no part of this wide world is a greater amount of true knowledge accu-

mulated by the medical man than in England; yet you see him humble, assiduous, untiring in his duties, seeking practical knowledge among the poor and needy; while without money and without price he yields to suffering humanity the fullest share of his consolation and experience. Well might we say "go thou and do likewise."

"Our medical men are strange compounds. No set of professional people in the world are more learned, more benevolent, or more practical in their own particular walk of life. No men are more laboriously active in the cause of charity. In wet and cold, in winter and summer, in country and in town, there is never a day or an hour in the year but some or other of the medical fraternity are administering to the poor *gratis*. They are, taken altogether, as well-intentioned, as kindly, and as ill-paid a race as any student of the *genus homo* has met with. So far at any rate as that mass of human knowledge which is made up of ascertained scientific truths is concerned, they are also the best informed professional men in the country. The clergy may, and do, know more about dead languages and classical literature. The lawyers may, and do, know more about the means by which in different ages men have been ruled and cajoled, and infinitely more about the noble art of getting up in the world. But about those sciences in which the world makes headway—chemistry, geology, natural philosophy—and other multitudinous ramifications of inquiry into the laws of the universe in their relation to animated nature—the medical men are by far the best informed professional class in the community."

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## TRINITY COLLEGE TORONTO.

Mr. Wm. Gilmor passed his final examination, and the following gentlemen the first examination for the degree of Bachelor of Medicine:—

Mr. Weston Herriman,
Mr. Edwin Goodman,
Mr. W. Bettridge, B. A.
Mr. Isaac Ryall,
Mr. David E. Burdett,
Mr. Paul R. Lewis.

James Bovell.
Dean of Faculty of Medicine.
*Daily Colonist*

It is worthy of remark that these gentlemen instead of

going up before an antagonistic Medical Board to obtain a license to practise physic, &c., are examined by their own teachers in their own class rooms; and when they shall have passed another examination under precisely similar circumstances, (if we make no mistake in the matter), they will receive a licence to practice from the Governor General, without the necessity of presenting themselves at the Provincial Medical Board. One gentleman has already received such a license, and we believe that Mr. William Gilmor is, by this arrangement, entitled to one also. We, however, feel convinced that there is a misapprehension of the law, on the part of the Government in this matter, and think it but right, public attention should be drawn to it.

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## PROGRESS OF QUACKERY.

The following delectable morceau we extract from the *Philadelphia Medical and Surgical Journal.* Comment on our part is unnecessary.

We lately saw in a Western journal an account of a person who having obtained a charter for conferring medical degrees, was selling them at the *reasonable* price of twenty dollars a sheep-skin. The following instance of obtaining what may be denominated an "Aberdeen or Royal College of Physicians' Degree," exhibits, we fear evidence of a similar system of diploma-selling existing in our country, both in and out of the regularly organized schools:—

A Root Doctor.—A (herbalist) Mr. Johnson, was lately examined before the Coroner, in London, for the death of a child under suspicious circumstances. The following conversation took place:

Coroner—I see from the certificate that has been produced that you have a diploma. Where did you get it from?

Witness—From the United States of America.

Coroner—I perceive that U. S. is attached to the certificate. Were you ever in America?

Witness—No, I was never there.

Coroner—How did you become qualified to act?

Witness—There are many others who obtain diplomas in the same way.

Coroner—How? I cannot understand. If you were never in America, how did you obtain your diploma?

Witness—From an agent in this country, on the part of the College of Surgeons in America.

Coroner—I see the initials M.R.C.S. What does that mean?

Witness—Member of the Reformed College of Surgeons. It is at New York.

# SELECTED MATTER.

## A COURSE OF LECTURES ON ORGANIC CHEMISTRY.

*Delivered in the Laboratory of the Royal Institution of Great Britain, by Dr. A. W. Hofmann, F.R.S., Professor of the Royal College of Chemistry.*

### Lecture VIII.

In the last lecture you became acquainted with the Chemical character, and with some of the applications of ferrocyanide of potassium. The relation of this substance to cyanide of potassium, and the manner in which it may be derived from the latter compound were likewise mentioned. It remains now to describe to you the process by means of which this important salt, which is the starting point for the preparation of all cyanogen compounds, is manufactured upon a large scale, and to add a few remarks upon the formation of cyanogen generally.

The ordinary method of manufacturing yellow prussiate of potassa consists in fusing animal charcoal with carbonate of potassa. Not every kind of animal charcoal is equally applicable. Generally dried flesh, horns, hoofs, and hides, are carbonized for this purpose; while the animal charcoal obtained by the carbonization of bones—the bone black of commerce—is reserved for the operations of the sugar refiner. A considerable quantity of the animal charcoal, for making prussiate of potash, is produced by carbonizing old shoes and boots. And so it is that the substances discarded every year, in such enormous quantity, that every one must wonder what becomes of the accumulation, are made to re-appear on the dresses of our ladies, after having passed through a series of chemical changes.

Animal charcoal, which is very rich in nitrogen, is fused in large iron vessels, with its own weight of carbonate of potassa, until effervescence has entirely ceased, the fused mass being continually stirred during the whole operation.

Two stages may be distinguished in this process. In the first place the carbon reduces the potassium of the carbonate of potassa, exactly as it does in the preparation of potassium, which, as you know, is obtained by fusing carbonate of potassa with wood charcoal. The free potassium, however, instead of being disengaged as in the latter operation, meets with carbon and nitrogen, with which it combines in the proportion in which these substances form cyanogen. The result is cyanide of potassium, which is, however, still contaminated with a great variety of impurities. The mass, when treated with water, acts upon the iron of the vessels, or upon the iron originally contained in the nitrogenous substances employed: these it dissolves. The iron in this reaction replaces the potassium of one equivalent of the cyanide: the cyanide of iron formed in this manner combines with two additional equivalents of cyanide of potassium to form ferrocyanide. The potassium, of course, becomes oxidized, either by the oxygen of the atmosphere, or by that of the water, whose hydrogen is evolved.

The solution of the ferrocyanide is now evaporated when the salt crystallizes. One or two crystallisations render it perfectly pure. It is remarkable that the ordinary mode of manufacturing ferrocyanide of potassium is entirely dependent upon the co-operation of processes of vitality, inasmuch as animal substances are involved in the reaction. It is, however, possible also to obtain cyanides, by uniting carbon directly with the nitrogen of the atmosphere. The experiments of Bunsen and Fownes have proved that if charcoal perfectly free from nitrogen—sugar charcoal was used for this purpose—be thoroughly mixed with carbonate of potassa, and exposed at a very

high temperature, to a current of nitrogen, a certain quantity of cyanide of potassium is produced. This process has been actually adopted for the production of ferrocyanide of potassium, upon a large scale, and considerable quantities of the salt are said to be produced in this manner. The mixture is heated for this purpose, in vertical flues of brick work, through which a current of atmospheric air is forced by mechanical means, the air having been previously deprived of its oxygen, by passing through a column of ignited coke. After ten or twelve hours the mass is raked out of the flue, exhausted with water, and the solution of cyanide converted into ferrocyanide, by digestion with finely divided spathic iron.

The direct formation of cyanogen presents considerable interest, inasmuch as this body belongs to those substances, in the generation of which but a few years ago the action of forces was assumed, differing from those concerned in the production of ordinary chemical compounds. For this reason I should have desired to have demonstrated this formation of cynogen before you. Unfortunately, however, I am precluded from the actual experiment, in consequence of the high temperature, as well as length of time, which it would require. But I have arranged an apparatus which will allow us to construct cyanogen, if not from its elements, at all events from some of their simplest compounds, the direct formation of which is beyond all doubt. This gas-holder contains carbonic oxide; it is in connexion with a flask containing a strong solution of ammonia, from which, especially if the flask be gently heated while the gas is passing, a considerable quantity is carried over with the carbonic oxide. The mixed gases are deprived of part of their water by passing through a system of tubes, containing lime; and they ultimately arrive in a tube containing spongy platinum, which is heated in a gas furnace. On the other side of the furnace a delivery tube dips into water. At this high temperature, and in contact with the spongy platinum, which is a remarkable promoter of chemical combination, the oxygen of the carbonic oxide, and the hydrogen of the ammonia combine to form water, while carbon and nitrogen unite to form cyanogen, which is disengaged from the delivery tube in the form of cyanide of ammonium. Two equivalents of carbonic oxide, and two equivalents of ammonia contain the elements of two equivalents of water, and one equivalent of cyanide of ammonium.

$$2\,CO + 2\,NH_3 = 2HO + NH_4\,C_2N.$$

To prove the presence of this compound, we avail ourselves of the process with which we became acquainted in the last lecture. By the addition of a solution of protoxide of iron, we convert the cyanide into a ferrocyanide. This, when mixed with sesqui-chloride of iron, and a small quantity of hydrochloric acid, to dissolve the precipitated oxide, will readily cause the fine color of Prussian blue to appear.

There is another formation of cyanogen, which may more easily be exhibited experimentally, and which, from reasons which you will appreciate by and bye, presents even more interest. In common oxalate of ammonia, carbon and nitrogen are present in the proportion in which they form cyanogen, while hydrogen and oxygen exist in the same proportions as in water. In fact, when merely looking at the formula, you may view oxalate of ammonia as a combination of cyanogen with water.

$$C_2O_3,\ NH_4O = C_2N + 4HO.$$

Now experiment shows that cyanogen is produced from oxalate of ammonia under the influence of substances which have a powerful attraction for water. When dry oxalate of ammonia is heated with an hydrous phosphoric acid, there is a considerable quantity of cyanogen evolved, which, although it is not perfectly pure, nevertheless burns with the characteristic purple flame exhibited by this gas when obtained from cyanide of mercury. The experiments which I showed you in the last lecture sufficiently prove the tendency of cyanogen to assimilate other elements or compounds. When associated with these it constitutes new molecular groups, endowed with different properties. Thus we saw that when iron is absorbed into its constituents, the monobasic radical cyanogen became converted successively

the bibasic ferrocyanogen, and lastly into ferrocyanogen, which is capable of uniting with 3 equivalents of metals. It is true that none of these secondary radicals have hitherto been isolated; but in most cases the compounds were long known before the radicals themselves were obtained in the separate state. A similar set of secondary radicals, which have not yet been isolated, are assumed by chemists to exist in a series of compounds which I have now to bring under your notice. A solution of cyanide of potassium, when digested for some time with finely divided sulphur, dissolves a considerable quantity, and the filtered liquid now contains a new substance. It is sufficient for this purpose to pour a boiling solution of cyanide of potassium through a filter, upon which flowers of sulphur are spread. This new substance is formed in large quantity when cyanide of potassium is fused with sulphur; and likewise when ferrocyanide of potassium, or better still, when a mixture of this salt and carbonate of potassa is treated in the same manner. The new salt thus produced, which has received the name of sulphocyanide of potassium, differs entirely from the original compound. Cyanide of potassium, when perfectly pure, has scarcely any action upon a solution of sesquichloride of iron. Sulpho-cyanide of potassium strikes a beautiful deep blood-red colour, with the salts of sesquioxide of iron. While cyanide of potassium crystallises in cubes or octahedrons, the sulpho-cyanide shoots into magnificent slender white needles, frequently traversing the liquid from one side of the vessel to the other. It crystallises particularly well from alcohol, in which it is less soluble than in water. If the composition of this salt be compared with that of cyanide of potassium, it is found that it contains the elements of the latter — 2 equivalents of sulphur. Its formula is $K\,Cy\,S_2 = K.\,Csy$. It may be considered as a combination of potassium with a compound radical, to which the name of sulpho-cyanogen has been given, and which contains the elements of cyanogen, and 2 eq. of sulphur. Many efforts have been made to separate this radical, and chemists at one period believed that they had succeeded. If a concentrated solution of the potassium salt be submitted to the action of chlorine, a beautiful sulphur-yellow powder is separated. This was long considered as the radical and described under the name of sulphocyanogen. Later researches, however, proved that the two substances in question differed in their composition, the latter containing a certain amount of hydrogen.

Sulphocyanide of potassium produces insoluble precipitates in solutions of most metals. The salts thus formed correspond in their composition with the potassium salt. The lead and silver salts are white precipitates, yielding, on being treated with sulphuretted hydrogen, free hydrosulphocyanic acid.

| | | |
|---|---|---|
| K Csy | = Sulphocyanide of | Potassium. |
| Pb Csy | = ,, | Lead |
| Ag Csy | = ,, | Silver |
| H Csy | = ,, | Hydrogen (free acid). |

Hydro-sulphocyanic acid, is an acid, colourless liquid, which is readily decomposed, forming hydrocyanic acid, and several other products. It cannot be obtained by the action of stronger acids, such as hydrochloric or sulphuric acids, upon sulphocyanide. On adding concentrated hydrochloric acid to a saturated solution of sulphocyanide of potassium, a yellow crystalline precipitate takes place. This substance, however, is a product of the decomposition of hydro-sulphocyanic acid. It contains a large quantity of sulphur, and is called persulphocyanic acid.

Sulphocyanide of potassium is an exceedingly valuable reagent for salts of sesquioxide of iron, affording a ready means of distinguishing them from the salts of the protoxide, which are not affected by it. On account of the great facility with which cyanides pass into sulphocyanides, the characteristic reaction of the latter with sesquichloride of iron may also be used to trace the presence of cyanides in minute quantities. This test is particularly useful, if the cyanide exist under circumstances under which the application of the ordinary tests becomes inconvenient, as in cases where it is mixed with organic substances and other salts. The experiment may be made conveniently

in the following manner: Two watch glasses are selected which exactly fit each other. The salt to be tested is placed in the lower one with a small quantity of sulphuric acid and then covered with the other watch glass, the inner surface of which is moistened with a few drops of yellow sulphide of ammonium, which, combining with the liberated hydrocyanic acid, is partly converted into sulphocyanide of ammonium. On gently heating the upper watch glass, the sulphide of ammonium is volatillized, while the sulphocyanide remains, which may now be tested in the usual manner. Cyanide of potassium, when submitted to the action of oxygen, exhibits a perfectly analogous deportment. When heated in contact with air, this salt absorbs two equivalents of oxygen, and is converted into a new salt, corresponding to sulphocyanide of potassium.

$$K\,Cy\,S_2,\ KCy\,O^2$$

According to this formula, it might be called "oxycyanide of potassium," but it is better known by the laboratory term of "cyanate of potassa." For the preparation of this compound on a larger scale, the oxygen is more frequently employed in a state of combination than in its free condition. Protoxide of lead, or minium, is often used for the purpose. The minium is gradually introduced into cyanide of potassium, fused in a Hessian crucible, where it is instantly deprived of its oxygen. On account of the facility with which cyanide of potassium is oxidized under these circumstances, this salt constitutes one of the most valuable reducing agents of the laboratory. Nor is it absolutely necessary to use cyanide of potassium; ferrocyanide of potassium may be likewise employed. An interesting mode of forming this compound consists in heating a mixture of two parts of dry ferrocyanide of potassium with one part of finely divided peroxide of manganese in contact with the atmosphere. A tinder-like combustion ensues, as is evident from the change of colour, and the combination of the evolution of heat, even after the gas has been turned off. The crude mass resulting from either of these processes, is extracted by hot dilute spirit, which, in cooling, deposits the potassium salt; water cannot be used for this purpose. The new salt dissolves with the greatest facility in this liquid; but on attempting to obtain crystals by evaporation, we soon find that a perfect decomposition has taken place, torrents of ammonia are evolved, and the salt which is ultimately left consists entirely of carbonate of potassa. This change is brought about by the action of the water, the elements of which are appropriated by the constituents of the salt. One equivalent of cyanate of potassa contains two equivalents of carbon 1 eq. of nitrogen, one equivalent of potassium, and two equivalents of oxygen; add to these the oxygen of 3 equivalents of water, and you have enough oxygen to convert the whole of the carbon into carbonic acid and the potassium into potassa, while the nitrogen combines with the liberated hydrogen to form ammonia.

| | | | | | |
|---|---|---|---|---|---|
| K | $C_2$ | N | $O_2$ | | |
| | | | $O_2$ | $H_2$ | = 2 water. |
| K | $C_2$ | N | $O_2$ | $H_2$ | |
| | $C_2$ | | $O_4$ | | = 2 carbonic acid |
| K | | N | O | $H_2$ | |
| K | | | O | | = 1eq. potassa. |
| | | N | | $H_2$ | 1eq. ammonia. |

From the potassium compound, a series of metallic salts may be prepared by double decomposition; thus on adding solutions of silver or lead, white precipitates are produced, in which the potassium is replaced by the two metals mentioned $K\,Cy\,O_2$—$Ag\,Cy\,O_2$ $Pb\,Cy\,O_2$ But all attempts to replace these metals by hydrogen—i.e., to produce the acid of the series—by the methods generally adopted for that purpose, have hitherto failed. I have alluded to the facility with which the hydrosulpho cyanic acid is decomposed—the corresponding oxygen acid is even far more readily altered. On adding hydrochloric or dilute $SO_3$ to the potassium compound, a penetrating odour it perceived, reminding you of sulphurous or acetic acid, which evidently belongs to the cyanic acid liberated; but after a few seconds a

powerful effervescence of $CO_2$ ensues, and the liquid which was previously free from ammonia, now contains the ammonia salt of the acid which was employed, and which may be readily shown by the addition of caustic lime, when the ammonia will be liberated. It is evident that the acid when set free undergoes the same decomposition which was observed on evaporating the potassium compound.

Cyanic acid has, nevertheless, been obtained, and, indeed, under circumstances so interesting and so instructive, that I cannot refrain from entering into some details respecting its formation. In order that you may understand the train of experiments which has led to this result, I must remind you of the deportment exhibited by many mineral chlorides; when coming into contact with water, a decomposition of the latter ensues. We obtain hydrochloric acid, and an oxide of the element with which the chlorine was combined. I perform the experiment with terchloride of antimony. The action of water produces instantaneously a precipitate of white teroxide of antimony. If a compound of chlorine with cyanogen could be obtained, it would not be impossible that the action of water on this substance would produce the acid in question.

$$Sb\ Cl_2 + 3HO = Sb\ O_2 + 3\ H\ Cl.$$
$$Cy\ Cl + HO = Cy\ O + H\ Cl.$$

Now, chlorine combines with cyanogen very readily. It is only necessary to bring together in a suitable vessel cyanide of mercury and chlorine, when, on the one hand, chloride of mercury, and on the other, chloride of cyanogen, is produced. This body is a gas at the common temperature, but may be liquified by exposure to a frigorific mixture. In this state it may be preserved when sealed in strong glass tubes.

The deportment of this substance, however, greatly differed from what chemists had anticipated. It was found that water had no effect whatever upon this chloride. Indeed its formation is greatly facilitated by the presence of water, and I hold in my hand a solution of this gas in water, which was prepared some weeks ago. The penetrating odour, and the expulsion of an inflammable body upon application of heat, at once betray the presence of this compound. If the chloride of cyanogen gas be passed into a solution of potassa, decomposition ensues, chloride of potassium and cyanate of potassa are formed, but the latter undergoes almost instantaneously the decomposition which has been repeatedly mentioned; it is converted into carbonate with evolution of ammonia. The liquid chloride of cyanogen which is preserved in sealed tubes, passes, however, rapidly into a new modification, which exhibits a perfectly different deportment with potassa. After a few days, long slender crystals begin to appear in the liquid; these gradually augment, and after the lapse of a week or two, the whole liquid has solidified into a crystalline mass. On opening the tube we find there is no longer the slightest odour perceptible. The compound which previously boiled below the freezing point of water is now converted into a substance difficultly fusing and boiling at a temperature not much lower than the fusing point of tin. The analysis of this substance has led to the remarkable result, that it has exactly the same composition as the gaseous chloride of cyanogen. Now what explanation can be given of this difference of properties exhibited by two substances of exactly the same composition? This explanation has been furnished by the examination of the density of the two substances when in the state of vapour. And here you have an example of the valuable aid which the chemist derives from the important process which I had an opportunity of describing to you in one of the former lectures. This examination shows that the vapour density of the solid chloride of cyanogen is three times that of the chloride of cynogen gas; in other words, that in the passage of the gas into the solid the molecules have been approximated in such a manner that the same volume of gas, after the change has taken place, contains three times the weight of matter which was originally present in it. We accordingly represent the composition of the gaseous chloride by the formula.

$$Cy\ Cl.$$

And that of the solid compound by the expression

$$Cy_3\ Cl_3.$$

substances related to each other, like the gaseous and solid chlorides of cyanogen, are called isomeric or polymeric substances. The cyanogen series is particularly rich in examples of this description. Solid chloride of cyanogen is not affected by water, but is readily attacked by a boiling solution of potassa. The products are perfectly different from those which are observed in the decomposition of the gaseous chloride. No carbonic acid, no ammonia is produced. We obtain the potassa salt of an extremely stable acid, which may be boiled with potassa without undergoing decomposition. Neither have its acids any action upon it. On adding concentrated hydrochloric acid to the solution of the potassa salt, a white crystalline precipitate takes place, which, when redissolved in boiling water, furnishes long slender prisms of the acid. This substance, remarkably enough, has exactly the composition of the acid which formed the starting point of this discussion—namely, cyanic acid, its formula being in fact

$$H\ Cy\ O_2.$$

The deportment of this acid, however, shows at once that it is not really cyanic acid. Boththeacid and its salts belong to the stablest compounds of organic chemistry, while, as I showed you, the cyanates are ephemeral. This different deportment, together with the origin of the acid from the solid chloride of cyanogen, rendered it very probable that the crystalline acid might bear to the acid in the cyanates, exactly in the same relation which the solid and gaseous chloride of cyanogen have to each other: and that the new acid was formed by the coalescence, as it were, of three atoms of cyanic acid into one atom of a more complete acid, having the same composition, which, in this case, would be expressed by the formula,

$$H_3\ Cy_3\ O_6.$$

This view has been borne out most beautifully by a close examination of the salts of this acid. It has been established that the new acid, which is called cyanuric acid, is unquestionably a tribasic acid—i.e., that it contains like phosphoric acid, three atoms of hydrogen, which are replaceable by metals. Consequently, it produces three series of salts, which are represented by the formulæ, M. expressing one equivalent of a metal,

$$M_3\ Cy_3\ O_6 \quad H \left\{ \begin{matrix} M_2 \\ \\ \end{matrix} \right\} Cy_3\ O_6 \quad H_2 \left\{ \begin{matrix} M \\ \\ \end{matrix} \right\} Cy_3\ O_6$$

The white precipitate produced by the addition of nitrate of silver to a solution of the potassium salt, belongs to the first series, it contains $Ag_3\ Cy_3\ O_6$, and has, consequently, the same per centage composition as the cyanate which, as you saw, contains $Ag\ Cy\ O_2$, from which it differs, however, in its deportment. With potassium, two salts

$$H \left\{ \begin{matrix} K_2 \\ \\ \end{matrix} \right\} Cy_3\ O_6 \text{ and } H_2 \left\{ \begin{matrix} K \\ \\ \end{matrix} \right\} Cy_3\ O_6$$

may be prepared, which sufficiently distinguish cyanuric from cyanic acid, salts of this composition being impossible with a monobasic acid.

The most beautiful result, however, obtained in these researches was the decomposition observed by Professor Wohler, in submitting cyanuric acid to the action of heat. When distilled in a small retort, cyanuric acid is entirely volatillized, and there is collected inthe receiver—which, for this purpose, has to be cooled with ice—a clear, colourless, transparent liquor, having a powerful pungent odour, similar to that of acetic or sulphurous acid. This substance has exactly the same percentage composition as cyanuric acid, with which however it has scarcely any other property in common. The character of this compound proves that the substance obtained by this peculiar round-about method is, indeed, the very cyanic acid which we vainly endeavored to produce by the ordinary processes employed for the separation of acids from their saline compounds. When coming in contact with water, this pungent liquid yields at once $CO_2$ and $NH_3$, a decomposition to which I have frequently adverted, and which alone would be sufficient to characterise it as a cyanic acid. It is evident, then, that by the action of heat one equivalent of cyanuric acid splits into 3 eq. of cyanic acid,

$$H_3\,Cy_3\,O_3 = 3H.\,Cy\,O_2,$$

and that in this process exactly the reverse occurs of what happens in the formation of the solid chloride of cyanogen.

Cyanic acid as obtained by this method, has a very transient existence. A few minutes after its preparation, it enters into a sort of ebullition and then suddenly solidifies into a white porcelain-like solid, perfectly insoluble in water, and which has again the same percentage composition as cyanic and cyanuric acid, from both of which it differs. It is another polymeric modification of the same molecular group, and is called cyamelide, or insoluble cyanuric acid. In what manner, however, the molecules are arranged in this compound it would be difficult to say, inasmuch as cyamelide is a most indifferent substance, producing no kind of combination, and yielding as the sole products of decomposition, cyanic or cyanuric acid.

But the list of polymeric compounds is not completed by cyamelide. There is still another—perhaps the most interesting of all—to which I have to call your attention for a few moments, and which, as you will see directly, is produced by a perfectly different process. Under the name of Howards and Brugnatelli's fulminating compounds, two salts have long been known, which are produced by the action of nitrous acid upon alcohol, in the presence of mercury or of silver. These substances, as indicated by their name, are explosive in the extreme. Their composition was utterly unknown about 25 years ago, when Liebig, at that time still under the guidance of Gay Lussac, embarked in their investigation. The result of the celebrated inquiry of these two philosophers, in which Liebeg's name appeared for the first time before the scientific world, was, that these substances are closely related to the cyanates and cyanurates, that, in fact, the fulminating silver has exactly the same percentage composition as cyanate and cyanurate of silver. But let us first see how this substance is produced. This beaker contains a saturated solution of nitrate of silver in alcohol; into this solution I pass the vapour of nitrous acid. As it is disengaged by the action of nitric acid upon arsenious acid, you observe that it becomes turbid most instantaneously. The white crystalline powder which separates is fulminate of silver. The reaction is easily intelligible. Let us add together the elements of one equivalent of alcohol, two of nitrous acid, and two of protoxide of silver; thus by subtracting six equivalents of water, we arrive at a formula which, when divided by two, coincides with that of cyanate of silver:

| | |
|---|---|
| 1 eq. alcohol | $C_4\,H_6\,O_2$ |
| 2 ,, nitrous acid, | $N_2\,O_6$ |
| 2 ,, ox. of silver, | $O_2\,Ag_2$ |
| | $C_4\,H_6\,N_2\,O_{10}\,Ag_2$ |
| 6 eq. of water | $H_6\,O_6$ |
| | $C_4\,N_2\,O_4\,Ag_2$ |

$$= 2\,C_2\,N\,O_2\,Ag = 2\,Ag\,Cy\,O_2$$

The experiment which I have shown you will illustrate the formation of this compound. In practice, however, both the silver and mercury salts are obtained in a somewhat different manner. In this case the nitrous acid is furnished by the action of the nitric acid upon a portion of the alcohol. Fulminate of mercury, for instance, is made by dissolving one part of mercury in twelve parts of nitric acid (of sp. gr. 1. 36) and adding this solution in a retort to eleven parts of spirits of wine (of 80 per cent). The heat of a water bath is sufficient to cause a most violent reaction, the details of which you will better understand after I have treated of alcohol. Suffice it to say that a portion of the alcohol is more or less oxidized, a variety of volatile products being formed, which are collected in the receiver.

The nitric acid, reduced to the state of nitrous, acts upon the remainder of the alcohol, and thus produces the salt. Both fulminate of silver and of mercury, but especially the latter, are used in the manufacture of percussion caps. The preparations of these salts has to be performed with the greatest precautions. The fearful catastrophe at Apothecaries' Hall, which caused the untimely end of Mr. Hennell, is still fresh in the memory of many.

On account of the rapidity with which the explosion of the fulminates takes place, they are not employed for charging firearms.

A remarkable composition, containing fulminate of mercury and collodion (gun cotton dissolved in ether), together with several other explosive compounds, has however been of late prepared for this purpose by Messrs. Gersheim and Winnivarter, of Vienna, which deserves the attention of those who take an interest in matters of this kind. This mixture does not explode unless submitted to powerful percussion: it may be handled with perfect safety. The explosion, although extremely powerful, is sufficiently slow for the propulsion of the bullet. Lastly, the presence of collodion protects the other constituents from the action of moisture.

The identity of composition of the fulminates with the cyanates and cyanurates, substances from which their properties so essentially differ, has naturally attracted the attention of chemical enquirers. They have endeavoured to account for this remarkable difference in a manner similar to the mode of explanation suggested for the different deportment of cyanic and cyanuric acids. A closer examination of the several fulminic salts has also in this case elucidated the question. On adding potassa to a solution of fulminate of silver a brown precipitate of protoxide of silver is produced. It is found, however, that by no means the whole amount of silver is thus precipitated; half of it remains in solution, which on evaporation furnishes a crystalline salt, containing both silver and potassium. The simplest expression into which the analysis of this compound can be translated is the formula

$$Ag.\ K\ C_4\ N_2\ O_4 = Ag\ K\ Cy_2\ O_4.$$

Analogous compounds are formed by treating fulminate of silver by soda or baryta, the existence of which naturally leads to the assumption that fulminic acid is a bibasic acid, and that the composition of fulminate of silver itself must be represented by the formula

$$Ag_2,\ Cy_2\ O_4.$$

Chemists have not yet succeeded in preparing the hydrogen compounds corresponding to the silver salt that is free fulminic acid. If the fulminate of potassium and silver which I have just now mentioned, be treated with nitric acid, the potassium is eliminated in the form of nitrate, and replaced by hydrogen, an acid silver salt of the formula

$$Ag\ H\ Cy_2\ O_4$$

being produced. The last eq. of silver, however, cannot be removed without entirely destroying the compound, which splits into hydrocyanic acid and a variety of products not yet sufficiently examined. If fulminic acid could be separated—and its isolation after what has been experienced in the case of cyanic acid, appears by no means improbable—it would have the composition

$$H_2\ Cy_2\ O_4.$$

This formula places fulminic acid between cyanic and cyanuric acids, as shown in the following table, and satisfactorily accounts for the dissimilarity of properties exhibited by the salts of the three isomeric acids.

Cyanic acid = $H\ Cy\ O_2$ monobasic.
Fulminic ,, = $N_2\ Cy_2\ O_4$ bibasic.
Cyanuric ,, = $N_3\ Cy_3\ O_6$ tribasic.

The fact that the fulminates are produced by processes so essentially different from those used in preparing the cyanate and cyanurates, has induced some chemists to doubt the actual existence of so close a relation between these several acids. It is true neither cyanates nor cyanurates have hitherto been converted into fulminates; but experiments performed not long ago by Dr. Gladstone have proved that the decomposition of fulminates invariably gives rise to the formation of members of the cyanic series, among which sulpho-cyanide of ammonium and urea may be specially mentioned. The latter, one of the most interesting compounds of cyanic acid, will claim our particular attention in the next lecture.

*Medical Times and Gazette*

## ON GOUT AS IT AFFECTS THE BLADDER.

By Dr. Robert B. Todd, F.R.S., &c.

[Preceding his observations by mentioning some cases in which pus is found in the bladder, Dr. Todd goes on to consider the subject of gout in the bladder. He says:]

Gout appears to me to manifest itself in the bladder in four different ways.

1st. It manifests itself as a distinct and very obvious inflammatory affection; so that I imagine, in these cases, the mucous membrane of the bladder would be found red and inflamed, presenting, indeed, the ordinary appearance of the mucous membrane in a state of inflammation. This condition must, however, be distinguished from inflammation of the bladder, occurring from other causes, and unconnected with any specific inflammation. Gouty inflammation of the bladder is an analogous affection to gouty inflammation of the lungs, gouty bronchitis, or gouty pneumonia, and gouty inflammation of the stomach. In cases of this kind there is a great tendency to the secretion of pus by the mucous membrane of the bladder. If there be any difficulty in the free evacuation of the pus, the urine becomes alkaline, from the retention of a small quantity of the secretion, and the subsequent decomposition of the urea; the highly alkaline urine, in its turn, keeps up the irritability of the bladder, and promotes the secretion of more pus. In this way, either a weak or paralytic state of bladder, or an enlarged prostate, or a stricture in the urethra, may stand in the way of the complete restoration of this organ to its healthy functions.

2ndly. Gouty inflammation attacks the bladder in a different manner to that last described, so as to produce incontinence of urine. A gouty man becomes troubled with incontinence of urine, and we find that this incontinence depends upon a highly irritable state of the mucous membrane of the bladder, and a consequent inability of that organ to retain the urine, and not upon a paralytic state of the sphincter vesicæ muscle. In this form, the sensibility of the mucous membrane is very much exalted, and the bladder becomes intolerant of the presence of the smallest quantity of urine, so that the evacuation of its contents is constantly taking place at short intervals. The prominent symptom then, in such cases, is frequent micturition of small quantities of urine, the urine being pale, acid, devoid of mucus or pus; sometimes, it may be, albuminous, owing to the existence of gouty disease of the kidneys.

It is difficult to define the exact pathological condition of the mucous membrane of the bladder in this affection. It is an irritable rather than an inflammatory state,—a condition in which the sensibility of the mucous membrane of the bladder is greatly exalted, owing to the influence of the gouty poison, which seems capable of irritating the bladder as cantharidine does. The cases in which it is apt to occur are generally in elderly persons, whose systems seem thoroughly imbued with gout, and in whom deposits exist in the joints, or the tendinous sheaths, or in the arteries. It occurs in old persons, and often accompanies enlargement of the prostate gland. Sir Benjamin Brodie describes cases which, I suspect, are of this nature, the primary cause of the symptoms being gout. He says, "An elderly man complains of frequent attacks of giddiness. Sometimes, in walking, his head turns round, so that he is in danger of falling; and this symptom probably arises from altered structure of the arteries of the brain, causing an imperfect state of the cerebral circulation. This state of things is sometimes attended with an irritable condition of the bladder, and, although the urine is of a healthy quality, and the bladder itself is free from disease, the patient is tormented with a constant micturition, voiding his urine without pain, but at short intervals, and in small quantity."

3rdly. A third class of cases exhibits a condition opposite to that which I have just described, in which, instead of the patient's being unable to retain even a small quantity of urine in his bladder, he is suddenly or rapidly affected with an inability to pass water, and the bladder becomes distended in consequence, causing great pain and suffering. The essential difference between these two conditions consists in this, that in the former case the

mucous membrane is rendered highly irritable by the gouty poison, and kept so by some irritating quality of the urine, but in the latter case the muscular coat is the seat of the affection. There is ample evidence to show, that muscles may be attacked by the rheumatic or by the gouty poison. Thus, in subjects of gouty diathesis, it is not uncommon to meet with sudden and severe affections of external muscles, accompanied with constitutional disturbance similar to that of acute gout. I am just now attending a nobleman in whom very decided constitutional disturbance, accompanied by distressing intermission of the heart's action, preceded for some time the sudden appearance of a very painful inflammatory affection of the same portion of the gastrocnemius muscle on each side, which came on the sudden way in which gout is apt to do. Lumbago is an instance of gouty affection of muscles. The intercostal muscles are often similarly attacked, giving rise to a most painful affection, which occasionally ends in pleurisy, or even pleuropneumony. Just in the same way gout may attack the muscular fibres of the bladder, stomach or colon; and in the cases of retention of urine such as I am describing it affects the muscular coat of the bladder so as to paralyse it, in a manner analogous to that in which the active principle of belladonna may affect the muscular fibres of the iris, and cause a dilated, immoveable pupil.

I will relate to you a case in illustration of this form of gout in the bladder. A barrister of great eminence in his profession was obliged to return to town from his circuit, where he was largely employed, and, indeed, overworked. He had been seized with severe muscular pains in the thighs and loins, which I regarded as gouty. The patient was of a gouty family, generated lithic acid freely, and had passed a considerable quantity of lithic acid gravel. On a former occasion I had attended him for one of those attacks of sudden affection of the intercostal muscles (gouty pleurodyne, as I would call it), passing on to dry pleurisy. For these reasons, I was justified, I think, in regarding and treating these pains as gouty in their character. After he had been three or four days under treatment for this affection, he found, one morning, on attempting to empty his bladder, that it refused to discharge its contents. A complete paralysis of the bladder had taken place, and evidently not from too great distension, as the patient did not suffer much inconvenience, and the quantity of water which had accumulated was not considerable. Under a soothing treatment, with slight counter-irritation over the region of the bladder, this paralytic state gave way within four-and-twenty hours, but it was several days before the full power and tone of the bladder was restored.

4thly. Gout attacks the bladder, in some cases, as follows (and I take my remarks on this head from a case which actually came under my notice):—A gouty man indulges more freely in the delicacies of the table than he is usually wont to do; perhaps he is guilty of some indiscretion in what he partakes, eating cheese or some other indigestible matter which disagrees with him, and, before he goes to bed, he is suddenly seized with violent pains in the region of the bladder, which in some cases lasts an hour, but in others continues to torment the patient for two or three hours, preventing him from sleeping, and often producing great distress. This condition is usually relieved by free counter-irritation, and the administration of alkalies.

If, then, you find a man labouring under any of the four conditions that I have described, and at the same time you are able to discover from his history symptoms characteristic of a gouty diathesis, and you are convinced of the absence of calculus, you may feel satisfied that the symptoms are dependent upon a gouty inflammation of the bladder, and your treatment will be influenced accordingly. It must, however, be born in mind, that a stone will cause the development of very similar symptoms, and it will therefore be necessary to sound the patient carefully, in order to determine the presence or absence of stone. The sudden invasion, the existence of the gouty diathesis, and the absence of other causes to account for the symptoms present, mark the peculiar nature of the affection, and concur in making us suppose the disease to be of gouty nature. Being decided as to

the diagnosis, what means are we to adopt to relieve the symptoms? The treatment in these cases is obvious and simple. First and most important, then, is a free counter-irritation; but you must apply your counter-irritation carefully, and consider what form of counter-irritant will be best suited to the case. Blisters would be improper, because cantharidine, which is the active principle of the blister, is a direct irritant to the mucous membrane of the bladder, and would tend, therefore, rather to increase the distress. Turpentine must not be employed either, because it irritates the kidneys, and the irritation is liable to be propagated to the bladder. Mustard is the most effectual counter-irritant which we can use in these cases, and has not the disadvantage of the former remedies. Strong ammonia may likewise be used as a counter-irritant. Our next consideration must be to relieve pain, which in many cases is a most urgent symptom, and we should endeavour to effect this in the speediest and safest manner possible. If the affection be of the first form, where pus is generated, the best course to pursue is to give an opiate in some way or other. This may be done by the endermic method, by rubbing in a strong opiate liniment over the region of the bladder. Or, what is much better, and more certain in its action, the opium may be given in the form of an enema injected into the rectum. About half a drachm of laudanum, mixed with a small quantity of decoction of starch, of which not more than an ounce and a half, or two ounces, should be employed, may be gently injected into the rectum, and you will find that it acts as a sort of warm poultice, containing opium, to the bladder; and in this way all kinds of irritability of this organ may be relieved. The irritable state of the bladder caused by cantharidine (strangury) is effectually relieved in the same way, and gouty inflammation is benefited in like manner. The action of cantharidine, indeed, forms a pretty good illustration of the manner in which we may suppose the gouty poison to cause the vesical irritability, and they may both be relieved in a similar manner. If the patient is not quite relieved after the administration of the first enema, you need not be afraid to give a second, provided that you are sure he exhibits no peculiar idiosyncrasy with respect to opium. In many cases of this kind you may give opium also with advantage by the mouth, and especially in combination with sudorifics.

With reference to the treatment of all cases of gout, where the disease is apt to attack internal organs, I may give you this practical hint, and I strongly advise you to bear it in mind whenever you may be called upon to treat gout of this nature. It is this, that these cases are of an asthenic character, and do not bear depletory measures; so that if you find a patient labouring under gout of the stomach, or gout affecting the bladder, you must not think of applying leeches, and employing the treatment which would be applicable to other forms of inflammation of these organs; for the abstraction of even so small a quantity of blood as would be taken by the application of a few leeches might do the patient serious mischief, and cause prostration from which he might never rally. On this point Sir Benjamin Brodie has expressed a similar opinion; for he lays it down, that antiphlogistic treatment is inapplicable to that particular form of inflammation of the bladder which is of a gouty origin. With regard to the exhibition of colchicum, I am of opinion, that, in many cases, it is inadmissible, and, in all; it should be given with great caution and circumspection; for this so-called specific is certainly very depressing in its influence, and therefore unsuitable to cases which partake of the asthenic character.

The treatment which, in my experience, has been most beneficial for gout, when it attacks any of the hollow viscera, consists in employing free counter-irritation—keeping up a moderate action of the bowels—paying attention to the functions of the skin, and promoting the action of this great secreting surface by the exhibition of sudorifics. Provided the urine be not alkaline, the administration of alkalies will be found of service, and opium is employed with great advantage for allaying the irritability of the affected organ, which is often productive of great distress to the patient.

As I have before hinted, there is much resemblance between the gouty

affections of the bladder and those of the stomach. In the latter organ, gout shows itself by the sudden development of violent pain referred to the stomach. This is often attended with the generation of gas in immense quantities, which distends the organ. Another form is, when the stomach is impatient of the smallest quantity of food, as the bladder is of urine. Incessant vomiting is the characteristic symptom of the form of the complaint. Sometimes these symptoms exist together. In other cases, the muscular coat becomes greatly weakened, and the food is pushed on only very slowly into the bowel. It accumulates in and distends the stomach, which becomes dilated and large, and by reason of the atonic state of the organ remains so. In all the forms of the complaint, but in none more than in this last form, the tendency to the generation of gas is a very prominent feature.—*Med. Times and Gaz., May* 28, 1853. *p.* 539.

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ON AN ALVINE CONCRETION, CONSISTING OF CHOLESTERINE.

By Dr. William D. Moore.

[This concretion seemed to have been formed in the intestinal tube. The patient was a young lady. There had been obstinate constipation and cholicky pains for some time; and it was at length voided per anum.]

She had never suffered from jaundice, pain, or other symptoms, whereby the passage of a gall-stone could be inferred. The calculus in size and shape resembled a pullet's egg: it weighed 210 grains, but was specifically lighter than water, as was proved by its floating when placed in a vessel of that fluid. Its outer surface was tubercular, and exactly resembled that of a mulberry urinary calculus. Some shining scales were visible externally, and also throughout the mass when cut. On the application of heat it first fused, and then burned with a bright flame. It dissolved completely in boiling alcohol, and on cooling separated from its solution, as was seen under the microscope, in broad tubular crystals of cholesterine, which, with a small admixture of fæcal matter, composed the bulk of the concretion.

Many writers have supposed that because calculi found in the intestines, or voided *per anum*, have been proved to consist chiefly of cholesterine, they must necessarily have formed in the gall bladder, and from that have passed either through the ducts, or by ulceration, into the intestine; and in support of this view, it has been argued that, where the parts are neither inflamed, nor in a state of spasm, the ductus choledochus may be considered to be in a passive state, admitting of an easy and gradual extension of its fibres, so as at length to allow of the free egress of the stone. It has also, indeed, been clearly proved by the example of a case in which a biliary calculus, in passing to the bowel, about a fortnight before being voided *per anum*, induced jaundice, yet gave no pain; that "the progress of gall-stones (even when inordinate in their dimension) through the ducts, is not disproved by the absence of pain from the epigastrium."

However admissible the foregoing facts may be, and conclusive as the case detailed by Dr. Wilson is, in establishing the proposition he advances, a little consideration will, I think, show, that the fact of a calculus consisting in whole or part of cholesterine, is not sufficient to prove it to be of biliary origin. For cholesterine is, according to Berzelius, "universally diffused through all parts of the body, and dissolved in its fluids." Simon states that it is a normal constituent of the bile, of the brain, and of the spinal cord. "It has been found," he adds, "in the blood; in the vernix caseosa: in the fluid of hydrocele; in an encysted tumour of the abdomen of a woman; in the ovary and testicle in a diseased state; in an abscess of the tooth; in a scirrhous structure in the mesocolon; in fungus medullaris; in medullary sarcoma; and in a vesical calculus extracted from a dog." Such being true, it is of course easily concedable that a concretion composed of cholesterine might form under predisposing circumstances, in some portion of the intestinal tube.

Dr. Douglas Maclagan was aware of the fallacy of inferring the origin of such calculi from their composition, for in his paper on the Constitution of Intestinal Concretions, published in the London and Edinburgh Monthly Journal of Medical Science for September, 1841, he observes, after describing a case in which vast numbers of small concretions had been passed, in reference to the question, as to whether these were a variety of gall-stone, that "the presence of cholesterine is no criterion. This substance is not only," he observes, "contained in the bile, and is thus poured into the intestinal canal, where it may easily be deposited; but it is frequently found in situations totally unconnected with the biliary organs." This statement is so very explicit, that I should not have thought it necessary here to enter upon the question, did I not find that many are still of the opinion that concretions of cholesterine must necessarily be derived from the hepatic system.

In conclusion, with respect to the patient, in reference to whose symptoms Sir Henry Marsh was consulted, it is clearly possible that the concretion voided by her may have been, not of hepatic, but of intestinal origin; and it appears to me that, if this be admitted, it will also be allowed to be more probable that a large calculus such as I have described should have formed in the intestine, than have passed in a young subject from the hepatic system to the bowel, either through the ducts or by ulceration, without giving rise to pain or jaundice.—*Dublin Quarterly Journal. August* 1853, *page* 247.

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### OBSERVATIONS ON A CASE OF FÆCAL OBSTRUCTION.

By Dr. Robert Christison.

[Dr. Christison remarks upon the frequency of habitual constipation amongst the better classes of society. Instances in which the bowels are only relieved once a week are comparatively common, and he records two cases of patients, aged 60 and 70, who stated that they had never had their bowels moved more than once a fortnight during their whole lives. In the case about to be related the patient had not had a stool for three weeks.]

On admission he had no appearance of any suffering. He seemed a fresh, vigorous, active, cheerful man. He took his food tolerably well; the pulse was natural, and the tongue was only a little furred. "The abdomen," to quote the Hospital journal, "is much distended, especially in the iliac regions, where there are two large prominent swellings projecting laterally, so that the crest of the ilium on each side is quite sunk, the tumours projecting much beyond the bones. There are various irregular swellings at different parts of the abdomen, especially in the track of the colon. Over some of these percussion is quite dull; over others it is tympanitic. The circumference of the abdomen, where largest, is 39½ inches."

As it was judged unsafe to give him active purgatives by the mouth at once, in case of the great gut being firmly obstructed with hardened fæces, a turpentine injection was properly administered by the clinical clerk in charge of him. The result was "a prodigious discharge of fæcal matter of all degrees of consistence," much of it composed of very hard scybala. A dose of jalop and calomel given immediately after this forerunner, brought away also a great mass of feculent matter. Next day, being quite well, but with the abdomen as large as ever, another similar dose occasioned only an ordinary discharge. On the third day, the swelling being equally great, though now quite uniform, and everywhere clear on percussion, I gave him—what has always appeared to me the most effectual of all safe energetic purgatives in cases of simple fæcal accumulation—two drachms of oil of turpentine with six drachms of castor oil in the form of emulsion. But he had only two scanty loose discharges, and the belly continued in the same state, presenting especially the singular enlargement and overlapping of the iliac regions.

It was now apparent that, owing to long continuous distension of the bowels with fæces and gases, their muscular coat had lost its tone, in some regions at least, and especially in the cæcum and descending colon. It was then proposed by the clinical clerk to resort to galvanism for relief from this paralytic condition; which suggestion was at once adopted. It is more than twenty-five years since galvanism was recommended as a useful remedy in cases of obstinate constipation; and we can easily see that it may be useful, and upon what principle it acts. The first way of using it was by directing the galvanic current from the mouth to the arms; and in that way it seems to have been most effectual and prompt in some cases. But its action is thus rather painful: and ulterior observation has shown that passing the current in various directions through the abdomen itself may be sufficient. This remedy seemed even more applicable to the state of our patient after the bowels had been cleared out. And accordingly it acted with wonderful energy and success. After the current had been passed for some time from before backwards, as well as from side to side, he had, in an hour, a copious evacuation, in three hours another, and next morning a third. Flatus was also discharged in abundance; and the abdomen fell greatly, but still not completely, above all in the iliac regions. The pain of the galvanic action, however, had been so great that the patient begged to have a day's respite. In fact, he declared his willingness, and confirmed it with an oath, that he would rather be shot than submit to be galvanized a second time. On the second morning, however, the remedy was applied more gently, and on two mornings subsequently. He had a daily discharge from his bowels, and sometimes two. The abdomen had now become natural in size and form. Since then he has had a natural evacuation every morning, without aid from either laxative or galvanism. He was dismissed after being fourteen days in hospital.

This is a case a little out of the common run, but not without instruction: and I have therefore thought it well to bring the chief circumstances under your notice. It is an excellent illustration of the influence exerted by galvanism over the animal functions. It appears to me to hold out a probability that the same remedy may prove serviceable in restoring the tone of the intestinal muscles, in other forms of inconvenient chronic flatulent distension of the abdomen.—*Monthly Journal of Medical Science, Sept.* 1853, *p.* 252.