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THE

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OF

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ORIGINAL COMMUNICATIONS.

ART. XXXIX.—*Pathological Histology, by* DR. GOTTLIEB GLUGE. *Translated from the German by* JOSEPH LEIDY, ESQ., M. D., *Philadelphia.*

THIRD SECTION.

Formation of the Blastema.

We have now to determine the sources whence the plastic substance is derived which furnishes the material for the development of the new tissues.

11. *Nutrition, Secretion, and Inflammation.*

In the process of nutrition, the vascular system of each organ separates under its influence the necessary elements; urine in the kidney, bile in the liver, etc.

In this manner, a large quantity of plastic matter is deposited in the structure of the pregnant uterus, which is transformed into fibres observable in various stages of development. If nutrition becomes abnormal, from causes which must remain unknown until we are acquainted with the laws of the normal process, there exudes from the blood vessels a liquid resembling serum, as in simple dropsy, or only single elements may exude, as fat in stearosis. In other cases albumen and fibrine are effused which experience little or no metamorphosis, or they become converted into perfect tissue, in the development of which the organ, the seat of the secretion, exerts a powerful influence. The tissue produced determines hypertrophy, or forms isolated masses constituting tumors. In a final case the blood stagnates and its corpuscles accumulate and experience

definite transformations; and the plastic constituents undergo one of the described metamorphoses within and external to the vessels. This process alone I designate by the name of inflammation.

Stasis of the blood-corpuscles and consequent metamorphoses of the blood, with or without exudation of proteine, are the only anatomical characteristics of inflammation. After stasis has occurred, the latter may disappear, and the plastic material continue to exude, as is the case in chronic suppuration. The name inflammation, however, should not be given up; because the other exudations above-mentioned occur in the vascular system, and are entirely different from those of the inflammatory process, in the fact that they occur without stasis and alteration of the blood-corpuscles; and the word hyperœmia, or stasis, and even exudation alone, define inflammation as little as the earlier words tumefaction, heat, redness, and pain, used for all its forms.

From the preceding it is clear that, in disease the plastic substance is deposited in two modes; without previous stasis of the blood, as in normal nutrition, and with stasis of the blood corpuscles, probably through their agency, as in inflammation. The first process we understand very imperfectly, because we are unacquainted with the laws of ordinary nutrition. We know isolated conditions, in which, for example, fat or serum is deposited in certain tissues, but the numerous explanations which have been given of diabetes are sufficient to exhibit the paucity of our knowledge in this respect. With the mode of deposition of plastic matter in inflammation, we have a rather more exact acquaintance, and shall treat of it particularly.

Inflammation consists of several consecutive groups of phenomena or stages, each of which may terminate without necessarily passing into the next, and each, according to its nature, requires a varied method of treatment already discovered unconsciously and empirically. These groups of phenomena or stages are as follow: congestion, hyperæmia, stasis, exudation, and gangrene.

12. *Congestion.*

This stage sometimes precedes the others, but not necessarily.

By the term we designate an unusual flow of blood through a certain portion of the capillary system in a given time, and the condition may be directly observed by means of the microscope. An acceleration of the entire capillary circulation may occur as well as partially in an organ or a

tissue. In the former case it is consequent upon the central organ of the circulation (contraction of the heart and respiration), and in the latter it is possible only upon augmented secretion and nutrition.*

The more rapid change of material operates through the constant effusion from a continued renewal of the stream of blood in the capillaries. Such partial congestions are frequent in certain organs during pregnancy, as in the uterus and the mammary glands. An organ moreover, may receive an increased quantity of blood in consequence of the growth and augmentation of its vessels, as is also exhibited in the organs last mentioned. In the same manner pathologically an organ may receive more blood than usual, a remarkable example of which is presented by tumours.

13. *Hyperæmia.*

Hyperæmia consists in an accumulation of blood in a portion of the capillary system, in arteries or in veins, produced by retardation of the circulation. The latter condition in the entire capillary system of the body is incompatible with life; the most remarkable example of this being presented by cholera.

Hyperæmia, or accumulation of the blood within the vessels, occurs in two forms. In the one case all the constituents, the liquor sanguinis and the blood corpuscles, accumulated; in the other, the corpuscles accumulate with a diminution of the liquor sanguinis. The former may occur in the arteries and in the veins, and more particularly the latter, because they possess a high degree of dilatability. The other form alone occurs in the capillaries, for these cannot receive a large quantity of blood without effusion of the liquor sanguinis (exudation), or rupture of their parietes (capillary hemorrhage). In hyperæmia of the capillaries, the blood-corpuscles accumulate so as to fill up the lymph-space, and come into immediate contact with the walls of the vessels, to which they adhere, and thus increase the retardation of the circulating current.

In this manner, vessels ordinarily conveying only a single row of blood corpuscles, and imperceptible, become visible to the naked eye; and a tissue, which in the normal condition is pale, becomes bright red. The walls themselves of the capillaries have no participation in the produc-

* It is often asserted that an unusual flow of blood in any organ is produced by increased excitability of a portion of the arterial system but this is an hypothesis a stronger pulsation of the arteries of an organ is observed only when the return of the blood is impeded by obstruction, which may exist in the organ itself, or in some other, having a functional or mechanical relation to the latter.

tion of the hyperæmia. As already stated in a publication in 1842, I have never seen in any organ or tissue of an animal, from any irritation whatsoever, a measurable dilation of fibreless capillary vessels; and, although such a change is asserted to occur, to the present time, by Vogel, Rokitansky, and others, yet I can only explain the discrepancy from these latter having failed to make comparative measurements. Those made by Lebert give Omm, 005; a difference too slight to be taken into consideration, and attributable alone to the measurement, for it is well known that it is quite impossible to measure the same body twice without obtaining a slight difference in the result. On the other hand, if dilatation of the capillaries does not occur in hyperæmia it is quite as difficult to prove they undergo narrowing or contraction. They only mode in which the latter could possibly take place, is by condensation and contraction of the tissue with which the capillary walls are firmly connected.

Dilatation of the arteries and veins, however, frequently occurs, and this condition determines a retardation of the current of blood through them. Further, simultaneously with hyperæmia of a tissue, fusiform dilatations are observed in those capillaries and arteries surrounded by the annular fibrous tunic, and likewise the experiments of Weber have proved their contractility under galvanic stimulus. Experience confirms the view that diminished contractility of the arteries participates in the production of hyperæmia. When an artery becomes calcified, hyperæmia is easily induced in the organ which it supplies with blood.

14. *Stasis.*

Stasis, or stagnation of the blood, as the term indicates, is the cessation of the circulation. It occurs in the arterial and venous, as well as in the capillary system. The alterations which the blood undergoes under these circumstances are the same in the three systems, and are only modified through the constitution of the latter. In this place, I shall treat only of stasis in the capillaries, and propose to devote a separate chapter to that of the larger vessels.

If the capillary vessels are stopped up with blood corpuscles, all movement of the sanguineous column ceases, the so-called lymph corpuscles increase in number and the lymph space has disappeared. The blood corpuscles themselves undergo the following changes:—They become grouped frequently in regular columns, resembling piles of

coin; their coloring matter dissolves in the small quantity of remaining liquor sanguinis; and they become irregular, and fuse into a firm fibrinous mass; or they decrease in size, give up their coloring matter and a portion of their fibrine, and become united by means of a soft, gray, coagulated albuminous matter, intomulberry-formed groups, the inflammation globules. Accompanying this change, serum, stained red, exudes from the capillary walls, and these are themselves sometimes ruptured, corresponding to the condition of the so-called inflammatory engorgement. Or the blood-corpuscles give up their contents to the liquor sanguinis, which effusing from the capillaries into the surrounding parenchyma, constitutes fibrinous exudation. At first the fibrine is always dissolved in a greater or lesser quantity of serum, but rarely remains a long time in the liquid condition, as in the so-termed hydrops fibrinosa, most usually coagulating immediately. Under the latter circumstances the walls of the capillaries become invisible, apparently from their having been pressed together by the exudation; and an organ in this degree of stasis, as for instance, a hepatized lung, contains a much smaller number of blood-corpuscles than in the normal condition.

The extravasation of the liquor sanguinis determines, in all the grades of stasis, swelling of the organ; and the impediment to the capillary circulation augments contraction of the arteries, and hence the beating of the part, which is therefore a result, and not a course of stasis. So soon as stasis has advanced to a considerable extent, the blood yet retained within the vessel presents a decided increase in the quantity of fibrine, which is also a result and not a cause of the condition. Thus Zimmerman, in a first vene section, in a case of pneumonia found 0,002 fibrine, and in a second 0,008. The source of this access appears to me to be the stagnated blood corpuscles from which it escapes, for, with very rare exceptions, the more the latter decrease the more the fibrine increases. Others have sought for the source in the decrease of the albumen of the blood, but this is more naturally explained by the exudation of serum from the vessels; and, besides this, we do not find such a dimmution with increase of the fibrine, if stagnation of the blood corpuscles does not occur; as, for instance, in albuminuria from stearosis.*

* In rheumatismus acutus, in which such an increase of fibrine also occurs, it is probably dependent upon the escape of this substance from the blood-corpuscles without preceding stasis. Coagula in the heart and the disposition to local exudations indicate this.

15. *Inflammation and its Termination.*

From what has been stated, it is clear that the inflammatory process consists of several phenomena or stages, which may exist independently without passing into another, and each has already found a therapeutic treatment emperically, hyperæmia, stasis, and fibrinous exudation.

To these succeeds a fourth stage, which may prove very variable in its character; exudation being followed by resorption, or organization into tissues, or the formation of pus, or decomposition—that is to say, gangrene.

1. Resorption—When this occurs, the stasis in the vessels disappears, the albumen is absorbed, and the fibrine is re-dissolved and also absorbed. Even coagula of blood in the pleura or peritioneal cavity have been frequently observed in the lower animals o become reabsorbed.

2. Organization.—In this process, the effused fibrine breaks up into minute globules, from the $\frac{1}{300}$ to the $\frac{1}{500}$ mil in diameter, consisting of proteine and a portion of fat (exudation globules), or it becomes organized into tissues according to the laws previously given, or it is converted into pus, in which case the exudation-granules serve in the formation of nuclei.

16. *Causes of Hyperæmia and Stasis.*

Hyperæmia may occur in the dead body, if, in some portion of the capillary system the blood does not coagulate; and the blood-corpuscles following the law of gravity, sink and accumulate together. In the living body, however, it is produced when the return of the blood from some portion of the capillary system is prevented by pressure upon, or obstruction within veins, through destruction or retardation of the circulation in another organ, by reduction in the activity of the heart, or through loss of elasticity in the arteries. Both it and stasis may be determined by disorganization of the latter organs, or through disturbance of nervous influence. Further, they may be induced by elevated activity in an organ. Hyperæmia, also, may arise through the local application of chemical or physical irritants. All substances capable of combining with the blood or the capillary walls may produce such an effect; as ether, acetic acid, salts, hydrocyanic acid, etc. A high temperature or great cold, likewise, may operate in the production of hyperæmia. The most remarkable example of local stasis is observed from the chemical influence of a blister. Again, they may be induced by one of the accessory aids to the capillary circulation, secretion, exhalation,

or respiration becoming diminished. The above causes, however, do not answer in all cases, to explain hyperæmia and stasis.

On this account some have supposed a greater power of attraction than usual in the capillary walls or surrounding parenchyma for the blood; and others have mentioned paralysis of the vascular walls as a cause. Probable as the latter may be in the smaller arteries, yet, until the present time neither mode of explanation has been proved. Even section of those branches of the sympathetic nerve which preside over the blood-vessels (Bidder); and, as I have myself observed in frogs, destruction of the spinal marrow and nerves of the lower extremities, do not induce the slightest disturbance in the circulation.*

It may also be said of the asserted adhesiveness of the blood-corpuscles as a cause of hyperæmia and stasis, that it is possible, but has not been proved. An altered physical and chemical constitution of the blood must certainly have a great influence in the production of stasis. The remarkable cases of stasis of the blood which Thierness and myself were able to produce at will, by nourishing animals upon oil, indicate how much the accumulation of an element in the blood can impede its circulation in the capillary vessels. The doctrine of attraction exercised by an irritated part upon a flow of blood, is certainly erroneous.†

The hyperæmia which occurs after death is not distinguishable from that which takes place during life, and stasis only can be detected anatomically in the dead body in so far as it may have operated in producing alterations of form in the blood or exudation.

17. *Of Pus in general.*

Pus, which, in the normal condition of the body is a homogenous, yellowish-colored, thickish liquid, of the specific gravity of 1030 to 1033, when collected in a narrow glass tube separates into a colorless serum, and a sediment consisting of solid bodies, the pus-corpuscles.

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*A pin stuck into the web of a frog's foot produces neither hyperæmia nor stasis when no vessel is interfered with. As already stated by Stieglitz the heart cannot send more blood into one than another organ, but the above-mentioned causes operating as stimuli, may induce an accumulation of blood, because its return becomes impeded. Quite as absurd is the supposition, that any irritation produces an increased flow of blood to the excited organ, and the old maxim, *ubi stimulus ibi affluxus*, should be altered to *ubi stimulus ibi stasis sequitur*. Hyperæmia, however, does not always occur in the organ itself in which the circulation is disturbed: thus, diseases of the liver produce hemorrhages of the stomach and intestines.

†In opposition, compare the hair-breadth positive results obtained by Axman on a section of the sympathetic branches with the words of Valentine (Jahresberichte, 1848, p. 161), who did not succeed in the same experiments, and thinks the repetition desirable.

The latter, which ordinarily give to pus its color, are spherical, but when not quite fresh, frequently have a fringed contour, are soft yellowish white, and usually measure, on the average, the 1-200 mil, in diameter. They consist of a soft grayish, delicately granular basis, and cannot be distinguished certainly as vesicular, although they swell up considerably in water.

The constituent mass of the corpuscles, frequently covered with fat-molecules, contains usually from one to four nucleoli (by others termed nuclei)* commonly adhering together, and generally only visible after the granular matter of the corpuscles is rendered translucent, or dissolved by acetic acid.

The nucleoli are round, and present a depression, but sometimes are rather elliptical; are soluble in ammonia and caustic potassa, but not in ether or acetic acid. According to some observers, these so-called nuclei are at first always simple, and divide into several, or become indented, cordiform, under the operation of acetic acid; but this change I have not observed, nor have I been able to convince myself that in all cases they are originally associated together.

The granular matter of the pus-corpuscles dissolves rapidly or slowly in acetic acid.

Normally-formed pus contains no other constituents than those mentioned, except occasionally minute globules consisting of fat, or protein.

Pus-corpuscles possess the construction above described only when perfectly formed. Besides these, corpuscles occur in pus which are somewhat smaller, or quite as large, exhibit no nucleoli, even after the application of acetic acid, and have a smooth or finely granulated surface. Frequently they constitute the sole element of purulent effusions of serous membranes. Dr. Lebert has proposed for them the name of pyoid-globules. They occur in vigorous as well as in cachetic individuals. The nucleoli of the pus-corpuscles apparently in the pyoid-globule has already become fused into the nucleus.

Both forms of the pus-corpuscle I view as nuclei; and the hitherto so-called nuclei, as nucleoli, which in the second form, as in other pathological nuclear structures, may be absent. Pus-corpuscles become the nuclei of future cells,

*What induces me particularly to view pus-corpuscles as nuclei, is the fact that in granulations and the formation of cicatrices it is readily and directly conclusive that cells form upon pus-corpuscles, for the nuclei of young cicatrix cells, in appearance and chemical relation, are perfectly identical with the latter.

where such are formed, in which cases many more nuclei than cells are produced, and the surplus are voided, or again dissolved and reabsorbed.

18. *On the formation of Pus.*

Pus may form in the blood within the vessels in liquid exudation from the latter, and from effused fibrine coagulated. I propose, in this place, to speak of the latter only.

The formation of pus in the earliest stage is most clearly observed in the suppuration of serous membranes and upon blistered surfaces.

In the process at the commencement, in the exuded albuminous serum, minute molecules originate, averaging the 1-500 mil. in diameter. These appear to thicken into nuclear structures, for a new layer forms around them, and frequently the nucleolus becomes fused into it. This mode of the formation of a nucleus around the nucleolus may be directly observed in the liquid of a blister, in which the latter are distinctly seen with a clear border.*

In other cases the exuded coagulated fibrine undergoes liquefaction, and in this the pus-corpuscles form in the manner just described, and are frequently observed still lying in a layer of granular or striated fibrine, as in many abcesses, and in gray hepatization of the lungs, in which the fibrine, at first liquid, and then coagulated, becomes softened, and is then converted into pus. Such a change also constitutes the ripening of abcesses, and occurs in inflammation of the lungs in the transition from red to gray hepatization.

When pus is too early discharged, flocculi of fibrine are frequently found mingled with it.

Good or healthy pus has no chemically destructive action upon surrounding tissues, and these only become softened; but if their nutrition is destroyed by hindrance to the circulation, they are dissolved; and in this way, in furuncle, besides fibrinous flocculi, we find a portion of detached areolar or fibrous tissues constituting the core.

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*To observe the origin of pus-corpuscles, the most convenient position is a blistered surface. The bulla at first contains only albuminous serum without molecules, but several hours after the application of the blister, the liquid has become slightly turbid and greyish, from the presence of pus-corpuscles which usually inclose a compound nucleolus plainly visible without the aid of acetic acid, or more rarely, a large simple nucleolus. At this period many of the pus-corpuscles (nuclei) may be observed with a clear border to one-half of their circumference, which is the future cell-wall in the course of development. The latter process appears to continue for a short time even after the removal of the liquid from the bulla, for, during the observation, the number of pus-corpuscles provided with the clear border considerably increases. In the liquid from the latter, which yet contained no trace of normal cells, after several hours, perfectly spherical cells with simple nuclei were observed to appear, so that I can confirm the observation of Heibert, that cells may form the coagulable or plastic liquid removed from the living body.

19. *Diagnosis of Pus-corpuscles.*

Formerly, I believed in the possibility of distinguishing pus-corpuscles by means of the microscope from physiological and other pathological structures which resemble them, but, at present, entertain a different opinion. The so-called lymph corpuscles of the blood are undistinguishable from pyoid-globules—*i. e.*, pus-corpuscles without nuclei—and the yellowish color is inconstant. On the contrary, lymph-corpuscles differ from the true pus-corpuscles in possessing a smoother surface and more indistinct nucleoli, which, even after treatment with acetic acid, appear smaller and less defined, and are more punctiform. The young nuclei of epithelial cells, as they occur in normal mucus in every irritation of a mucous membrane, either possesses two or three nucleoli like in pus-corpuscles, or more frequently are without, as in the pyoid-globules, and they resemble both these in size and chemical relation, or are smaller and more frequently dissolve much less rapidly, or not at all, in acetic acid. Sometimes the nucleus of perfectly formed epithelial cells exhibits the strongest resemblance to pus-corpuscles. From this, however, we are not to conclude pus and mucus are the same, but that a mucous membrane may form the same kind of nuclei as well under the influence of stasis as without it. Pus consists not only of its corpuscles, but of these with serum, as the blood does of corpuscles, with liquor sanguinis. Nevertheless, from what has been stated, we are not to consider the microscopic investigation of pus as useless, for it may be distinguished from many other liquids; and, on the other hand, the presence of epithelia frequently indicates the nature of the secretion, as do also inflammation-corpuscles, and mingled fragments of tissues often throw light upon the seat of the suppuration.

The physiological character of pus-lymph and mucous-corpuscles explains the above difficulty. The former and the latter are certainly the early condition of cells, but the mucous corpuscles undergo metamorphosis as nuclei to future epithelia much more rapidly, and thus become cells more quickly. The lymph-corpuscles, most probably, are converted into blood-corpuscles, as is indicated by their considerable increase after loss of blood, and their disappearance when the blood-corpuscles again augment.*

*Mucus contains little or no albumen, and no fat, whereas the liquor puris is strongly albuminous and contains fat, and therefore the liquid produced in irritation of mucous membrane is purulent, but the transition stages from mucus to pus are numerous. Further, a peculiar viscid, amorphous, transparent matter, Mucin, forms the principal constituent of mucus, and incloses the nuclei and cells, but the latter are not essential, and may be entirely absent, as in the mucus from the glandulæ palatinæ. Mucus is a physiological secretion which may be increased, as determined by the function of the mucous membrane. Pus is a pathological product determined by stasis, and formed from the entire blood-plasma.

20. *Chemical relations of Pus.*

Pus, which is of a weakly alkaline or acid reaction, or is neutral, has a specific gravity of 1,0409 to 1,027, whereas serum of the blood, according to Becquerel, in the male, has 1,028 and in the female 1,027. The water in pus varies in its proportionate quantity in 1000 parts from 769 to 907, according to the authority of Bibra. In the male, the water of the blood is 779 parts in the 1000; in the female, 791,4 (Becquerel).

The quantity of albumen and corpuscles in pus, is 60 to 180 parts in the 1000 (Bibra); whereas, in the serum of the blood, the average quantity of albumen is, in the male, 69,4 parts, in the female, 70,4 parts (Becquerel). The fat in the pus varies from five parts (Bird), to twenty-four parts (Bibra).

The salts of pus, Güterbogk found to consist, in greatest part, of chloride of sodium, a less proportion of phosphate, carbonate, and sulphate of soda, chlorides of potassium, and calcium, a small quantity of phosphates of lime and magnesia, and carbonate of lime, and a trace of oxide of iron.

From a comparison of the above-stated facts, a resemblance is perceived between pus and the plasma of the blood, except that we miss the fibrine in the former, which, however, in a modified condition, constitutes the pus-corpuscles.*

A very considerable difference is observed in the quantity of fat, which is very much greater in pus. The relative quantity of liquid and solid constituents is very variable in pus, though the latter generally are more abundant than in blood, and rarely less; circumstances, probably, greatly influenced by the character of the exudation. The greater concentration of the liquor puris in comparison with the serum of the blood, can only be explained by the participation of the blood-corpuscles in the production of the plastic matter.

21. *Varieties of Pus.*

Pus varies in appearance and composition, according to the elements mixed with it. The most frequent admixture is blood, besides which there occur also mucus, bile-pigment, and urine. Most of these can be detected with the naked eye, or by the microscope. The organ or tissue in which pus is produced has a great influence upon its constitution. Hence, the milk or cream-like pus of serous mem-

* A peculiar substance, pyin, is mentioned as a constituent of pus by Güterbogk, but has not been constantly found by others.

branes; the quantity of globules determining the physical difference. Much more important are the variations exhibited by pus in different diseases, depending upon abnormal nutrition, from general or local causes. In such cases, the pus-corpuscles do not attain their perfect development.

Sometimes they exhibit no distinct nucleolus, but contain only minute globules, which appear to be fat, and they are smaller than normal, and in this condition are to be considered as imperfectly developed. These (pyoid-corpuscles) may form the principal mass of pus, as in suppuration of serous membranes. Ichorous pus is distinguished by its great fluidity, its greenish or reddish color, its odor, and the construction of its corpuscles, which are in small quantities, very soft, irregular, indistinctly defined, and frequently covered with isolated molecules, and may even be nearly absent. Cachectic pus is either quite fluid or thickish coagulated milk-like, and grayish-yellow colored. This variety, frequently, is difficult to recognize as pus with the naked eye, as in peritonitis, where it may readily be mistaken for the escape of matter from a perforation of the small intestine. In it the pus-corpuscles are soft, liquefying on the slightest pressure, gray, irregular, and not sharply defined; but nevertheless their nucleoli are distinguishable. The pus of dyscrasies, as in tubercle, scrofula, and cancer, always contains, besides the peculiar elements, a considerably quantity of fibrinous flocculi, which indicate at once to the naked eye its abnormal character. A distinctive characteristic, however, for the pus of particular dyscrasies does not exist, and the pus of syphilis is no. distinguishable from that of variola, or glanders, &c., a fact which I proved years ago. A large quantity of fat in a fine molecule is intermingled with the pus of dyscrasies. In sanies, sometimes vibriones are found.

Pus dried upon a glass plate puts on an arborescent appearance, consisting of the pus-corpuscles brought into contact, calling into mind a similar arrangement of the blood-corpuscles in rolls when a thin layer of blood coagulates.

When dried, pus-corpuscles become a third smaller and irregular, their nucleoli become indistinct, and they have some remote resemblance to the nuclear structures in typhoid exudation and tubercle, but the inference is by no means to be made that dried pus and these substances are the same.

22. *Granulation and Cicatrization.*

The liquid portion of pus may disappear by absorption

as may also the pus-corpuscles, after undergoing solution. This is proved by experiments on the lower animals, and observations on man, in which abcesses disappear without having been opened. Where there has been a loss of substance, the purulent fluid furnishes a plastic material to the formation of a more or less distinct fibrous structure, the cicatrix; which latter frequently covers itself with epidermal cells. But very frequently suppuration determines the production of a new organ, which in turn separates pus, until the loss of substance is restored. In this case pus-corpuscles form layers and gradually become true cells, and among them blood-vessels penetrate, often supported by a mesh work of cylindrical or nuclear fibres. This structure frequently invests the cavity containing pus, and is a true pus, producing membrane. Sometimes it consists of rounded wart-like eminences called granulations, which may form in all tissues capable of producing pus, as upon serous membranes, in glands, in areolar tissues, in bone, upon the periosteum, &c. Granulations are frequently converted into epidermal cells upon their surface, and under such circumstances have been sometimes improperly denominated epithelial cancer. When granulations arise in dyscrasies, they become the constant source of suppuration, and even produce an inoculable matter, as in the contagious inflammation of the conjunctiva. It is an anatomical fact, that the cicatrix produced in the process of suppuration is generally constituted of a different tissue from that of the pus-producing organ, in which only at a later period the lost tissues sometimes again appear. The contraction and diminution which are always observed to occur in the substance of the cicatrix, do not depend upon an inherent contractility of its fibres, as is frequently asserted, but upon resorption in a slightly vascular tissue. The reproduction of tissues is the property particularly of the exuded blood. When wounds heal without suppuration, per primam intentionem, it occurs by organization of the blood discharged from the cut or torn capillaries; an opinion advanced by Hunter, and perfectly correct according to my own observations.

(*To be continued.*)

ART. XL.—*A Clinical Lecture upon a case of abscess in the perineum of a patient, treated in the Toronto General Hospital: by* DR. AIKINS, *one of the Surgeons of that Institution. Reported by* MR. GAMBLE, *a student of the Toronto School of Medicine.*

Daniel McKay, aged 43, a painter by trade, unmarried, was admitted into the Toronto General Hospital, August 31st, 1853.

About the 8th or 10th of June last, while standing at work, four feet from the ground, upon a board, it split in half; one portion descended to the ground and the other turned on edge, and he fell astride upon it; previous to the accident he had been very healthy, had no disease of the urethra, and had always passed his urine in a good full stream. Soon after the accident a dark coloured swelling took place in the perineum, also in the scrotum, and even in the groin. Now a discharge of urine occurred without obstruction, or difficulty, but for several days after, it was passed in a small stream, with some pain. About ten days after the injury he travelled from Gravelly Bay to St. Catherines, and by this time the tumefaction had nearly subsided; but still his urine was voided frequently, in a small stream, accompanied with pain and straining; nevertheless he went to work and continued in about the same state for a week, until at last the ability to pass his urine had ceased. He was now put into a warm-bath, and frequent efforts were made to introduce a catheter into the bladder; at last it entered, drew off the urine, and was allowed to remain for three days. At this time he returned to work for a fortnight—still, however, evacuating the bladder in a small stream, and with considerable pain. About a week since he observed a swelling in the perineum; as this swelling increased, the stream of urine diminished, until it entirely ceased, which was about two days and-a-half since. An attempt was made to introduce the catheter, when a quantity of pus and urine, he should think about half a pint, escaped from the urethra. Since that time the urine has dribbled from the penis, and the bladder has been considerably distended.

Upon admission into the Hospital a fluctuating swelling was discovered in the perineum, about the membranous part of the urethra, the urine dropped from the extremity of the penis, and the bladder was found to be distended with urine. A pretty free incision was made into the perineum, when a large quantity of pus escaped, a communication was found between the abscess and the urethra, and upon straining, the urine flowed freely through the wound.

but not so as completely to empty the bladder; as pressure above the pubes, however, caused the urine to flow, this was clearly dependent more upon the want of tone in the muscular structure of the organ, than from any hindrance to its escape.

Sep. 1.—He passed his urine freely through the wound and more completely emptied the bladder.

4th.—This still continues, while the irritation appears to be subsiding under the use of poultices and fomentations.

7th.—A catheter could not be passed into the bladder, so the perineum was now incised and the urethra freely opened, when a small catheter was passed into the bladder, and left there.

8th.—Has complained of an occasional pain at the end of the penis, but urine has passed through the catheter.

9th.—A No. 10 gum catheter was now introduced and allowed to remain in the urethra.

12th.—The catheter was removed and another gum elastic catheter was introduced without any difficulty, the one withdrawn being much roughened from end to end.

15th.—The same was repeated, and the wound in the perineum and urethra appears nearly closed.

21st.—The same course has been pursued every few days, so that the man has continued to improve in health; the largest size catheter passes freely, with a slight halt at the point of the injury in the urethra, but readily mounts over it and enters the bladder without any other difficulty. There is still a very small fistulous opening in the urethra, so small, however, that it is with difficulty you can find the catheter in the urethra, with a probe; but still if the man stops the mouth of the catheter with his finger, he can force a drop of urine through the wound in the perineum.*

From the history of the case you may observe that we have an abscess formed in the perineum, which upon being opened is found to communicate with the urethra. Let it be then our business to consider the several causes which could give rise to an abscess in the perineum, but in doing so, let us first take a transitory view of the anatomical structure and relation of the parts influenced by the disease.

The urethra, which in the male performs the double office of an excretory passage for the urine, and serves for the conveyance of the semen from the vas different, has been divided into three portions:—the prostatic, the membranous, and the spongy.

The prostatic position of the urethra is surrounded by the

* The wound in the perineum has entirely closed, the urine passes without any difficulty, and the patient was discharged cured on the 15th December.

prostate gland, a whitish glandular body, situated in front of the neck of the bladder, perforated by the ejaculatory ducts of the testicle, and having many openings for its own excretory ducts. It appears to be a mucous gland.

The membranous portion extends from the prostatic portion to the bulb of the urethra; it lies immediately under the arch of the pubis and passes through the triangular ligament; it is in connection with very many veins, a sort of erected tissue above, while below it is embraced by two sets of muscular fibres, the muscles of Wilson and the muscular faiculi described by Guthrie; it is this portion of the urethra which we have especially to deal with in cases of abscess in the perineum. It is the most complicated and exposed of any portion of this canal, and the most liable to accident and disease.

The spongy portion of the urethra constitutes by far the largest part of the urethra, commencing commonly opposite the sympathis pubis, by an expansion called the bulb, and terminating in a still larger expansion, called the glands penis. The bulb is embraced below and upon its sides by the bulbo-cavernous muscles, which are inserted into it. In front the bulb is continuous with the spongy portion of the urethra, and the angle of union with the corpus cavernosum is its anterior boundary. Immediately posterior to the bulb are situated Cowper's glands. These glands secrete mucus and open into the canal of the urethra on its under surface, passing obliquely through the spongy portion, having excretory ducts of an inch and-a-half to two inches in length. The corpus spongiosum is composed of a strong fibrous cylindrical membrane enclosing a spongy or erectile structure, a variety of the areola tissue, in which veins communicating with each other, and at last expanding into a mass of cell, which cells apparently result from the frequent anastamosis of these veins. This structure now completely surrounds the urethra, and fits with it into the lower groove, formed by the union of the corpora cavernosa penis, a structure of a similar character to the one just described, but of much greater size, in fact constituting the chief part of the body of the penis.

The urethra is lined with a mucous membrane, which extends from the meatus, lines its whole course, and is continuous with the mucous coat of the bladder, it dips down into the ejaculatory ducts of the testicle, the vesiculæ seminales, and Cowper's glands; in it are several folds which open outwardly, and are called lacunæ; at the commencement of the prostatic portion, the caput gallenaginis ends with its several radiating folds; and here the

seminal ducts open by two distinct orifices. The mucous coat consists of a fibrous basement membrane, which is covered upon its free surface by an abundant development of mucous corpuscles and epithelial cells. The areolar tissue connecting the basement membrane with the corpus spongiosum is largely supplied with capillary vessels intended to sustain and develop the mucous corpuscles and form the epithelial cells.

Such is a slight sketch of the seat of the disease which was presented in the case of the patient Daniel McKay. All the probable causes which could produce the formation of matter in this region should now enter into our consideration. In the first place, however, it will be obvious from conformation of the parts, that the membranous portion of the urethra is the most complicated and exposed of all these parts; and here we find abscess more frequently to occur. The prostatic portion is surrounded and defended by the prostate gland, and the anterior portion is securely enclosed in the corpus spongiosum, while the membranous is covered and supported merely by fascia and muscles.

In the first place, as in Daniel McKay, we may have an injury caused by a blow upon the perineum. The urethra may be caught between a foreign body and the arch of the pubis; the injury may cause extravasation of blood by rupturing some of the vessels surrounding this membranous part of the urethra; some of the large veins perhaps, or even the bulb itself may be ruptured, causing considerable extravasation of blood, and perhaps some injury to the urethra itself. The effect of this hemorrhage may be an extravasation of blood, that compresses the urethra, and prevents the escape of the urine; but, as the urethra has not been broken, the power of the detrusor urinæ will still, in all probability, be sufficient to extrude the urine from the bladder; probably there is no great hindrance to the flow, and assuredly the catheter will easily pass into the bladder and relieve the distention; by degrees the perineum looks black and discoloured, but after a time the ecchymosed blood gets absorbed, and being entirely removed, the patient gets well. Should it happen, however, that the quantity of effused blood is very considerable, the thinner parts are, perhaps, only absorbed, the pressure that constricted the canal is diminished, and now the patient passes his water freely; perhaps the clot of blood, too large to be removed by the absorbents, has, after some slight irritation, begun to soften and form pus. The bruise and injury of the urethra have, perhaps, contracted its calibre and there is a slight impediment to the passage of the urine; the

strain and pressure of the bladder comes upon the injured spot, and a degree of inflammatory action is the result; this still further contracts the canal, the inflammatory action spreads to the clot of blood, which now, instead of being dissolved and absorbed, takes on a new action, and having softened, the pus corpuscle is largely developed, and abscess is formed in the perineum. The flow of urine is now arrested. At this moment if you try to introduce a catheter into the bladder, pus flows with the urine. If at this period, or just before the discharge of pus has taken place, you examine the perineum, you will find a distinct fluctuating tumour, and, when you come to open it, you find that at the next time the man makes his water the urine passes by the wound. This was clearly the case of Daniel McKay. The urethra was now laid open, to give free exit to the pus and the urine, so that the urine did not infiltrate itself into the perineum; and as soon as the catheter was introduced the case became quite simple, and in a short time, in all probability, the wound in the urethra will heal, as well as the external opening, and the man will be cured.

In this case of Daniel McKay you have one variety of abscess in the perineum from an injury of the urethra; this, however, was clearly consequitive, the consequence of the formation of matter in close proximity with the membranous part of the urethra. In this case the matter passed into the urethra, and the urine might have entered into the abscess, but you had an effusion of fibrine around the abscess, which formed a wall that prevented the extravasation of the urine into the loose areolar tissue of the perineum. The man was, however, in great danger from the opening ever since the matter passed into the urethra, for the pres of urine might have forced the fluid into the areolar tissue, when you would have had terrible irritation and inflammation as the result; for you know well how deadly a poison this urine is to the living parts.

We will now contrast this cause with a somewhat similar accident:—A man was walking along the sleepers of a house that was in course of building, he slipt his foot and came down astride of the sleeper, resting on the perineum, immediately posterior to the scrotum. He felt considerably hurt, but upon examining the part could find no wound; he walked home, and the next time that he attempted to empty his bladder, he was greatly surprised to find that no urine flowed from the end of the penis. He was conscious that the urine passed out of the bladder, and, placing his hand on the perineum, he now discovered

a considerable swelling. He sent for me, and I at once told him that he had cut through the urethra by the fall on the sleeper, and that the urine had flowed into the areolar tissue of the perineum. I tried to introduce a catheter but could not, for the urethra was completely severed. I now advised to lay open the parts with free incisions, to ensure the speedy evacuation of the urine infiltrated into the parts, and to secure a certain exit from the lower part of the wounded urethra. The man, not feeling satisfied with my description, and having a great dread of the knife, preferred sending for another medical gentleman. After this person had examined the patient he declared the man had a stricture, although the patient positively assured him that he never had the least difficulty of making his water prior to the accident; still, however, he persisted in his endeavours to introduce the bougie, but was foiled in his attempts to relieve him by these means. When we met the next day he consented to the course I had proposed; but now the scrotum and perineum were distended to the utmost with urine. The only course I could now pursue was to make very free incisions so as to evacuate the urine, and to be sure that my opening had reached the wound in the urethra, so as to insure a free exit of any more urine that might be passed. Fomentations and poultices were now applied, considerable sloughing of the parts took place, but by degrees the irritation subsided; having watched my opportunity, when the man was passing his urine, I introduced a probe into the lower opening of the urethra, I then passed a silver catheter down the anterior portion of the urethra, and pushed into the bladder; by degrees the wound healed kindly, and the free passage of the urethra was established without fistula or structure remaining. Here you see a more formidable consequence, the result of this injury of the perineum; here you may observe that nothing but the knife could possibly have saved the patient; for had the urine been allowed to remain, by temporising and delay, the infiltrated parts would have been killed, nay, the urine would soon have found its way among the muscles of the hip, leaving terrible fistulas; or it may have passed into the pelvis, exciting abdominal inflammation and causing the death of the patient.

Again: I may point out to you another cause of inflammation and abscess in the perineum. A man has had a clap, which, perhaps, has been neglected; the inflammatory action travels down towards the neck of the bladder: the inflammation causes pain in the perineum, but this is disregarded until, perhaps, months after the acute stage of

the gonorrhœa has subsided, and nothing remains to him but a persistent gleet. Perhaps, by accident, he feels a small swelling, not larger than a nut, situated in the perineum just behind the scrotum; if you examine it, it will appear deep seated under the fascia of the perineum. This is a blind fistula connected with the urethra, and every time the man micturates a little urine flows into it. The urine cannot however spread, for there is a wall of fibrine around the fistula; in this condition it may remain for years. I believe that you will find the mode of the formation of this disease to depend upon the original inflammatory action in the urethra. Here the blastema was effused into the areolar tissue alongside of the membranous part of the urethra; pus was developed in it, and after a time the matter was discharged from the little abscess into the urinary canal; but an opening having been established between this passage and the abscess, at every flow of urine the water passed into and kept up the cavity; had any injury occurred to the part so as to permit the urine to pass the walls of the abscess, you know what would be the consequence. In this case the best mode is to open the little abscess with a lancet, and to keep the urinary passage free by means of the catheter. If a fistula remains, stimulants such as the nitrate of silver will be required to heal the wound.

Should your patient have a stricture of the urethra, it may again be another cause for abscess in the perineum. The stricture may not completely occlude the passage of the urethra; you may, perhaps, be able to pass a considerable sized bougie; but, nevertheless, some irritation brings on an increased amount of inflammatory action in the neighborhood of the part; blastema is effused into the areolar tissue alongside of the urethra, pus forms, and an abscess is the result. You now find a tumour in the perineum, perhaps the abscess has opened into the urethra, and the matter has passed with the urine, still at every passage of the urine the abscess is filled; perhaps, if the stricture of the urethra increases, a violent strain causes the walls of the abscess to burst and you have extravasation of urine into the areolar tissue, that may spread widely over these strictures, killing and destroying them to a great extent. Here again your patient's safety depends upon the free use of the knife; by sufficient incisions you free the parts of the urine, and now you may cut through and cure the stricture, at the same time healing the wound over the catheter secured in the bladder.

If you remember, in describing the second variety of these

accidents causing abscess in the perineum, I told you that the medical gentleman declared the cause of the extravasation of urine was produced by a stricture in the urethra. Although he was incorrect in his diagnosis, still such an accident as extravasation of urine is occasionally caused by this disease. A man has perhaps had a confirmed stricture of the urethra for many years; at last the opening has got so small that he cannot pass his urine but in drops; by this time the muscular walls of the bladder have become hypertrophied, and the power exercised to overcome the obstruction of urine is very great; below the stricture the urethra is perhaps greatly dilated, and during the violent straining to pass water the urethra bursts just behind the stricture, or a process of ulceration has taken place which causes the opening in the urethra. You can now justly appreciate the consequences of this accident; great extravasation is the quick result; the scrotum and perineum is filled to bursting, while the extravasated fluid finds its way possibly into the pelvis and down the thighs. Here again speedy incisions alone will save your patient. You must be sure that you open freely into the urethra, and now your best mode of curing the stricture will be to lay it freely open, cut completely through the thickened and hardened canal, in the line of the urethra, and, as soon as the irritation has somewhat subsided, introduce your catheter into the bladder, and perhaps the wound will heal kindly over it; thus curing the stricture, at the same time that you save the life of the patient by your free incisions.

While considering the anatomical structure of these parts I told you that Cowper's glands were situated just behind the bulb in the membranous part of the urethra, and that the ducts of these mucous follicles open into the lower part of the urethra. Sometimes during inflammation of the mucous membrane of the urethra the irritation has spread down the ducts into the glands, and, as in all other glands, the structure becomes enlarged, perhaps the cells are distended with an increased secretion; at all events, the inflammatory action not unfrequently spreads from the gland into the neighbouring areolar tissues, and abscess in the perineum is the result. The patient feels some pain in the part, and the surgeon finds a small hard tumour about the membranous part of the urethra. This body is perhaps hard and prominent but feels obscure, from its depth. The formation of matter may remain quiescent for some time, but by degrees its pressure causes irritation, and, as a foreign body, it has to be removed; as the disease increases

we now find a fluctuation in the part, perhaps an opening is made into the abscess, or probably it finds its exit through the fascia and the skin; at this time it may have happened that the glands themselves have sloughed, and occasionally we find urine has insinuated itself into the orifice of the glands which open into the urethra, and passed through them into the abscess, and now makes its exit by the fistula. In such a case, if we observe the matter located in the perineum, we make an opening into the abscess, and having evacuated the matter, we know that it is not improbable that a fistula will remain, notwithstanding all our own endeavours to heal the wound; for, let it be remembered, that in this case we have not an ulcerated opening in the urethra, but that the naturally formed mouths of the gland itself constitute the opening through which the urine passes into the abscess—hence it cannot be expected that nature shall endeavour to close natural openings; so that you see, if we should succeed in healing the external outlet of the abscess, the urine would still pass into the part, and will be sure to renew the complaint. This also is the cause why fistula in the perineum is the constant result of abscess in Cowper's glands. In the cure of this fistula in perineo there is no other method left to us than to obliterate these excretory ducts, and the best method to do this is to introduce along the fistula a bougie armed with nitrate of silver, or to use the actual cautery by means of a silver wire, so as to destroy the mucous membrane lining the ducts, and by exciting adhesive inflammation in the part, we may cause an occlusion of the ducts, even as they make their exit from the urethra.

There is yet one other cause that may produce abscess in the perineum; it is the lodgment of a small angular calculus, just behind the urethra. As you know, the bulbous portion of the urethra is the most contracted part, hence the foreign body will lodge in this membranous portion of the urethra; here it arrests the flow of urine, not completely however, for the bladder is still emptied by slow degrees. The membranous part of the urethra suffers distention in consequence of the obstruction of the canal; the consequence is that inflammation and the effusion of blastema take place in the neighborhood, and an abscess is formed; or, if the obstruction is sufficiently great, a sloughing or rupture of the canal may be the consequence. By this time you know the natural consequences of such accidents, and when they occur, you know that the scalpel alone can afford relief or place the life of your patient out of this most perilous position. Should you however be

called before matters have got to this length, your own common sense will teach you to remove the stone from its position in the urethra; and if you do this, you will in all probability prevent the evil consequences I have pointed out to you, as liable to occur from its presence in this position.

I think that I have now detailed to you all the various causes that may lead to abscess and the escape of urine into the areolar tissue of the perineum. You may observe that the causes of these accidents are many and various, and you can now appreciate the advantage of thus bringing them together before you. You can now compare these causes and effects, and if you have gained a true knowledge of the anatomical structure and relations of the parts, I think you will readily distinguish the different varieties I have pointed out, and doubtless you will be able to treat them with judgment and skill.

[We understand that the Professors of Trinity College have delivered Clinical Lectures at the Toronto General Hospital, we wish we could get some of the Students to report them; for it would give us great pleasure to insert them in the pages of the *Journal*.—Ed. U. C. M. J.]

ART. XLI.— *Case of poisoning by the endemic use of tartar emetic. By* JOHN WANLESS, *coroner, and formerly house-surgeon of the Dundee Royal Infirmary, London, C.W.*

To the Editor of the Upper Canada Medical Journal.

LONDON, November 8th, 1853.

SIR,—With your concurrence, I herewith send you, for publication in your new and well conducted journal, the following case of death, as the result of the application of tartar emetic ointment to the head of a boy suffering from old standing tinea capitis, by a licensed medical man formerly of this province, which transpired on the 7th May 1852, whilst acting in my official capacity of coroner, and which, at the time, created against me some sensations of rancor, which is unfortunately so prevalent amongst medical men in "this Canada" and so unbecoming the members of an enlightened profession, who should be rather anxious for the elicitation of truth and the advancement of the profession, than allow themselves to be led away by passions which men of eminence in older countries would feel ashamed of. The case may be another guide to caution young practitioners in their exhibitions of fatal doses, and may not be uninstructive to the student of medical jurisprudence. There were three of the children

affected with the disease; two of them died from virulent inflammatory action of the scalp penetrating the skull and cerebrum, and one recovered after very extensive sloughing of the scalp; the subject of the following case will be selected from one of the two deaths, it being considered the most marked:

"*Examination of witnesses at inquest of Charles Conkwright, 7th May* 1853.

"Dr. Mackenzie sworn—Examined the body of Charles Conkwright very carefully; found inflammation continuous through the scalp and skull into the brain, as if produced by some irritating substance which had been applied to the scalp. If the substance had been ointment of tartrate of antimony, would consider that more than fifteen grains to the ounce of lard had been used, on account of the severe inflammation produced.

"Dr. Farrow sworn—Examined the body of Charles Conkwright; found the effects of virulent inflammation on the scalp, which extended through the skull to the dura mater continuously; there was a thickening of the external membrane of the skull; there was unusual engorgement of the vessels of the brain; would consider that death resulted from effects produced on these parts; have never known tinea capitis to produce such effects; would consider that some irritating application had been made to the scalp; have never seen tartrate of antimony applied to a raw surface, could not state that fifteen grains to the ounce would have produced the appearances found; would not have used tartrate of antimony as a remedy for tinea capitis; would expect that one hundred grains to the ounce would produce a severe irritation, would consider it necessary to watch the effects of any irritating poison being applied to a raw surface very carefully; would consider tartrate of antimony an unsafe remedy to apply to raw surfaces in large quantities.

"Elizabeth Conkwright sworn—Is step-mother of the boys Conkwright; deceased has been ailing for the last nine years, with diseased scalp, the disease has been cleaned off several times with ointments which were obtained at the apothecary's, but the eruption always broke out again. About December last called in Dr.—— to see the head, he told me it was an eruption between the scalp and the skull; Dr. —— said, "that if she did not take it thoroughly out of the blood it would be of no use, for it was of no use healing the surface while the blood was bad;" used a mixture which we obtained from Dr. ——

and applied something out of a small phial over the eruption; the eruption got some better under this treatment. On Thursday last got an ointment from Dr. —— to rub his head with; the Doctor said it would bring out pimples over the other eruption; got some written directions, which were the following, written and signed by Dr. ——: "Use the medicine in the bottle and jug the same as before." "After shaving their heads as I directed, rub a small quantity of the ointment over, two or three times a day." His father shaved the head on Saturday last, and the ointment was applied as directed over the raw surface of the scalp; the boy was then in his usual state of health when this ointment was applied; the ointment smarted him after it was applied; the ointment was rubbed three times over the scalp, twice on Saturday and once on Sunday. On Monday morning about breakfast time, his father went to the bedside to see him, as he thought he was sleeping too long, and he found him dead; on Sunday he seemed as if he could not keep awake; he was like to fall off the chair; never saw him before in that way.

"William Conkwright, the father of the children, sworn —The children were to all appearance in their general health before the application of the ointment ordered by Dr. ——, their medical attendant; after the ointment had been rubbed on their heads, for twenty-four hours the heads were greatly swollen, the ointment had been applied four or five times before the head came out in one mass of sores; before Dr. —— came in to see the patients, when they were so ill; heard him say that they had surely got some poisoned nuts dug up some way; did not exactly recollect the precise words used, something to that effect *about poison;* the boys were not out to get poisoned nuts that he could know of."

"Dr. ——, the medical attendant, stated that he had used the ointment of tartrate of antimony for the tinea capitis on the children's heads; the strength would be fifteen grains to the ounce of lard; not sure whether it was fifteen grains or twenty to the ounce of lard, thinks it was fifteen."

The other evidence was of similar import in as far as the application of the ointment producing severe inflammatory action was concerned.

Verdict of the jury, "Death from the improper treatment of Dr. ——"

A warrant of apprehension was issued for Dr. ——, who was held to bail to appear at the next criminal assizes.

Upon conversing with the Queen's counsel, Colonel Prince, about the condition of the remainder of the ointment that had been applied to the scalp, and which I had removed from the house of the parents for further examination, Colonel Prince ordered me to ascertain its component parts. To which order I reported as follows:—I scraped the ointment from the chip box and weighed it; it weighed one half ounce, put this into a galipot upon the stove in order to melt the lard—a very small portion only melted. I poured upon the substance a solution of potash, and having stirred the whole, threw it into water; removed the scum, evaporated the water, and found *eighty-seven grains* remaining of a white powder; weighed two grains of this white powder, and dissolved it in water, tested it with sulphuric and muriatic acids, which threw down a white precipitate; continued to pour the acids upon it, and the excess of acids redissolved the precipitate. Took two grains more of the white powder and tested it with the infusion of galls, which produced a dirty-yellowish precipitate. Tested another solution of the powder with the sub. carbonate of potash, which threw down a white precipitate; and, lastly, took four grains of the white powder and dissolved it in water, and passed a stream of sulphureted hydrogen gas through the solution, which produced an orange red deposit; and stated that it was my opinion, as a medical man, that the white powder was tartrate of antimony, and which was mixed with the lard very much over the quantity generally used for external application on sound surfaces, and would produce fatal results if applied to a large raw surface.

I then sent thirty-six grains of the white powder to Professor Croft of Toronto, for analysis; to which he returned an answer as follows:

"Toronto, 12th May 1852.

"Sir,—I beg to acknowledge the receipt of your letter of the 7th instant, enclosing for analysis 36 grains of a white powder, supposed to be tartar emetic. I have applied all the principal tests for antimony and tartaric acid, and have arrived at the same result:

1st. The orange sulphuret with sulphureted hydrogen.
2nd. Its solubility in hydro-sulphuret of ammonia.
3rd. White precipitate with hydrochloric acid soluble in excess.
4th. Precipitate after a time with ammonia.
5th. Smell of pyro-tartaric acid on heating.
6th. Alkaline reaction of residue.

7th. Effervescence of residue with acids.
8th. Reduction to metallic grains by heating.

I have not been able to detect any other substance in the powder; and in order more fully to prove its purity, I performed a quantative analysis:

1-6025 grammes of powder gave
0-5096 grs. of sulphuret of antimony, equivalent to
43-96 per cent. of oxide of antimony; theoretically it is
44-84, and according to other analysis as follows:
43-35 Philips,
43-08 Dulk,
43-16 Brandes.

It is therefore pure tartar emetic, and from the quantity employed fully capable of producing the fatal results you mention.

"I have the honor to be, sir,
"Your very obedient servant,
"HENRY CROFT.

"J. WANLESS, Esq., Coroner."

This was the evidence submitted to the Queen's counsel Colonel Prince at the following assizes. There was no indictment preferred against the accused, Dr. ——, who, when relieved from further responsibility, threatened to *prosecute* me as Coroner, for performing what I conceived to be the strait line of duty. And at the conclusion of the court, Colonel Prince wrote me as follows, in explanation of *his* action in the matter:

"LONDON, Oct. 9th, 1853.

"DEAR SIR,—I beg leave to return to you herewith the inquisition in Charles Conkwright's case. The course you took with regard to Dr. ——, upon whom the coroner's jury so severely animadverted, was the correct and, indeed, the only course you could take without compromising yourself. But as far as I am concerned, I shall take upon myself the responsibility of declining to prosecute Dr. ——, because I cannot glean from the evidence that he is chargeable with gross ignorance, or with that degree of gross neglect, which would justify me as an officer of the crown in preferring an indictment against him. It seems to me that his want of success in the case arose rather from an error in judgment than anything else; and therefore, considering his youth and comparative inexperience, I am willing to make some allowance for his failure, and am unwilling to involve him in a prosecution which may, and probably would, have the

effect of blighting his future prospects in life.* Nevertheless, the verdict of the jury left you no alternative, and you acted quite right in the course you took.

"I remain, dear sir,

"Yours very truly,

"JOHN PRINCE, Q.C.

"To DR. WANLESS, coroner,
"town of London and county of Middlesex."

I am, sir,

Your most obedient,

JOHN WANLESS,

Formerly house-surgeon, Dundee Roy. Infirm.

BOOKS RECEIVED FOR REVIEW.

An Epitome of a Lecture on the Ottawa Productions, delivered before the Bytown Mechanics' Institute and Athenæum.—By EDWARD VAN CORTLANDT, Surgeon, Honorary Librarian to the Institute, Bytown, C.W., 1853.

ERRATA IN DR. KERR'S PAPER.

Page 112, line 28—for "under teeth" read "molar teeth."
" 114, " 35—for "cords of false membrane" read "shreds of false membrane."
" 115, " 23—for "question seems" read "question arises."

*The medical man has left the country, but I have thought it unnecessary to publish his name.

EDITORIAL DEPARTMENT.

THE CHOLERA.

We present to our readers two articles, one from the *Union Medicale*, the other from the New York *Courier and Enquirer*, which clearly prove that the progress of this fell malady, the cholera, is still advancing towards us, and is indicating to the inhabitants of the western world that before long they may expect its devastating influence to spread widely over society in this region. This would appear to be the fifth time the epidemic cause which produces the Cholera has taken its regular course from the East Indies westward, invariable entering Europe by a northern route, appearing in Russia and extending through northern Europe before it has approached the shores of England. At the present moment it has appeared on the western portions of the British Isles, and would seem by the mortality on board of ships on the Atlantic ocean, that this invisible agent was traversing that sea on its progress to the western continent, and from all appearances may be expected to arrive in this country early in the spring of 1854.

Thus forewarned, it appears to us that the government and people of this country should be forearmed; so that, by proper preparation and due arrangement, every means which science and experience could approve, should be employed for the public safety and the good of the community; that necessary means should be at hand to be used in proper time, and due attention to abstinence from all immediately exciting causes, should be forcibly impressed upon the people. Experience has shown that the early employment of the remedial means are generally of the greatest importance; it therefore appears to us that the medical profession should be properly armed, by having all necessary means at an early period placed at their disposal, for attendance upon the sick poor. In

the larger cities of Canada the sick poor may, in some degree, be said to be already provided for, by the facilities rendered by the hospital establishments, and from poor-houses within their limits; but not so in the country, where the cholera patient, if poor, will have to rest upon the tender mercies of private charity—great as we confess that such generally is, it is by no means a sure refuge in the hour of sickness, and especially in such a sickness. The cost of the medicine and attendance must devolve upon the charity of any medical practitioner who may be called in such a case; and we would loudly contend that it is not fair to throw the burden of such a malady so entirely upon the medical profession. In Upper Canada, the medical man, from the great amount of competition, is hardly worked and badly paid, and, if by chance he should commit an error of judgment, his faults are visited with an unsparing hand, in the shape of damages; it is therefore perfectly clear that this pestilential visitation about to occur, should not be thrown upon the medical practitioner as an additional burden, which, from the nature of the circumstances, it is likely to be, requiring from him medicines and attendance upon the sick poor, without any possible remuneration; most certainly the necessary expenses should be borne by the municipalities, and not cast upon individuals, who from the nature of their profession cannot refuse the calls of humanity. And again, although the medical man is all charity and benevolence—giving both his time and attention to sick poor without hopes of remuneration—we would simply ask if it is to be expected that his most assiduous endeavours are likely to be attended with success in the cure of this disease, unless they are sustained by proper conveniences and judicious diet; it surely cannot be expected that he can supply these also. We maintain that with proper care, and due professional means at hand, this direful malady may be greatly stayed in its ravages in the first instance, and then would not be so likely to extend through the country; for, although we do not believe this disease to be contagious, in the common acceptation of the term, yet we really think that when the cause of the

complaint is most potent, that circumstances often very decidedly indicate the possibility of such a circumstance; if so, the public safety and the calls of humanity alike demand that every means which an increased knowledge of the laws which directs this epidemic and regulates its treatment, should have due weight and consideration. Besides these circumstances, we think that the municipal councils should be called upon to establish some proper conveniences for the poor who may become sick with the disease, and not leave them to die by wholesale; for unless due attention be given to this point, and proper precaution taken in their behalf, this will, in all probability, be the case. Proper dispensaries to supply medicines, and proper medical officers to attend the sick poor, should be appointed in all the larger villages, especially along all the lines of the public works now going on in this country; for unless some such method is adopted, we foresee a vast amount of disease and death in such localities.

It also behoves our city fathers and the public generally, to require the removal of all decomposing and offensive matters in their neighbourhood, that might aid the advent of this pestilence. The decomposition of dead animal and vegetable matter helps to deteriorate the atmosphere and make the air we breath impure; as a necessary consequence, it prevents the purification of the blood, degrades and debilitates the whole animal frame, and makes the advent of the cholera far more probable. It is clear that marsh miasma and impurity of the air from such a cause, does not produce cholera, for these are more or less always present with us, but it is nevertheless sufficiently clear that they often pave the way for an attack of the invisible agent which causes cholera, by rendering the constitution less able to withstand its influence, showing that, when possible, all such causes should be obviated as far as it is in the power of man to do it.

THE CHOLERA IN EUROPE.

The *Union Medicale* publishes the following bulletin:—"We have been right in not feeling too ready to conclude, from the momentary diminution of the cholera in London, that the scourge was about to disappear. The course followed already by the

cholera in 1835 and 1848 presented variations not less remarkable than those which distinguish its present visit. The fact is, that in the past week the number of deceases, which had fallen in the week preceding that, to 45 for the city of London, has almost doubled—amounting to 83, of which 40 were males, and 43 females. As in the preceding epidemics, and during preceding weeks, the suburbs south of London were most severely attacked, since they alone count 49 of the 83 deaths. However, the epidemic does not seem to have extended beyond London. Only a few isolated places are specified—such as Dundee, Cockermouth, Hampstead, Luton, and South Shields. At Liverpool, from October 16 to 24, there were 19 new cases and 9 deaths; 8 of which were German emigrants. At Stockholm, the epidemic had reached its term. On October 11, the sixty-second day of the epidemic, there had only been seven new cases; but there yet remained 152 cases under treatment, and the deaths were to the number of 8. Since the cholera broke out in that city, the number of cases has been 4,123, of which 2,654 terminated fatally.—Diarrhœa appears to be prevalent at Stockholm, throughout the whole duration of the epidemic. There had been 1,819 cases, and only 458 of them degenerated into cholera. Without seeking to change the general conviction entertained by English physicians, that the disease always commences in a premonitory diarrhœa, the English Board of Health admits in its last report that a certain number of cases of cholera are not preceded by diarrhœa, and makes a pressing appeal to physicians that they will record their observations upon the comparative frequency and absence of that symptom.

MORTALITY AT SEA.

The disease which is now creating such terrible havoc among the emigrant passengers is unquestionably cholera—Asiatic Cholera in its most decided and malignant form. The statements of the officers of the ships, of the emigrants themselves, and of the Health Officers at Quarantine Ground, all agree. A day or two of diarrhœa, followed by vomiting and purging, spasms, collapse and death within six or twelve hours—such is the history of the disease, which cannot be mistaken for anything but Asiatic Cholera. It will be asked if cholera, why is it not confined to emigrants who suffer from imperfect ventilation, filthy and crowded decks and bad food? The reply is simply that such is not the fact. The ship *Constellation* is, as we have already mentioned, one of the best arranged and best managed ships that sails out of this port. She was not over-crowded. Her second cabin is entirely isolated from the steerage, roomy, airy, and with good state rooms; yet in that cabin there were four deaths. Other cases might be mentioned where the officers, their wives, and the crew had suffered from attacks of cholera, and it is impossible to doubt it—it does not result from the imperfect sanitary condition of the ships. Filth, foul air, are patent agents of destruction, but they never breed cholera, they only exas-

perate it; and had these existed to such an extent as frequently happens, the mortality on the above ill-fated ship might have been double or treble what it was.

From all that we can learn, the disease and mortality bear no ratio to the sanitary condition of the ships. Cholera exists but it is not epidemic, in Liverpool, Havre, and Bremen, and doubtless many of the emigrants crowded below decks with systems predisposed to the disease, but the fate of vessels sailing out of the same ports under similar circumstances is very dissimilar. Large ships, such as the *Constellation*, well ventilated, and comparatively clean, lose one-tenth of their passengers. Ships filthy, and comparatively ill ventilated, lose no more, while others ordinary in all respects, make the passage with the loss of one or two men. The absence of any common cause for the mortality either in the sanitary condition of the ships, or in the prevalence of an epidemic in their port of departure, would seem to prove that the mysterious agency of the disease, vomited fourth from the foul fens of India, after having eaten its way through Asia and Europe, is now forcing itself in slow but certain career over the bosom of the Atlantic. Its foul and pestilential breath now rests upon the eastern margin, but with the coming spring its withering breath will, it is to be apprehended, be felt upon the western shore of the ocean. Will our city authorities prepare to wrestle with the dread pestilence, or will they wait supinely to be enfolded in its embrace of death? This is a question which interests every member of the community, and chiefly the mercantile community. Let them look to it.—*New York Courier & Enquirer.*

PRINCIPLES ADVOCATED BY THE PHILADELPHIA MEDICAL AND SURGICAL JOURNAL.

1. Cash payments at the time of rendering service in the practice of medicine.
2. Elevation of the standard of Medical Education.
3. Legal protection in the study and practice of medicine.
4. Thorough and complete organization of the members of the profession throughout the country—for the dissemination of medical and hygeinic facts and the general welfare of physicians.
5. The establishment of a National Association for the relief of the Widows and Orphans of Deceased Indigent Graduates in Medicine.
6. The establishment of a "Medical Publication Society," for the publication of medical works by the members of the profession.
7. The establishment of Veterinary Colleges in the United States.

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 at the Royal College of Chemistry.

LECTURE IV.

Gentlemen:

Before proceeding to the details of the several groups of organic substances which I intend to bring under your notice, I must beg your permission to return once more to the formulæ by which we are in the habit of representing the composition of chemical compounds. I have explained to you, in the last Lecture, how, by a series of exceedingly simple calculations, we pass from the percentage composition of a substance to its simplest atomatic expression; but I mentioned, at the same time, that this expression is not always adopted as representing a compound in the most appropriate manner. We have now to inquire by what reasons chemists have been induced, in some cases, to select more complicated formulæ in the place of the simpler ones. A variety of considerations, many of a somewhat arbitrary nature, have been brought to bear upon this subject. Some of the more important of these have now to be discussed.

A very interesting result to which chemists were led at an early period, by the study of mineral substances, was the recognition of the fact, that certain elements, or groups of elements in chemical compounds, were replaceable by other elements, or groups of elements, the introduction of which, though it modified to a certain extent the properties of the primitive substance, did not altogether interfere with its normal chemical character. You probably know that the recognition of this fact, together with many collateral observations, has led to the establishment of the theory of chemical equivalents. Take the following illustrations:—In ordinary carbonate of potassa you have a compound of carbonic acid and potassa, in which you may replace either the acid or the base by a whole series of analogous substances; on adding nitric acid to this salt, the carbonic acid is evolved with effervescence, the well-known nitrate of potassa being produced; this salt, when submitted to the action of sulphuric acid, yields its nitric acid, (you may recollect this is the ordinary method of preparing nitric acid,) while the sulphate of potassa remains behind.

The quantities of nitric and sulphuric acid required to replace a given amount of carbonic acid, have been determined with great accuracy, and thus a series of numbers has been obtained representing the relative proportions in which these several acids unite with a certain amount of potassa. These numbers express equivalent weights,—i. e., quantities possessing the same value in relation to potassa, quantities capable of producing with potassa the same effect—in other words, compounds in which the properties of the potassa are counterbalanced by those of the acid with which it enters into combination. You clearly perceive that these numbers are altogether relative, their absolute value depending upon the actual amount of potassa which is taken as a starting point. Chemists have, however, endeavoured to impress upon these numbers a more absolute character, by fixing the quantity of potassa which, for the sake of convenience, should be taken as a standard of comparison. Without attempting to give here a full account of the theory of equivalents (of which the question before us is but an isolated case), I may remind you that the proportions in which substances combine with each other are now almost universally referred to one unit by weight of hydrogen. This, you observe, is entirely a matter of convention, and, indeed, some time intervened before the great majority of chemists

actually agreed on this point. But, so soon as this matter was settled, it is obvious that all the relative proportions became, for all the purposes of calculation, a series of absolute magnitudes. One part of hydrogen being taken as the unit, we have only to determine the amount of potassium capable of replacing it in any hydrogen-compound—in water, for instance—and farther, to ascertain the quantities of carbonic, nitric, and sulphuric acids which unite with the amount of potassa thus produced. We arrive in this manner at absolute numbers for the equivalents of those several acids. Experiment has shown, that to replace 1 part of hydrogen in water 39 parts of potassium are required—*i. e.*, 39 of potassium are equal to 1 of hydrogen; 39 of potassium, when uniting with oxygen, combine with 8 parts of it. To find the equivalents of carbonic, nitric, and sulphuric acids, we have to determine experimentally the respective quantities of these acids combining with 39+8=47 parts of oxide of potassium or potassa. Experiment has shown that these equivalents are as follow:—

Carbonic acid 22
Nitric " 54
Sulphuric " 40

These numbers represent the so-called anhydrous acids, the carbonic acid in the perfectly dry state; the nitric acid, as (according to recent researches of M. Deville) it is procured with great difficulty by the action of chlorine upon nitrate of silver; lastly, sulphuric acid, as it is obtained by the distillation of many sulphates in the form of silky crystals. Most acids, however, almost invariably occur in combination with water, for instance, nitric acid as *aqua fortis*, and sulphuric acid as common oil of vitriol; it is, therefore, frequently more convenient to state the equivalents of the hydrated acids. It is obvious that these equivalents are obtained by adding to the above numbers an equivalent of water, or 8+1=9. Therefore—

Hydrated carbonic acid = 22 + 9 = 31
" nitric " = 54 + 9 = 63
" sulphuric " = 40 + 9 = 49

The same facts may be stated in a somewhat different manner. Dismissing for the moment the consideration of the anhydrous acids which, in fact, only occur very rarely, we may say that the equivalent of an hydrated acid is that amount in which one equivalent of water is replaceable by one equivalent of potassa, or, better still, that amount in which one equivalent of hydrogen is replaceable by one equivalent of potassium. I repeat to you, this mode of establishing the equivalent of an acid is entirely arbitrary, any other substance than hydrogen might have been chosen as a standard, when all the numbers would have been altered, although their relation would have remained exactly the same. I should moreover mention, that there are certain classes of acids, the equivalent of which is fixed in a somewhat different manner. These, however, I will not consider for the present, in order not to complicate the subject.

Chemists have further agreed, that the formulæ by which they express the composition of substances should represent exactly their equivalents. This is the case with the acids which I have quoted, the formulæ of which are familiar to you:—

CO_2, HO or CO_3 H = 6 + (8 × 3) + 1 = 31
NO_5, HO or NO_6 H = 14 + (8 × 6) + 1 = 63
SO_3, HO or SO_4 H = 16 + (8 × 4) + 1 = 49

Now that I have explained to you the meaning of the term "equivalent" when applied to an acid, I may briefly show you how this equivalent is determined, if the acid under examination be an organic acid. Benzoic acid may serve again as an illustration—its percentage composition, and its simplest atomic formula have been ascertained in the preceding Lecture. Let us recollect, we have to determine the quantity of benzoic acid in which 1 of hydrogen is replaceable by 39 of potassium: to attain this result, we might form a potassium-compound, estimate the amount of potassium in it, and calculate accordingly. This is not, however, the process generally adopted; the estimation of potassium is attended with practical difficulties, and it is

preferable, therefore, to replace the potassium by some other metal which is easily separated. The metal most frequently employed is silver. For this purpose, the solution of the potassium-compound is decomposed by a solution of nitrate of silver, when a white crystalline salt (benzoate of silver) is precipitated, which is collected upon a filter, washed, and carefully dried. a weighed quantity of this silver-salt is then gradually ignited in contact with the atmosphere, when all the carbon, hydrogen, and oxygen are expelled in the form of volatile products, such as carbonic acid and water, there remaining only the silver, which can be accurately weighed. In an experiment of this kind, 9 grams of benzoate of silver left 4·24 grains of metallic silver, which shows an experimental percentage of 47·11 silver in this salt. If we now recollect that 108 parts of silver are equivalent to 39 of potassium or 1 of hydrogen, we have all the data necessary to calculate the equivalent of benzoic acid; this equivalent evidently equals a weight of benzoate of silver, containing 108 parts of silver, from which we subtract this quantity of silver, replacing it by 1 of hydrogen.

We have the following proportion:—

$$47{\cdot}11 : 108 = 100 : x$$

$$x = \frac{100 \times 108}{47{\cdot}11} = 229{\cdot}5$$

229·5 is the equivalent of benzoate of silver; if in this salt we exchange 108 of silver for one of hydrogen we arrive at the equivalent of benzoic acid.

229·25 — 108 + 1 = 122·25 equivalent of benzoic acid.

Let us now compare this number with the number represented by the formula which was established in the last Lecture, by translating the percentages of carbon, hydrogen, and oxygen found in the simplest atomic expression. This formula was

$$C_7\ H_3\ O_2$$

and the weight represented by this formula is

7	atoms of	carbon	42
3	"	hydrogen	3
2	"	oxygen	16
			61

It is seen at the first glance, that the number furnished by the determination of the equivalent is double that represented by the simplest atomic formula. The equivalent of benzoic acid weighs twice as much, contains twice as much matter, as is indicated by this formula; or, in other words, the formula, in order to correspond with the equivalent of benzoic acid, has to be doubled to

$$C_{14}\ H_6\ O_4$$

14	atoms of	carbon	84
6	"	hydrogen	6
4	"	oxygen	32
1	atom of	benzoic acid	122

A series of perfectly analogous considerations may be applied to the second formula, which we have calculated together in the last Lecture, viz., that of aniline. This compound belongs to a very numerous class of substances, which are called organic bases, the character of which I hope to bring before you in a special Lecture. Chemists have agreed that by the term equivalent of an organic base, that quantity of the base should be represented which combines with one equivalent of an acid. To determine the equivalent of aniline it would be sufficient to ascertain the quantity which unites with 122 of benzoic acid, with 63 of nitric, with 49 of sulphuric acid—in other words, to analyse the benzoate, nitrate, or sulphate of aniline But in this case, too, we find that practice has pointed out the compounds with certain acids as peculiarly adapted for determinations of this description. The compounds of such bases with hydro-chloric acid are frequently employed, but often still the salts which they form with a rather complicated acid, hydrochloro-platinic acid, consisting of 1 equivalent of hydrochloric acid, and 1 equivalent of bichloride of platinum. These salts are readily prepared, and j-

as easily analysed; for it suffices to ignite them exactly as we did in the case of benzoate of silver. The residuary platinum enables us to calculate the equivalent of the base.

In an experiment of this kind,

15 grains of analine-platinum salt left
4·94 grains of metallic platinum.

This corresponds to a theoretical percentage of 32·93.

From this percentage of platinum, we find without difficulty the equivalent of the platinum-salt. This is evidently the amount of salt which contains 1 equivalent of platinum.

We have the proportion

$$32{\cdot}93 : 99 = 100 : x : : x = \frac{100 \times 99}{32{\cdot}93} = 300{\cdot}6$$

In order to find the equivalent of analine, we have to subtract from the equivalent of the salt the weight of one equivalent of hydrochloroplatinic acid, which, as was mentioned previously, consists of 1 equivalent of hydrochloric acid, and 1 equivalent of bichloride of platinum.

1 equivalent of hydrochloric acid	36·5
1 " bichloride of platinum...	170·0
	206·5

Hence the equivalent of aniline

$$300{\cdot}6 - 206{\cdot}50 = 94{\cdot}1$$

The simplest atomic expression for analine from the estimation of the carbon, hydrogen, and nitrogen, you will remember, was

$$C_{12}\ H_7\ N$$

The weight of matter represented by this formula very nearly coincides with the equivalent deduced from the platinum-salt, as may be seen by the following comparison:—

12 atoms of carbon	=	72
7 " hydrogen	=	7
1 " nitrogen	=	14
		93

Hence the simplest atomic formula for aniline represents likewise the equivalent of this substance.

The third substance the analysis of which was considered in the last Lecture, was, as you recollect, benzol, for which we calculated the atomic formula

$$C_2\ H$$

Now, does this formula represent the equivalent of benzol? This hydrocarbon is what is called an indifferent substance, *i. e.*, it neither combines with acids or with bases, at least not to form compounds from which it can be separated again undecomposed.

The methods of controlling the atomic formulæ which were employed in the case of benzoic acid and aniline are not applicable to benzol. With such substances, the choice of the formulæ is generally determined by a series of considerations which vary according to the nature of the compounds, and for which a rule of universal application can scarcely be established. The commonest mode of proceeding is to inquire into the origin and family relations of the compound. We seek among its ancestors, or among its descendants, for a compound whose equivalent may be readily determined, and which enables us to infer forwards or backwards what the formula of the indifferent compound may be. Let us apply this rule to benzol. The source from which Mr. Faraday originally obtained this substance (the distillation of a variety of fatty bodies for the purpose of making gas) is not calculated to throw much light upon the nature of this compound, but the existence of this body once established, its percentage composition ascertained, and its properties described, it was not long before its formation was recognised under circumstances scarcely admitting of any doubt regarding the true formula of benzol. Prof. Mitscherlich, in Berlin, and M. Peligot, in Paris, observed simultaneously that *benzoic acid*, (the very acid the equi-

valent of which we have just now determined,) when submitted to distillation with an excess of lime or baryta, furnishes this substance in a state of perfect purity and with great facility.

In this decomposition, the whole of the oxygen in the benzoic acid separates from it combined with carbon in the form of carbonic acid, which remains in combination with the baryta. The decomposition of benzoic acid by means of baryta is represented by the following diagram:—

$$\begin{array}{lllll} \text{From} \ldots & C_{14} & H_6 & O_4 + 2BaO & \\ \text{Deduct} \ldots & C_2 & & O_4 + 2BaO & = 2\,(BaO, CO_2) \\ \text{There remains} & \underbrace{C_{12}} & \underbrace{H_6} & & \text{Two atoms of carb. of baryta.} \\ & \text{Benzol.} & & & \end{array}$$

It is evident that after deducting two equivalents of carbonic acid from benzoic acid, the carbon and hydrogen remain in the proportions of C_{12} H_6, *i. e.*, in the relation of two of carbon to one of hydrogen (C_2 H,) or in the atomic ratio which we have originally established for benzol. We have now the choice of assuming that 1 equivalent of benzoic acid, when decomposed by baryta, yields either 1 equivalent or 6 equivalents of benzol. The former of these assumptions is simpler. We prefer it, although it compels us to raise the original atomic expression by multiplying it by 6. The considerations which I have just now explained would alone perhaps have been scarcely deemed sufficient for adopting the formula C_{12} H_6 for benzol in preference to that of C_2 H originally deduced. But the study of the derivatives of benzol, of its products of decomposition, under the influence of powerful chemical agents, is likewise in favour of the higher formula. Common nitric acid has no effect upon benzol: the concentrated acid, however, reacts upon this substance with great violence—the benzol dissolves. On mixing the clear liquid with water, a dense oil is precipitated, possessing in a remarkable manner the odour of oil of bitter almonds, to which, in order to remind us of its origin, the name of "nitrobenzol" has been given. The analysis of nitrobenzol has shown that this compound contains nitrogen and oxygen in addition to the elements of benzol. The simplest atomic expression, by which the results obtained in the analysis of this compound can be represented is the formula.

$$C_{12}\ H_5\ N\ O_4$$

We have again here the choice of assuming, that, in the formation of nitrobenzol, the nitric acid has acted upon either 6 equivalents of the substance C_2 H, or upon 1 equivalent of the body C_{12} H_6. We prefer the latter: and accordingly represent the change which benzol undergoes under the influence of nitric acid by the equation

$$\begin{array}{llll} C_{12}\ H_6 & + NO_5 = & C_{12}\ H_5\ N\ O_4 & + HO \\ \text{Benzol.} & & \text{Nitrobenzol.} & \end{array}$$

Moreover, nitrobenzol, when dissolved in an alcoholic solution of ammonia, and treated with sulphuretted hydrogen, undergoes a further change, with the details of which you will become acquainted bye and bye, but the result of which is the formation of "aniline,"—the very alkaloid the equivalent of which we have just now determined by the analysis of its platinum-salt. The equivalent of aniline contains indubitably 12 atoms of carbon; and we thus obtain additional evidences in favour of the formula C_{12} H_6 for benzol, which, in fact, completely harmonises both with the origin of the substance, and with its products of decomposition. Indeed, on looking at the following series of formulæ, representing the substances which have been submitted to your consideration,

Benzoic acid	C_{14} H_6 O_4
Benzol	C_{12} H_6
Nitrobenzol	C_{12} H_5 N O_4
Aniline	C_{12} H_7 N

we cannot doubt that the formula C_{12} H_6, although less simple than C_2 H, nevertheless expresses the relation of this body with other substances more completely than any other. You will see, moreover, that this formula is supported also by other considerations.

A similar mode of proceeding is generally adopted in the case of indifferent substances. But it is evident that the detail of the considerations must vary greatly with the nature of the several substances. Frequently, however, it happens, that the exact circumstances under which indifferent substances are generated are unknown, and that they are likewise deficient in yielding products of decomposition possessed of salient properties. In such cases, we have still a means of controlling the formula as established by analysis, provided the substance be volatile. This control consists in the determination of the specific gravity or the density of the vapour which substances form at high temperatures. Now, as this control is very frequently adopted, even in cases in which we are by no means reduced to this last resource, and as both the considerations which it involves and the mode of experimenting, are particularly interesting, I will, before concluding these remarks upon formulæ, direct your attention briefly to this subject in the next Lecture.

ARTIFICIAL TYMPANIC MEMBRANES.

By Joseph Toynbee, Esq., F.R.S.

[At a meeting of the Pathological Society].

Mr. Toynbee said, that certain experiments and dissections, which he performed during the past year, had convinced him that the guttural orifice of the Eustachian tube was closed, except during deglutition, and he was subsequently led to infer, that, for the function of hearing to be perfectly performed, it was requisite that the tympanum should be a closed cavity, being convinced that, if it were not so, the sonorous undulations would not strike the tympanum with sufficient force. He determined, therefore, to close entirely, by artificial means, the next case of perforated tympanum that presented itself, and did so with great success; and, since that he had employed an artificial membrane with great benefit in between thirty and forty cases. He, Mr. Toynbee, had used thin layers of vulcanised India rubber or gutta percha, to construct the artificial membrane; to the centre of one of the surfaces of this membrane he attached a fine wire or stem of some other material, by means of which the septum would be passed down and adjusted. Mr. Toynbee employed this treatment, first in the case of a man aged 43, who had been discharged from the army for deafness. In each membrana tympani was an aperture between one and two lines in diameter, and the mucous membrane of the tympanum was thicker and redder than natural, and discharged freely. Blisters behind the ears and astringent injections were prescribed, and a slight improvement followed. The man's hearing, however, still remained very defective, so that he was unable to follow any useful pursuit. At the commencement of last June, therefore, Mr. Toynbee placed in the left ear a very delicate layer of vulcanised India-rubber. When it was properly adjusted, the patient observed, that he heard more clearly than he had done for years. Ever since that time, this patient had worn the artificial membranes, and with their aid he could hear almost as well as any other person; but when they were removed, he could not hear words spoken in a loud voice. The man was then introduced, and the artificial membranes having been removed, the members of the Society had the opportunity of observing the perforate condition of the membrana tympani. After the removal of the membranes, he could not hear unless loudly spoken to, but when he had replaced them, which he did with apparent readiness, his hearing was excellent.

[A conversation ensued afterwards as to the necessity of an aperture existing in tympanum for the production of sonorous undulations. It was stated both by Mr. Brooke and Mr. Toynbee, that it had been established by the experiments of Müller and other enquirers, that such an aperture was necessary only for the formation of loud sounds, such as were produced by

the kettle-drum, but that a small instrument like the ear required no such aperture to enable the undulations of air in the tympanum is to take effect.] —*Med. Times and Gazette, Feb.* 12, 1853, *p.* 176.

ON THE MUSCLES WHICH OPEN THE EUSTACHIAN TUBE.

By Joseph Toynbee, Esq., F.R.S.

[The general opinion of anatomists upon this subject may be thus recorded:—

That the guttural orifice of the Eustachian tube is always open, and that the air in the tympanum is constantly continuous with that in the cavity of the fauces. An examination of the guttural orifice of the tube in man and other animals has led the author to conclude, that, except during muscular action, this orifice is always closed, and that the tympanum forms a cavity distinct and isolated from the outer air. The muscles which open the Eustachian tube in man, are the tensor and levator palati, and it is by their action, during the progress of deglutition, that the tubes are ordinarily opened. That the act of swallowing is the means whereby the Eustachian tubes are opened, is shown by some experiments, of which the following may be cited:—If the mouth and nose be closed during the act of swallowing the saliva, a sensation of fulness or distention arises from the air, which is slightly compressed in the fauces, passing into and distending the tympanic cavities. Upon removing the hand from the nose, it will be observed that this feeling of pressure in the ears does not disappear, but it remains until the act of deglutition is again performed, while the nose is not closed. In this experiment the Eustachian tubes were opened during each act of deglutition; during the first act, while they were open, air was forced into the cavity of the tympanum by contraction of the muscles of the fauces and pharynx, and the guttural orifices of the tubes remained closed until the second act of swallowing, which opened the tubes and allowed the air to escape. That the act of deglutition opens the Eustachian tubes was inferred also from the custom usually adopted of swallowing while the descent of a diving-bell is performed; by this act the condensed air is allowed to enter the tympanum, and the sensation of pain and pressure in the ears is removed or entirely avoided. The author gives an account of the Eustachian tube and its muscles in mammalia, birds, and reptiles. In some mammalia the muscles opening the tubes appertain, as in man, to the palate; in others, this function is performed by the superior constrictor muscles of the pharynx. In birds it is shewn that there is a single membranous tube into which the two osseous tubes open; this membranous tube is situated between, and is intimately adherent to, the inner surface of each pterygoid muscle, and by these muscles the tube is opened. The conclusion to which the author arrives respecting the influence of the closed Eustachian tubes is, that the function of hearing is best carried on while the tympanum is a closed cavity, and that the analogy usually cited as existing between the ordinary musical instrument the drum and the tympanum, to the effect that in each it is requisite for the air within to communicate freely with the outer air, is not correct. On the contary, the author shows that no displacement of the air is requisite for the propagation of sonorous undulations, and that, were the Eustachian tubes constantly open, these undulations would extend into the cavity of the fauces, there to be absorbed by the thick and soft mucous membrane, instead of being confined to the tympanic cavity, the walls of which are so peculiarly well adapted to the production of resonance in order that they should be concentrated upon the labyrinth.

In corroboration of the above views, the author states, that in case of deafness, dependent simply upon an aperture in the membrana tympani, whereby the sonorous undulations are permitted to escape into the external meatus, the power of hearing has been greatly improved by the use of an

artificial membrana tympani, made of very thin vulcanized india-rubber or gutta-percha, which is so applied as again to render the tympanum a closed cavity.—*Med. Times and Gazette, Feb.* 26, 1853, *p.* 229.

ON A SIMPLE METHOD OF ASCERTAINING, WITHOUT THE USE OF THE CATHETER, WHETHER THE EUSTACHIAN TUBES ARE PERVIOUS.

By Joseph Toynbee, Esq. F.R.S.

[The common mode of exploring the Eustachian tube by the catheter produces pain and discomfort, and requires great experience in its use. The plan also of attempting to distend the tympanum by a forcible expiration, while the mouth and nostrils are kept closed, is by no means always successful].

In a paper recently read before the Royal Society, the author endeavoured to show that the guttural orifice of each Eustachian tube is generally closed, and that the air in the tympanum is not continuous with that in the cavity of the fauces, except during the momentary act of deglutition. In proof of this, the following experiment was cited:—If the mouth be shut, and the nostrils be held closed by the finger and thumb, and then the act of swallowing be performed, a sensation of fulness or pressure is experienced in each ear; and this sensation does not disappear upon the removal of the pressure from the nose, but it vanishes at once when the act of swallowing is again performed, while the mouth and nostrils are open. During the first act of swallowing, a small quantity of air was forced into the tympanic cavities through the Eustachian tubes, and it therein remained until the second act of swallowing again opened the tubes and permitted the air to escape. The muscles whereby the Eustachian tubes are opened are the tensor and levator palati, which, it is well known, take origin from the cartilaginous walls of the tubes. As, during the act of swallowing with closed mouth and nostrils, air is forced through the Eustachian tubes into the tympanic cavities, it is evident that the permeability of these tubes can be ascertained by making the patient swallow some saliva while the mouth and nose are shut. Nor need the surgeon depend upon the statement of the patient respecting the sensation of distention felt in the ears: for by listening with the *otoscope*, should the Eustachian tubes be pervious, the air will be distinctly heard to enter the tympanic cavities, and produce a gentle crackling sound. The author next proceeds to consider the treatment of cases of obstruction of the Eustachian tubes, especially in reference to the use of the catheter. It having been ascertained that these tubes are obstructed, is it desirable to attempt to open them by means of the catheter? Believing that obstruction of the Eustachian tubes generally depends upon a thickened state of the mucous membrane covering the guttural orifice, and that this state is always associated with a thickened condition of the faucial mucous membrane of the tympanum, the author suggests, especially to those inexperienced in the use of the catheter, not to attempt to pass this instrument—first, because, in such cases, the mucous membrane of the Eustachian tube is often so tumefied that no ordinary degree of pressure will force the air into the tympanum; and, secondly, because, should the surgeon succeed in transmitting a few air-bubbles, the relief obtained is only partial, and endures for a very brief period, since the mucous membrane remains as thick as before, and the ill effects of the obstruction soon recur, from the air in the tympanum becoming of a different density from that without. The membrana tympani becomes more or less fixed. The treatment recommended is such as shall tend to reduce the thickened mucous membrane of the guttural orifice of the Eustachian tubes to a healthy state, so that these muscles may be able to open them. For this purpose, besides the use of general remedies, the solid nitrate of silver, or a strong solution of hydrochloric acid, may be applied to the mucous membrane of the fauces and to the apertures of the tubes, and gentle counter-irritation is to be kept up over the region of the fauces.

By these measures, as a general rule, the mucous membrane can be reduced to its natural state, and the tubes become again opened by their muscles. Should this not take place, the Eustachian catheter may now and then be introduced and air be gently blown through it. A modification in the shape of the Eustachian catheter, is suggested—viz., that it should be oval instead of round, the advantages derived being, that it not only can be passed through the nose with less discomfort to the patient, but its presence in the Eustachian tube is much less disagreeable from the absence of the convex surfaces which in the rounded catheter press against the nearly flat surface of the tube. In conclusion, the author expresses his concurrence in the opinion of Harvey and Kramer, that enlarged tonsils are never the cause of obstruction in the Eustachian tubes, and that any benefit that may have followed their extirpation has arisen from the loss of blood consequent upon the operation—*Lancet, April* 9, 1853, *p.* 348.

ON THE SOLUTION OF URINARY CALCULI IN DILUTE SALINE SOLUTIONS, AT THE TEMPERATURE OF THE BODY, BY THE AID OF ELECTRICITY.

By Dr. H. Bence Jones, F.R.S. (Read before the Medical Society.)

This paper contained the record of a number of experiments made to determine whether, out of the body, urinary calculi could be dissolved by placing them in dilute solutions of nitrate of potash and other salts, and then decomposing the solution in contact with the calculus by means of the galvanic battery. The urinary calculus was carefully dried and weighed, then fixed between the poles of a galvanic battery, after which it was immersed in a solution of nitre, and at the end of the experiment it was re-dried and re-weighed. The loss of weight gave the effect which was produced. The different calculi which had been used were also exhibited, showing the different degrees in which the various kinds of urinary calculi are dissolved when submitted to this treatment. The conclusions at which the author arrived may be thus stated:—In a solution of nitre containing twenty grains to the ounce, kept at the temperature of the body, uric acid calculi can be dissolved by the aid of electricity, at the rate of from two to nine grains an hour. The solution takes place at the alkaline or negative pole. In the same time, and under the same circumstances, phosphatic calculi can be dissolved at the rate of from two to twenty-five grains. The solution takes place at the acid or positive pole. Calculi, consisting of oxalate of lime, proved to be far less soluble, usually not more than half a grain an hour, and at most two grains being dissolved. At the conclusion of the reading of the paper, the author stated, that he had been engaged in making further experiments with a solution of nitrate of potash containing only ten grains to the ounce; and he exhibited some large uric acid and phosphatic calculi, which had been partially dissolved by the decomposition of this solution at the surface of the calculi. He also showed a catheter, or lytholyte, made by Weiss, which fulfilled the conditions requisite in an instrument for effecting the solution of urinary calculi in the body. It resembled an ordinary lithotrite, but the blades were—1st, isolated so as to conduct the electricity to the surface of the stone when it had been caught; 2ndly, the external surfaces of the blades were guarded, so that in case they came in contact with the mucous membrane no chemical action would be there set up; 3rdly, a double channel for the injection of the solution of nitre was formed inside the instrument. Lastly, the author stated, that, although many difficulties would have doubtless to be overcome before he could lay the result of his experiments within the body before the Society, still they would only be mechanical difficulties. The principle, which consisted in setting up mechanical action at the spot where it was wanted, whilst elsewhere a dilute neutral solution was present, left nothing further to be desired, at least so far as the solution of uric and phosphatic calculi was concerned. At present, by the aid of lithotrite, mechanical force is applied to the surface of the

calculus, and the stone is passed in fragments. At some future time, by the aid of the litholyte, chemical force will be set up at the surface of the calculus, and it will be passed in solution, or as an impalpable precipitate.—*Med Times and Gazette, January* 1, 1853, p. 21.

REMEDY FOR THE STINGS OF BEES.

By M. Gumprecht.

The stung place is to be rubbed with the freshly-pressed juice of the honey-suckle. (Lonicera caprifolium.)

The expressed juice may be kept in closely-stoppered bottles for this purpose.—*Dingler's Polyt. Journal, CXXVI. p.* 80.

A common Canadian remedy for the stings of bees is the blue bag used by the washer-women. The blue bag is a piece of flannel containing moistened indigo, and if applied to the wound has a surprising effect in relieving the pain. I once saw a child that had been fearfully stung, and was in a dreadful state of irritation; upon the application of the blue bag by a neighbour, the pain immediately subsided and the child went to sleep.—Ed. U. C. J.

ON THE INDUCTION OF PREMATURE LABOUR, BY THE METHOD OF PROFESSOR KIWISCH, OF WURZBURG.

By Dr. W. Tyler Smith.

[Hitherto the main agents in exciting the gravid uterus to expel its contents have been—the administration of ergot, dilitatation of the os uteri by sponge-tents, the separation of the membranes from around the os and cervix uteri, or puncturing the membranes by some convenient instrument. The ergot is uncertain in its operation, and the use of sponge-tents is not only uncertain in its effects, but in some cases the application is difficult if not impossible. The same remarks apply also to the separation of the membranes].

The operation of puncturing the membranes is far more effective than either of the preceding methods. It almost invariably brings on labour within a few days of its performance. But cases of deformity are met with, and these are cases requiring most imparatively the induction of premature labour, in which the most experienced practitioners are unable to enter the uterus. In cases requring the induction of premature labour, in the early months, before the developement of the cervix uteri, the attempt to puncture the membranes must always be a serious undertaking. Numerous instances are on record, in which serious results have occurred from the attempt to evacuate the liquor amnii. Two or three years ago a patient died after the performance of this operation, in whom, upon a post-mortem examination, the internal iliac was found to have been punctured. Dr. Radford has related a case, in which the Cæsarian operation was performed successfully, but the woman becoming pregnant again, an operation for inducing premature labour was performed with a fatal result. The difficulty of reaching the os uteri, in cases of great pelvic deformity, was referred to the discussion at the Medico-Chirurgical Society last year, as a justification of the Cæsarian operation; and the possible and known dangers of the proceeding were among the grounds of opposition to this great obstetric advance, put forward in the most recent discussions of the French Academy.

But the operation of puncturing the membranes, even when it can be performed readily, has its disadvantages. This is particularly the case when the operation is performed in the eighth or ninth month, with a view to save the child. The evacuation of liquor is always an unfavourable commencement of labour, particularly in cases of distortion, when turning may have to be performed, and when the child is subject to long-continued pressure

before and during delivery It is to the withdrawal of the liquor amnii as one important consideration, that we may refer the considerable mortality to the fœtus, which takes place in the induction of premature labour by this operation.

Under these circumstances, a new method of inducing premature labour, devoid of many of the disadvantages and of all the dangers of previous operations, cannot fail of being recognised by obstetricians as a great boon.

It is to Dr. Kiwisch Ritter von Rottereau, obstetric professor in Wurzburg, one of the highest obstetric names in Germany, that we owe the principle of the operation practised in the following case; and this is not the only improvement which his great practical genius has conferred upon obstetric medicine.

Without further preface I proceed to detail the following example—the first, I believe, in which the plan of Dr. Kiwisch has been carried into operation in this country, and which was attended by complete success.

[E. H———, aged 37, was as near as could be calculated in her 37th week of gestation. She was the subject of a severe spinal distortion which had latterly much increased. She had borne three living children, but only after the most protracted labours. On examination, the uterus was greatly anteverted, and the urine for a long time had escaped almost involuntarily. The antero-posterior diameter of the brim of the pelvis was certainly under three inches. After carefully weighing these conditions, the induction of premature labour was determined upon, and Dr. Smith proceeds:]

I resolved on trying the plan proposed and adopted by Professor Kiwisch, of Wurzburg, which consists of directing a stream of water from a height by means of a syphon, continuously upon the os uteri. Kiwisch recommends the use of warm water; but knowing from experience, in case of hemorrhage, the increased efficacy of the alteration of hot and cold temperatures in causing uterine contraction, I determined to try the effect of alternating the hot and cold douche. Kiwisch's mode of operating is alluded to in vol. viii. of the "British and Foreign Medico-Chirurgical Review," but it had been previously described to me by Dr. Schneemann of Hanover. I followed his method as nearly as I could under the circumstances, without any time for previous preparation: the only difference being in the variation of the temperature of the douche.

September 1.—Half-past nine, a.m.: A piece of India-rubber tubing, above eleven feet long, and half an inch in diameter, was connected with a straight tube from an injecting apparatus five or six inches in length, the latter forming the uterine extremity of the syphon. A vessel containing two gallons of water of about 110° Fahr., was placed nine or ten feet from the ground, the patient being placed in an empty hip-bath. The proper end of the tube was now passed into the vagina and directed towards the os uteri, where it was held steadily. After exhausting the tube, the other extremity was placed in the warm water. The stream immediately began to flow with considerable force against the os uteri, and continued until the whole of the contents of the vessel had been discharged. Two gallons of cold water were then poured into the vessel, and discharged in the same manner. The time by the whole douche was from twenty minutes to half, an hour, the patient only complaining of discomfort when the hot and cold currents first began to run. During the after part of the day she complained of dysuria and occasional pains in her back.

Sept. 2nd.—One p.m.: The douche was again applied in the same manner and quantity. In these applications I had the kind assistance of Mr. Walker, and the subsequent applications were entirely conducted by him, but I give the progress of the case from the notes he was good enough to take at the time.—Nine p.m: She had labour pains from half-past twelve till four, so much so that she was nearly sending for Mr Walker The

douche was repeated at this time The warm current was discharged as before, but upon the communication of the cold stream, she became hysterical, and had to be removed from the bath.

3rd.—Half-past nine, a.m.: Has had a restless night in consequence of of pains "all over her" but without any particular uterine pain. The dysuria and pain under the pubes are very troublesome. No appetite. The bowels have not acted for two days. Pulse 95. To take six drachms of castor-oil. Two p.m.: Has had irregular uterine pains since the douche in the morning. I made an examination, and the os uteri could now be felt dilated to the extent of half-a-crown, the fundus uteri being hard and contracted. The bowels have not yet acted. Douche repeated at this time.—Nine p.m.: Had considerable uterine pain for about half an hour after the last visit. Bowels have acted freely, with sickness. Pulse 100. The douche was again repeated, lest the uterine action should remit.

4th.—One a.m.: Mr. Walker was hastily summoned. The patient had suffered powerful expulsive pains, almost without intermisson, since the last douche. The head presented in the second position, and about an hour before Mr. Walker's arrival the membranes had ruptured, but only a small quantity of liquor amnii had been discharged These pains continued with increased vigour, and within half an hour from Mr. Walker's arrival, the child, a girl, was born alive without any assistance. The placenta quickly followed. After the birth of the child, a large quantity of the liquor amnii, which had been pent up behind the head, was discharged. A draught of ether and camphor was given, and she passed a very comfortable night. She had the usual amount of after-pain, and was hysterical on two or three occasions, but recovered perfectly, and both her and the child are now in good health. A little blood was discharged, as usual, after the expulsion of the placenta, but the lochial discharge was more scanty than after natural labour. The secretion of the milk appeared naturally.

Thus, in this case, delivery was accomplished in sixty-four hours from the first application of the douche. But it must be borne in mind that twenty-seven hours elapsed between the first and second application of the douche, otherwise delivery would probably have taken place earlier. Five applications of the douche were made; but from the state of the os uteri, after the fourth application there can be no doubt that labour would have proceeded, even if the fifth douche had not been employed. Before the first application of the douche, there had not been the slightest appearance of uterine disturbance.

The time between the first application of the douche in this case and the completion of delivery, was less than frequently occurs in cases of puncture of the membranes. But it has been objected to the douche, by those who have used it on the continent, that some women are less susceptible of its influence than others, and that the susceptibility of the same woman varies in different pregnancies. I suspect this variation may be obviated by performing the operation, when the time can be selected, at the eighth or ninth catamenial date, and by increasing the energy of the douche by the alteration of the temperature.

In a certain class of cases, it becomes necessary to induce labour before the end of the seventh month; when this is the case, the operation simply has reference to the safety of the mother, the ovum being necessarily sacrificed.

In another class, the operation is not called for until after the completion of the seventh month, and in the great majority of these cases the operation is performed with a view to the safety of both the mother and the child, in consequence of the condition of the mother

In a third class the operation becomes necessary, in the latter months of pregnancy, to save the life of the child alone, the safety of the mother not being at all involved in the cause of danger to the fœtus, as in diseases of the placenta.

As regards cases requiring the operation before the fifth month, such as excessive and irrepressible vomiting, occurring to such an extent as to

threaten death by starvation or debility, the induction of abortion by the douche would evidently be far preferable to either the dilatation of the os uteri, the attempt to puncture the membranes, or the administration of ergot. The latter has little power in such cases, while neither dilatation nor puncture could be effected without danger, because of the undeveloped state of the cervix uteri

After the fifth month, when in the normal condition of the pelvis the os uteri can be reached, and the membranes punctured with tolerable facility, there is a certain number of cases in which the evacuation of the uterus is called for to relieve the effect of the pressure or irritation, and in which the evacuation of the liquor amnii is alone sufficient to relieve the urgent symptoms. In these cases, the operation of puncturing the membranes has the advantage of affording immediate relief. I alluded to dropsy of the amnion; excessive vomiting in the latter months of pregnancy; draining hemorrhage from partial separation of the placenta; the occurrence of insanity, convulsions, and chorea; or dangerous oppression of the circulation or respiration. Here the mere diminution of the size of the uterus, which may be obtained by the evacuation of the liquor amnii, without the immediate expulsion of the fœtus, sometimes affords instantaneous relief In all such cases, puncturing the membranes is a more direct method of obtaining relief than any other procedure, and on this account may be preferred.

In cases where the operation is performed to save the child, without reference to the condition of the mother, as when the child has died, and again at the latter part of pregnancy, from imperfect circulation in the placenta, there can be no question of the superiority of the douche to any other method. Its operation is, in fact, scarcely, if at all different from natural labour, and there is no risk whatever of injury to the mother through its employment.

In fine, from the accounts of the numerical results of the induction of premature labour by the ordinary method, it appears that nearly one-half of the children are born dead. This is partly owing to the necessity for its performance in some cases before the fœtus has become viable; and in part to the occurrence of difficult labours from deformity, and from the evacuation of the liquor amnii at the commencement of labour. This latter cause of increased mortality among children born through the induction of premature labour, promises to be entirely obviated by the substitution of the douche for the operation of puncturing the membranes. There are, indeed, sound reasons for preferring the douche in all cases in which the fœtus is living and viable, in which the immediate relief to be obtained by discharging the liquor amnii is not imperatively demanded. As regards the mother, the douche relieves her from all risk of mechanical injury to the uterus. It is well known that the proportion of mal-presentations is increased in cases in which labour comes on at the full term. In cases requiring turning, after the induction of premature labour, the danger to mother and fœtus is increased by the absence of the liquor amnii. But these and other difficulties which follow upon the evacuation of the liquor amnii before the commencement of labour, when the fœtus has arrived at the latter months, are greatly diminished by the employment of the douche. This happy improvement promises to be of equal value to the mother and child. Above all, it is applicable in cases where the os uteri cannot be reached, where the induction of premature labour by any other known means is impossible, and where the only alternative is the danger of the Cæsarian section.—*Lancet, Oct.* 2, 1852, *p.* 297.

OBSERVATIONS ON THE INDUCTION OF PREMATURE LABOUR BEFORE THE SEVENTH MONTH OF PREGNANCY.

By Dr. Robert Taylor Lee, F.R.S.

[In a paper, read before the Medical and Chirurgical Society, Dr. Lee said that]

In the year 1812, in the third volume of the "Transactions" of the

Society, Dr. Merriman had published a paper entitled "Cases of Premature Labour Artificially Induced in Women with Distorted Pelves, to which are subjoined some observations on this Method of Practice." The author thought it significant that in thirty-two volumes of the "Transactions, embracing a period of forty years, there did not occur the history of a single case to illustrate this important rule of practice; while in these volumes there were reports of ten cases of Cæsarian operation. Of the safety, efficacy, and morality of inducing premature labour, in conformity with the rules inculcated by Mr. Merriman, the author thought most British and some foreign practitioners were convinced; but in respect to the induction of premature labour before the seventh month and in first pregnancies, to obviate the danger of craniotomy, and the fatal effects of the Cæsarian section, in cases of great distortion of the pelvis, little had been said by writers on midwifery. To justify the practice, which the author regarded as equally safe, efficacious and moral, before, as after the seventh month of utero-gestation, and in a first as in any subsequent pregnancy, he submitted the history of a successful case, which was attended with peculiar complications, and formidable difficulties.

In October, 1849, with Mr. Booth, of Queen-street, Westminister, he saw Mrs. S———, who had been in labour forty-eight hours, and whose pelvis was distorted in the highest degree from mollities ossium. After perforating the head, which had not entered the brim of the pelvis, and by tearing in pieces the bones with the crotchet, delivery was accomplished after two hour's violent exertion. The partially dilated state of the os uteri greatly increased the difficulty and danger of the operation. The patient recovered without any unfavorable symptom. In December, 1852, the author learnt from Mr. Booth that the patient was again pregnant; and in the fifth month, some diagnostic symptoms of pregnancy being absent, any interference was postponed for another month. In January 1853, the movements of the fœtus could be distinctly felt, and the necessity for immediately attempting to induce premature labour was obvious and urgent. The great distortion of the pelvis (the tuberosities of the ischia were almost in contact, with the sacrum projected forward nearly to touch the front of the pelvis) presented unusual difficulties even in reaching the os uteri for the purpose of introducing the stiletted catheter to puncture the membranes. After a time, the fore and middle fingers of the left hand were passed into the vagina and the anterior lip of the os uteri was touched with the tip of the fore-finger; the instrument was then guided into the cavity of the uterus, and the membranes punctured. The liquor amnii continued to flow till the morning of Friday, the 7th of January, when the labour pains come on. At two p.m. the os uteri was so much dilated that the points of the two fingers could be introduced, and the nature of the presentation ascertained. It was not the head, but whether shoulders or nates could not be determined. At seven p.m. the right hand was hanging out of the external parts, and the shoulders and thorax had sunk deeper into the pelvis. On a careful examination, it was found that the tuberosities of the ischia had been pressed considerably apart, the short diameter of the outlet had thus increased; and there was little doubt that the bones at the brim had also yielded somewhat to the pressure. The shoulder being brought down as much as possible, the viscera of the thorax were removed by the crotchet; and after fixing its point in the spine as near as possible to the pelvis, after strong traction, the nates and lower extremities were drawn through, and the other superior extremity soon followed. But little difficulty was experienced in crushing or extracting the head. The placenta soon followed. Three weeks after the delivery, the author received a satisfactory communication from Mr. Booth, stating that the patient had progressed very favourably.

[Mr Hodgson, the president, enquired what was the smallest diameter of the pelvis which would admit of the removal of the fœtus piecemeal?]

Dr Lee said that his object in narrating the case was to bring under the

consideration of the Society the propriety of inducing premature labour, in certain cases, before the seventh month of pregnancy, to prevent the necessity of resorting to other and dangerous operations. With respect to the production of premature labour after that period, full discussion had taken place. With regard to the question put by the President, he might remark that it was most difficult to determine the exact measurement during life, but that he had never seen a pelvis with a less diameter than in the present case; and after this, he felt confident that if premature labour was induced before the seventh month, no case could occur in which delivery could be effected. In this case, also, it might be remarked that the diameter of the pelvis had been increased by the pressure of the head of the child, in consequence of the bones being affected by mollities this might reasonably be expected to occur in cases of a similar kind. He wished to know if any one objected to the course of the proceeding which he had recommended previous to the seventh month, to prevent the necessity of craniotomy, or of the Cæsarian section. He might here remark that he had the best reason to believe that one fatal case of Cæsarian section had occurred since the discussions on that subject before the Society: and this, too, in an instance in which it would not have been so difficult to effect delivery as in the case before the Society. That operation, however—he meant the Cæsarian section—had not been recorded.—*Lancet, Feb.* 19, 1853, *p.* 186.

ON THE PHRENIC NERVE.

By Professor Lushka.

In a monograph by Luschka, on the phrenic nerve, the author arrives at the following conclusions:

1. The phrenic is not merely a motor nerve, but a mixed nerve, containing sensory filaments distributed to the pleura, pericardium, and the peritoneum, covering the diaphragm, and on the anterior wall of the belly. It is also distributed to the coronary and suspensory ligaments of the liver.

2. It brings about a double interchange of fibres between the sympathetic and spinal nerves, since organic nerve-fibres go to it from the inferior and occasionally the middle cervical ganglion, and it gives, by its abdominal portion, fibres to the solar plexus.

3. In the majority of cases the phrenic arises but from one cervical nerve —the fourth.

4. The diaphragmatic branches he traces to the tendinous centre, the inferior vena cava, the right auricle, and the liver.

5. In its course over the pericardium it appears to be endangered in diseases of the pleura and lungs, especially tubercular. Hence, probably, some of the disturbances of respiration in these complaints.—*Schmidt's Jahrbuch.* (*Med. Chir. Rev.*)