

VITAL VALUE OF CORRECT BALANCE.

The balance actually broken is fatal; the balance disturbed, danger to life is imminent. The disturbance being on the circulating side, and the blood being held in partial stasis, the blood-corpuscles begin to coalesce, the lung structure begins to lose its perfect organization, and even if the cardiac power is restored, these obstacles to recovery offer serious difficulties. When the balance is disturbed on the respiring side, and the heart is left imperfectly controlled by the air pressure, then there is exudation from the blood into the pulmonary structure, reduced combustion, and increasing strain on the thoracic mechanism, with failing prime force to supply it withal. In a word, in the course of disease there is no danger so long as the balance of the respiring and circulating mechanisms is correct; that disturbed, there is danger; that actually broken, there is death.

The failure of artificial respiration, the failure of transfusion of blood in cases where the cardiac-pulmonic balance is actually broken, is due to the perfection of the break. Let the pulmonary artery be left for the briefest time empty of blood, and it cannot then be recharged. The space previously occupied with blood is filled with some gaseous product, which prevents the blood passing on from the right ventricle, whatever force be employed short of rupture of the vessel.

POINTS OF PRACTICE.

And now the last and great question comes: Can an appreciation of the disturbance of this balance, and of the seat of the derangement, be applied, in any case of disease, to the service of practice?

I. I think there are facts to indicate that when we have before us a clear case of disturbed balance from distinct and continuous obstruction to the entrance of air through the larynx, any attempt to relieve by operation—tracheotomy—must, to be successful, be made very early; and that such operation, after long struggling for breath with the lungs congested, their structure infiltrated with fluid, their blood in languid motion, and the respiring muscles exhausted by incessant labor, is all but hopeless. I do not say this to discourage the operation even under these extreme circumstances, for once I have seen it succeed when, from these conditions, hope seemed gone; but I refer to it in respect to the prognosis connected with it.

II. When in disease there is failure of balance, clearly from the cardiac side, when the heart is failing while the respiration is active, then to do anything that shall reduce the circulation is to break the balance the more completely. On the other hand, when the cardiac action is full and powerful, and the breathing slow and oppressed, the greatest benefit will often follow the removal of cardiac pressure. I still occasionally abstract blood from a vein under these circumstances, and with very decided benefit. My papers on blood-letting as a scientific practice afford more than one example where, with a failing respiration and powerful circulation, the removal of a few ounces of blood has restored equilibrium and saved life.

III. In prescribing remedies which influence, specifically, the circulation, the balance of the cardiac and pulmonic systems should always be remembered.

As experiment teaches us that some volatile fluids having low boiling-points, such as ether, tend to reduce the respiring power, and that some volatile fluids having high boiling-points, such as chloroform, tend to reduce the circulating power, it was worth testing experience from experiment, in extreme cases, to see if these agents can be used, by inhalation, as regulators: ether, in cases where a relatively overpowerful respiration is working with an enfeebled circulation; chloroform, in cases where a relatively overpowerful circulation is working with an impeded respiration.

Lastly, in prescribing soluble remedies, we may, with advantage, remember their relative values as controllers of the respiring or circulating organs, and select from them according as we may be anxious to regulate the balance between air and blood. In conversing with Dr. Wilks not long since on this point, he made an observation, with which I entirely concur, on the employment of digitalis to control the rapid action of a heart made rapid in its action by the rapidity of the respiration. In lung affection where there is local pulmonary irritation, and where, under the reflex, the breathing is quickened and intensified, the heart may follow suit with a quickness of movement and height of pulse which may convey the idea of vascular overaction. But such overaction is not primary; it is the heart following the respiration at an intense expenditure of cardiac power, a possible forerunner of fatal cardiac exhaustion. In such a case any attempt to bring down the beats of the heart while the breathing remains high is to check the heart and break the balance on the cardiac side as certainly as if a weight were put on the regulator of a steam engine while the furnace was too keen and the steam-pressure too severe. Subdue the respiration by an opiate or by administration of ether, and the cardiac vehemence will subside of itself.

These and other points of practice suggest themselves when the simple but important study of the pulmonic cardiac balance is under observation. I leave it as a study, which widens greatly when it once takes hold of the observant mind.—*The Asclepiad*.

EFFECT OF CHLORIDE OF IRON ON THE TEETH.—AN EXPERIMENTAL STUDY.

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It is now, I believe, generally admitted by almost every one who, I might add, has had an opportunity of observing the effects, that the tincture of the chloride of iron, although passing transiently through the mouth and over the surfaces of the teeth, nevertheless exerts a most powerful and pernicious action on their structure.

Two things are essentially necessary before arriving at a satisfactory conclusion regarding the cause of this destructive action:

1. The composition of the tincture of the chloride of iron, i. e., the nature and quantity of the acid it contains.

2. A knowledge of the quantity of the different inorganic substances contained in the enamel of the teeth.

The tincture of the chloride of iron is made from

the liquor ferri chloridum, and contains 37.8 per cent. of the dry chloride. In making the tincture of the chloride, thirty-five parts of the liquor are added to sixty-five parts of alcohol. Atfield says that the liquor which is used in making the tincture contains much free acid, which is necessary to prevent the precipitation of the basic salts of iron; it is obvious from this that the relative proportions of the iron and the acid, whatever they may be, are adjusted very delicately, and that whenever water or any other fluid is added either to the liquor or tincture the result is a constitutional disturbance, i. e., the affinity existing between the acid and the iron which is held in the solution is more or less disturbed, according to the character of the fluid which is added.

Clinical observation shows that water increases the destructive energy of the tincture of the chloride of iron upon the structure of the teeth more than any other fluid, and therefore must necessarily not only cause more chemical disturbance when added to the solution, but do more injury to the teeth during the process of ingestion.

As an illustration: The effect of adding water to a simple solution of the chloride of iron, devoid of free acid, is to give us basic salts of iron and the separation of free hydrochloric acid.

When a tooth is immersed in a solution of the tincture of the chloride of iron, a double action takes place: 1. The chlorine unites with the calcium, forming the chloride. 2. The carbonic acid is given off, and the hydrated peroxide* of iron is precipitated.

When a small quantity of the strong solution of the tincture of the chloride of iron (official strength) is placed in a test tube, and a little of the carbonate of lime added, you will observe that there is a decided and immediate action, but no precipitation occurs; in a weak solution, however, say one drachm of the tincture to the ounce of water, the iron is at once precipitated. In the strong solution there is no precipitate until all the acid is neutralized by the carbonate of lime. On adding to the solution more lime, or immediately after neutralization takes place, there is the same precipitate, viz., the hydrated peroxide of iron; and this action continues until all the iron is precipitated, carbonic acid being given off continually throughout the operation, from the time the acid begins to neutralize until the last trace of the iron is precipitated. In other words, the perchloride of iron acts with the carbonate of lime precisely like an acid.

On referring to the card containing the specimens of teeth which have been immersed in solutions of the tincture of the chloride of iron of different strengths, it will be observed that those teeth which have been immersed in the strong solution for a period of twelve hours remain unaltered in their structure and appearance, while those teeth immersed for the same length of time in a weak solution, consisting of only one-half a drachm of the tincture to an ounce of water, are very materially injured. (It is impossible to show this satisfactorily in a drawing; cuts are therefore omitted.)

You will very naturally inquire why it is that a strong solution of the tincture of the chloride of iron, which, containing much more acid, and acting with a far greater energy on the carbonate of lime than the weaker solution, as you have just seen demonstrated, yet has little, if any, effect upon the lime salts of a tooth when immersed in such a solution. Before discussing this point let me call attention to an old and doubtless familiar experiment.

When a piece of zinc is placed in strong sulphuric acid (H_2SO_4), it will be observed that the acid has no effect whatever upon the structure of the zinc; but if a little water be added to the acid, we find the zinc is immediately destroyed. It is not entirely a matter of the strength of the fluids, so far as the quantity of iron or acid is concerned, but a matter of constitution or solubility.

The zinc in the strong sulphuric acid is protected from immediate destruction in the same manner that the tooth which is immersed in the pure tincture of the chloride of iron is protected, viz., the surface is blocked up with basic iron salts, insoluble in alcohol, which prevents chemical action. In the case of the zinc it is the sulphate of zinc resulting from the first action, which is insoluble in the concentrated acid, that forms a protecting coat over the surface of the zinc; the addition of water dissolves this protecting sulphate, and renders further chemical action possible. In the case of a tooth immersed in the strong solution of the tincture of the chloride of iron, a similar action takes place, viz., the oxide of iron first formed protects the tooth from immediate chemical action, owing to its compact adherence to its surface.

To illustrate still further, let me call attention to two otherspecimens of teeth on the card, which were immersed in the tincture of the chloride of iron and alcohol. Here we shall see that although the solution used contained the same quantity of the tincture, and possessed apparently the same relative strength, and immersed for the same length of time, yet no injurious effect is produced on their lime salts. The reason is due to the fact that alcohol is a dehydrating compound, and the peroxide which is formed in the alcoholic solution is of the anhydrous form, and in character very compact, adhering closely to the surface of the tooth, thereby preventing immediate chemical action, while, on the other hand, in the presence of water the peroxide which is precipitated is the hydrated form, and is flocculent in character, does not so well adhere to the surface of the tooth, or at least the product of the decomposition is more easily removed from the surface, leaving the free hydrochloric acid in the solution to unite with the lime salts with greater facility. Thus we find two forms of the peroxide of iron, viz.:

1. The hydrated form ($Fe_2(OH)_6$), formed in the water solution, which is flocculent and non-protecting to the teeth. 2. The anhydrous form (Fe_2O_3), formed in the alcoholic solution, which is heavy and compact, and protects the surfaces of the teeth. The following formula will show how the hydrated peroxide is formed from the anhydrous peroxide ($Fe_2O_3 + 3H_2O = Fe_2(OH)_6$).

The teeth on the card that were immersed in a solution composed of the tincture and the elixirs, are affected but very little. Take for example the teeth that are immersed in an ounce of the elixir of the pyrophosphate of iron, with one drachm of the tincture of the chloride added, which was the quantity of the tincture used

in the water solutions, as shown in number three column. With water as a vehicle, the enamel of the teeth is completely destroyed in twenty-four hours; but with an elixir in combination with the pyrophosphate of iron and the tincture of the chloride, the effect on the enamel is hardly perceptible.

The elixirs are composed of nearly twenty-five per cent. alcohol, the presence of which, as we have just seen in the strong solution of the tincture and in the alcoholic, affords a protection to the enamel of the teeth in the manner described. It is to be said, however, in this connection, that when a tooth is immersed in a solution of the tincture and simple sirup, in the same proportions as above mentioned, the enamel is not much affected. This is probably due to a mechanical reason or a condition of fluidity of the solution; in other words, the presence of the sugar in solution coats the surface of the enamel, preventing chemical affinity between the acid held in the solution and the lime salts. Equally interesting are the teeth immersed in a solution of the tincture and the weak alkaline waters (notably Vichy). When a drachm of the tincture of the chloride of iron is added to an ounce of Vichy water, a slight effervescence takes place, indicating that the bicarbonate of soda in the water has neutralized a part of the free acid introduced with the iron; thus when a tooth is immersed in such a solution, the destructive energy of the iron is somewhat modified. Unless the specific nature of this preparation of iron to which I have alluded is materially affected (and by contact the peculiar odor of the tincture remains the same), I see no reason why it should not, at least in all cases of anemia, be administered in combination with Vichy. The specimens of teeth on the card show the slight effect such a solution produces on the enamel.

There is an objection to the use of alcohol, whether in the form of spirit or combined with sirup in the form of an elixir. It has recently been stated by a prominent physician that although the administration of a drug in the form of an elixir was pleasant and agreeable, and the patient perhaps cured of some particular disorder, yet it might be found after the cure had been effected that the patient had contracted a habit for strong drink. Nevertheless, alcohol in the form of a spirit is looked upon with favor by many of our best physicians, and frequently prescribed in the fevers and other affections associated with great debility.

In such cases, when, in addition to alcohol, iron is also prescribed, they could doubtless with advantage to the patient be given together, and in this manner many teeth might be preserved which otherwise would be destroyed or seriously injured. Certainly water in small quantities, so far as iron in connection with the preservation of the teeth is concerned, is literally worse than nothing; and glass tubes seem to avail but little. When a tooth is placed in a weak solution of the tincture of the chloride of iron, the first appearance of a chemical action is indicated by the appearance of numberless minute bubbles distributed over the whole surface of the tooth. At the end of five minutes, if the fluid in the glass in which the tooth has been immersed be slightly agitated, a milky white cloud will be seen floating from the surface of the enamel; and if the fluid be agitated from time to time, it will, in the course of twenty-four hours, become more or less turbid, according to the amount of the tincture of alcohol contained in the fluid.

If the tooth be allowed to stand in the solution without being disturbed, a precipitate of the phosphate of iron will in the course of thirty days completely invest the upper part of the tooth, hiding it from view. This deposit is beautifully shown in the lower right hand corner of the card. On the same column can be seen the difference in the structure of the light and flocculent precipitate found in the weak solution and the heavy and compact precipitate of the strong or alcoholic solution.

At the end of thirty days from the deposit which is formed around the tooth, there will appear a number of projections extending in an upward direction, which in appearance resemble stalagmites, and which are composed principally of the precipitate which surrounds or invests the tooth, or the phosphate of iron. In connection with this phenomenon, it may be said that it is a well known fact that in making the superphosphate of lime, i. e., the soluble lime phosphate, for agricultural purposes, the manufacturer chooses the phosphates that are free from iron, for the reason that the phosphate that they have made soluble will, from contact with the iron, become in time insoluble, forming the phosphate of iron, which shows that mere contact of the iron compound, although not soluble, will cause a reaction with the phosphates.

We shall take occasion at some future time to present the results of further researches which we are at present engaged in.—*N. Y. Med. Monthly*.

FLAMINGOES.

THE birds which the ancients called phœnicopteri (Greek, φοινικότεροι, "red-winged"), derive their English popular name of flamingo from Spanish *flamenco*, which in turn is borrowed from the Flemish name, *vlaming*, "flaming," alluding to the bright red color of their wings. Hence also the French name, *flamant* (formerly *flambant*), "flaming," "blazing."

Although these birds, through the structure of their bill, which is provided with horny scales on the edge of the mandibles, and through the form of their feet, whose front toes are connected by webs, remind us of the duck, they are connected with the Grallatores or waders by the length of their tarsi, by the slenderness of their neck, by the lank form of their body, and by the arrangement of their skeleton. It was erroneous, therefore, in Linnæus, Wagner, and Gray to class them among the Palmipedes, alongside of the Anatides, since their true place is in the order Grallatores, where they nevertheless constitute a somewhat aberrant group. This group, it is true, is not very rich in species, but it exhibits so characteristic a physiognomy that it merits elevation to the rank of a distinct family. In fact, while the flamingoes resemble the rosy ibises and the spoon-bills of Tropical America and the wood ibises of Indo-China and Eastern Africa, through the colors of their plumage, they differ completely from these waders in their very thick, abruptly bent bill, with the upper mandible much smaller than the lower, and fitting upon the latter like the cover on a snuff-box. Despite its strange form, this bill is admirably adapt-

* *Synonyma*: Hydrated sesquioxide of iron, ferric hydroxide.