

page of the heart. If the inhalation be interrupted, the fall still goes on, at a rate proportionate to the rapidity of the fall while the chloroform was being inhaled. This after fall is due to absorption of some of the residue of chloroform in the air passages. Thus, often, if chloroform is given rather freely, respiration although going on when the chloroform is discontinued, afterwards stops. If the chloroform is stopped altogether, the blood pressure falls for a little, but soon rises again and shortly becomes normal. If the anæsthetic be pushed further, there comes a time when the blood pressure and respiration will no longer be restored spontaneously, although the heart continues to beat after the inhalation is stopped.

Occasionally, if the fall has been very gradual, the respiration stops completely, but as the blood pressure rises again, the respiration recommences spontaneously. The same thing may happen when the inhalation has been discontinued.

If struggling is accompanied by acceleration of the respiration and pulse, especially if the respiration is deep and gasping, there is a more rapid inhalation of chloroform and consequently a more rapid fall of blood pressure, and a greater after fall. A similar rapid decline of blood pressure is caused by involuntary holding of the breath, and by slight continuous asphyxia, for both are followed by a deep gasping inspiration.

Complete asphyxia has a similar but more marked effect, and the trace corresponds precisely to that due to irritation of the peripheral end of the cut vagus. The pressure falls very rapidly, sometimes almost to zero, and the heart's action becomes excessively slow or even stops for a few seconds. This effect of asphyxia is the result of stimulation of the vagi.

In itself, is the slow action, or temporary stoppage of the heart, with gr. at fall of pressure produced by vagus irritation, an element of danger in chloroform administration, and if not, wherein is the danger?

Deliberate irritation of the vagi during anæsthesia was shown experimentally to diminish rather than increase the danger. The effect on the heart is never continuous, and as the vagus becomes exhausted, or the irritation is taken off, the blood pressure rises again, as it

does when the same result is produced by asphyxia.

The slowing of the heart and circulation produced by irritation of the vagus from any cause, e.g., holding the breath in chloroform administration, retards the absorption and conveyance of chloroform to the nerve centres.

The effect of vagus irritation upon the heart is never continuous; and in chloroform administration, as the pressure rises again after the slowing of the heart and temporary fall of pressure produced by any form of asphyxia, violent respiratory efforts with bounding heart's action lead to a rapid and dangerous inhalation of chloroform, and consequent rapid and dangerous decline in blood pressure. The temporary exhaustion of the vagi after stimulation is to be feared, not the actual stimulation, so long as it is continued.

Accordingly in chloroform administration neither holding the breath, even if involuntary, nor vagus inhibition can be kept up beyond a certain time; and if the chloroform is not removed from the face, one or both of two things may happen: (a) when the animal breathes again, it takes deep and gasping inspirations, the lungs become filled with chloroform, and an overdose is taken in with extreme rapidity; or (b) when the restraining influence of the vagus is taken off the heart, through the irritation ceasing or the nerve becoming exhausted, the heart bounds on again, and the circulation is accelerated in proportion. The blood then becoming quickly saturated with chloroform, an overdose is at once conveyed to the nerve centres. The theory hitherto accepted that the danger in chloroform administration is the slowing or stoppage of the heart by vagus inhibition, is now shown to be *absolutely incorrect*. The controlling influence of the vagus on the heart is a safeguard; it is the exhaustion of the nerve which is dangerous.

When the pulse is rapid and bounding, with high blood pressure, there must be more rapid absorption of blood from the lungs, and a more rapid propulsion of the chloroformed blood to the medulla oblongata, and consequently a more rapid paralysis of the respiratory and vaso-motor centres and precipitous fall in the blood pressure. Not only is the poisoned blood carried more swiftly to the vital centres