

might have proved fatal but for an immediate resort to vigorous measures. Since, however, great relaxation of the uterine tissues does not occur in these cases, it is rarely that they progress to a sudden termination of life. Such a result might be brought about by a delay in the use of remedies.

We now pass to a brief notice of our last prominent cause of sudden death, viz.:

VI.—ENTRANCE OF AIR THROUGH THE UTERINE SINUSES INTO THE CIRCULATION.

This is a subject which, until a comparatively recent period, received no study; and even now points remain which need further elucidation. The possibility of this accident occurring was first suggested by the younger Legallois, over forty years ago, his father having observed the sudden death of a rabbit after parturition, an autopsy of which revealed the presence of air in the right auricle, pulmonary artery, anterior and posterior venæ cavae, and uterine veins. The subject has since been developed by Simpson, John Rose Cormack, George May, Jr., Dr. Green, of Mass.,*

and others; so that at the present day it is generally conceded that *air may enter the uterine veins after child-birth*, and that death may result from this cause.

It has long been known that air may enter the circulation after injuries or surgical operations; and that this occurs generally through the large veins about the neck, the location of which has hence acquired the name of the "dangerous region." This may happen when, from any cause, the incised extremity of the injured vessel is kept from closing; and the explanation generally received is, that during inspiration there is a tendency to the formation of a vacuum within the thorax, by which the air is drawn into the cut vein. Hence it has been noticed that air never enters the veins of the neck except during inspiration; and that during expiration air which has entered may even in some measure be expelled.

Now, when we examine the exact state of the newly delivered woman, we find conditions that are equally favorable for the occurrence of this accident. After accouchement the uterine veins are exceedingly large—"the size of a goose-quill, and some of them will admit the little finger without lacerating" (McClintock). They are also free from inosculation, and are without valves; and in a relaxed condition of the uterus are patulous.

The condition of the uterus and veins being favorable, then, how is the introduction of air brought about? The entrance of air into the vagina and uterus is the first step. Churchill thinks it may penetrate during the process of expulsion of the child, or that it may be present as the result of decomposition. Perhaps, however, it more commonly enters after the birth of the child. Dr. Adolph Rusch, after a careful investigation of the subject, has found that, by placing a multipara, whose genitals are in a normal condition, in the prone position or on all

fours, air will enter the vagina, if the vulva be open, "because the intestines, falling downwards by gravity, cause a vacuum." (Dr. Barnes's Lecture, *Lancet*, Feb. 10, 1872.) He did not find this to occur when the patient was on her back or side, though we can readily imagine it might do so if the head was much lower than the pelvis, and with the relaxed and heavy state of the uterus which we find after delivery. Dr. Barnes, in a recent lecture says: "If an examination is made when the uterus is relaxed after labor, especially if the hand be introduced into the uterus, the vaginal walls are separated from their usual contact, and a channel is formed along which air easily enters. Merely turning on the side, or a little more prone, will often, by favoring a fall of the uterus forwards, produce a vacuum, into which air will rush." Now, is it not possible, during this rush, for the air to enter, not only the vagina and uterus, but even at the same time the open sinuses? Or, a large quantity having once entered the womb, a repetition of the same cause, viz., falling suddenly forwards of the uterus and intestines, might force the air into the veins. This would be especially liable to occur if the detached placenta, or a remaining portion of it with membranes, covered the os in such a way as to permit the entrance, and yet prevent the exit, of air; in other words, to act as a valve at the os.

Amussat thinks that the respiratory movements even by elevating and depressing the intestines, may operate here as at the neck, and a suction action, or "venous inspiration," be produced.

But Simpson gives another explanation of this occurrence, accounting for it in this way: "Supposing air once introduced into the uterine cavity, which in some cases may occur in consequence of the alternate relaxations and contractions of the organ following delivery (as in after-pains, post-partum hæmorrhage, etc.); and supposing further that, under the returning contractions of the organ, the expulsion of this air was prevented by the presence of a clot at the os uteri, or other such obstructing cause; it will then, under the compression to which it is subjected, be liable to be driven into the open venous orifices existing in the lining membrane of the uterus." (Works, vol. ii., p. 721.) Dr. Cormack accepts this explanation, and even emphasizes it. He says: "Should any impediment be offered, in such cases, to the free exit of air by the os uteri, must be forced into the uterine veins, were their mouths not protected by coagula."

Symptoms.—It has been found by experiment, and in the observation of cases, that there must be either a considerable quantity of air present, or that it must enter the circulation with considerable force, in order to cause speedy death. A small quantity, injected slowly, produces but temporary disturbance. The symptoms present in serious or fatal cases we abbreviate from Dr. Green's paper as follows: The patient suddenly turns pale, utters a cry of alarm, as if death were impending, and becomes insensible. Or there may be observed anxiety of countenance, labored respiration, lividity of the lips, dilated pupils, convulsions. The pulse is generally

* To whose interesting paper in the *Amer. Jour. Med. Sci.*, for Jan., 1864, we are indebted for many facts here given.