

staggering, and unconsciousness, and the men would have fallen if they had not been supported. They say that, "in two subjects of weak intellect and moderately anæmic, in whom, notwithstanding the above symptoms, the compression was continued, a choking sensation, attended by vomiting and general convulsions, came on, which, however, did not attain an aggravated form: for, on withholding the compression, they disappeared in a few seconds." (*Op. cit.*, page 28.) Compressing the carotids does not, of course, entirely cut off, but only greatly lessens the supply of arterial blood to the brain; but these experiments render it probable that sudden occlusion of all the arteries supplying the brain would as certainly excite epileptic convulsions in man as in the lower animals. And this conclusion is confirmed by observing the results of certain diseases and accidents in the human subject. Thus convulsions occur almost invariably as a result of sudden suffocation or acute apnoea. It has commonly been supposed that the convulsions thus occurring are caused by the noxious influence of black blood upon the brain. It is far more probable that they are caused by the sudden and extreme anæmia of the brain, consequent on the impeded flow of blood through the lungs into the systemic heart and arteries, as explained in my first lecture. The epileptiform convulsions, which often result from the inhalation of nitrous oxide gas, admit of the same explanation. It is quite certain that, in Kussmaul and Tenner's rabbits, with closed carotids and subclavians, no black blood could reach the brain, yet the convulsions were apparently identical with those which result from suddenly fatal apnoea, whether in the lower animals or in the human subject.

A few years since the following case came under the observation of my friend, Dr. Lavies, and myself. A gentleman, about sixty years of age, had been confined to his bed for three weeks with symptoms which pointed to great feebleness of the heart, and probably to fatty degeneration of its walls. There was dyspnoea on exertion, and sometimes on awaking after along sleep; the heart's impulse and the radial pulse were feeble; there was some œdema of the legs, and over the bases of the lungs there

were moist crepitating sounds, probably the result of œdema there. He awoke in the middle of one night, told the nurse that he felt quite comfortable, asked the time, and began to repeat her reply, "Oh, half-past —", when he suddenly stopped, and the nurse, turning to him immediately, saw that his face was livid and he was in strong convulsions. In a few seconds, and before anyone could answer her call for assistance, the patient was dead. The body was examined, in the presence of Dr. Lavies and myself, by my friend and former colleague, Dr. Kelly. The walls of the heart were thin, soft, and fat. The right ventricle was dilated, and contained firm decolorized thrombus, extending from the apex of the ventricle through the tricuspid orifice into the auricle, to the outer wall of which it had evidently been attached and moulded, but, becoming separated from the auricular wall, it had fallen over the tricuspid orifice and completely closed it. Thus, the circulation must have been completely and instantaneously arrested. The result was lividity of the face from venous fulness, and epileptiform convulsions from cerebral arterial anæmia. In this case, as in the case of the rabbits with ligatured arteries, it is evident that the convulsions were caused not by black blood, but simply by the absence of circulating blood in the cerebral vessels.

When animals are killed by air being forcibly blown into a vein, the breathing becomes hurried, the animal suddenly falls down, and usually dies in convulsions; the contents of the bladder and rectum being frequently expelled at the time of death. Dr. John Reid states that, "in very few cases only is death from this cause not preceded by convulsions." (*Physiological, Anatomical, and Pathological Researches.*)

The immediate cause of death in these cases is the arrest of the frothy mixture of air and blood by the contraction of the pulmonary arterioles, the air seldom reaching the left side of the heart; and as a result of this arrest there is, of course, sudden extreme anæmia of the brain, and of every other organ supplied by the systemic arteries. In man, it appears that death from the accidental admission of atmospheric air into a vein during an operation, is