

increased strain upon the kidneys. In the primiparæ the vascular apparatus (Harcourt Barnes*) is not adapted, and in many pregnant women the assimilation of nutriment is inadequate to the added physiological work, and the tension of the cerebral vessels, which increases with the progress of gestation, attains its maximum (Madden†) during parturition, when convulsions must frequently occur. There is, in addition, an increase of nerve-force, irritation of the pneumogastric, and a nervous sensitiveness especially characteristic of pregnancy.

The evacuation of the gravid uterus is followed by engorgement of the abdominal veins, which had been more or less obstructed by the pressure of the enlarged organ. This abstraction of the blood from the thoracic organs and from the brain, harmless as it is in most cases of parturition, and salutary as it proves to be in a majority of cases of convulsions, may result in such a condition of cerebral anæmia, enfeebled and irregular cardiac action, and imperfect decarbonization of the blood, as to become, in conjunction with the deteriorated condition of the blood mass, the immediate and exciting cause of post-partum convulsions.

The condition of the blood during pregnancy is aggravated by the loss of albumen, simulates anæmia, yet the condition of the system is that of physiological plethora, due to the increment of the blood-mass. During pregnancy and during labor the brain may contain a redundancy of this impoverished and deteriorated fluid, and yet be insufficiently nourished. The sudden engorgement of the abdominal veins after delivery may withdraw from the cranial cavity the requisite amount of fluid. In both instances the brain is anæmic, in one case containing an excess, in the other a deficiency, of the altered and toxæmic blood.

To these physiological departures from a condition of health, due to the pregnant state and taking place coincidently in the blood, the vascular apparatus, and the nervous centres, most rapid in their progressive development and manifest in their effects upon the animal economy during the period when puerperal convulsions usually occur, and to the consecutive and consequent morbid changes, we must look for the predisposing and proximate causes of puerperal eclampsia. It is not, however, my purpose at present to seek a determining cause, but to associate these conditions with other facts which have but recently come to our knowledge.

The physiological phenomena which favor cerebral congestion lend force to the once very commonly accepted theory that puerperal convulsions were occasioned by a determination of blood to the head. This view derives important corroboration from the anatomical resemblance of the arterial circulation ‡

in women and in the cow,* to which parturient apoplexy and convulsions are mainly confined. The points of resemblance, as indicated by Prof. Walley, are in connection with the distribution of the internal carotid and the formation of the basilar artery and the circle of Willis, which favor a larger and more direct supply of blood to the brain, especially to the centres from which emanate the convulsive actions in puerperal eclampsia. If these researches should be confirmed by future investigations, we have present, during pregnancy, a peculiar condition of the blood, increased arterial tension, augmented blood-pressure, and an anatomical arrangement of the brain vascular apparatus, which favor inter-cranial congestion. To these may be added toxæmia, from destruction of the red blood-corpuscles, and retained effete products from renal congestion; malnutrition, from the loss and consumption of albumen, and from an inadequate supply of nutriment; deficient consumption of oxygen, from diminution of muscular action; and the various incidental nervous phenomena which so frequently complicate the period of utero-gestation. All these, acting together in the turbulent union of untoward events, culminate in convulsions.

But perhaps the most important contribution recently made to the study of the nature of puerperal eclampsia consists in the recognition of the febrile phenomena so uniformly associated with the convulsive seizures.

Quineke was the first to observe the elevation of temperature in puerperal eclampsia; † but to Bourneville‡ we are indebted for the first series of systematic observations. From carefully recorded thermometric observations in seventeen cases, including four fatal cases, he deduces the following conclusions: §

"1st. During the eclamptic state the temperature is raised from the onset of the attack to its termination.

"2d. In the intervals of the attacks the temperature remains elevated, and at the moment of the convulsion a slight accession takes place.

"3d. If the eclamptic condition is about to terminate in death, the temperature continues to augment, and reaches a very elevated figure; if, on

* In the horse the vertebrals do not enter into the formation of the brain-circulation. In the pig and dog the basilar artery is formed by the cerebro-spinal branches of the occipital, as in the horse. In the sheep the vertebral, after anastomosing with the occipital, sends branches which gain access to the cranium and contribute to the formation of the basilar, and a large plexus which lies underneath the medulla. The difference of the circulation in the ox and sheep is, that in the ox each vertebral, after anastomosing with its fellow, proceeds forward and connects through the posterior plexus with the occipital, while in the sheep the vertebrals pass into the spinal canal, inosculate, proceed forward as a single artery, again bifurcate, and anastomose with the occipitals. Tralley, *Obst. Jour. Great Britain and Ireland*, vol. ii. p. 376.

† Quineke, *Berlin. Wochenschrift*, 1869, No. 29.

‡ *Arch. de Toxicologie, Des Mal. des fem. et des Enf.*, April, 1875, Paris.

§ I have had the opportunity of confirming these observations in two cases, the convulsions occurring in one at the sixth month, and in the other at "full term."

* *Amer Jour. Obst.*, vol. viii., p. 719.

† *Obst Jour. Great Britain and Ireland*, vol. ii. p. 239.

‡ The human brain derives its arterial supply through the internal carotid, vertebral, and ophthalmic arteries. The circulation is equalized by the circle of Willis, which is formed by the anastomosis of the branches of the internal carotid and vertebral arteries. The basilar artery is formed by the junction of the vertebral arteries.