THE RELATION OF BIRTH TRAUMA TO NEONATAL MORTALITY AND INFANT MORBIDITY*

HUGO EHRENFEST, M.D.
ST. LOUIS

A factor of outstanding significance in intranatal and neonatal mortality and infant morbidity is the traumatization of the child incident to birth. An increasing appreciation of this source of loss in infants' lives during or soon after delivery is unmistakably expressed in the gradual and steady increase in the number of death certificates that give birth injury as the cause of death. Even so, official vital statistics are still far from disclosing actual conditions. This particular cause of death of the new-born infant only rarely manifests itself conclusively in symptoms and clinical findings, and in the majority of instances can be discovered only by means of an exhaustive postmortem study that includes inspection of the dura folds within the cranium, sectioning of the vertebral column (especially of its cervical portion), and inspection of all abdominal parenchymatous organs with particular attention to the suprarenal glands.

Routine use of this type of extended autopsy reduces to a noteworthy degree that large group of stillbirths and early deaths at present rather generally assigned to asphyxia, prematurity and congenital debility, and also lessens the number of cases in which the customary entirely inadequate autopsy fails to reveal the actual cause of death.

It is impossible to give exact figures as to the frequency with which the child is injured in some way or another in the course of his birth. But the relative importance of birth trauma for intranatal and neonatal mortality is well attested by such facts as the following: In large series of complete autopsies performed subsequent to breech labors and particularly after versions and extractions, the immediate cause of death is found to be of traumatic origin in from 80 to well over 90 per cent. In large series of necropsies done on stillborn infants and

* Read at the White House Conference for Child Health and Protection, Washington, D. C., Feb. 18, 1931.

* A bibliography pertaining to the facts mentioned in this article may be found in Ehrenfest, H.: Birth Injuries of the Child, ed. 2, New York, D. Appleton & Company, 1931.

those dying within the first few days of life, fatal lesions within the cranium on an average are discovered in about 25 per cent, while in another 25 per cent definite evidence of some damage is present which, however, cannot be positively accepted as responsible for death. The latter group contains many cases in which an edema of the brain or widely distributed minor hemorrhages leave doubt whether they express primary traumatization or represent only secondary phenomena of asphyxia actually induced by interference with fetoplacental blood circulation. It seems likely that about 5 per cent of autopsies on new-born infants reveal a hemorrhage in the suprarenal glands which might have caused death. It is of great practical interest that in severe hepatic injuries sustained in birth (or during brusque efforts at resuscitation), the baby as a rule seems well at first and rather unexpectedly dies on the third or fourth day, and that the cause of death is ascertained only in autopsy.

The cranial structures and parenchymatous organs of the premature baby are particularly vulnerable and, for this reason, are often severely traumatized even in normal spontaneous labor, especially when it progresses rapidly. To a very large extent both the immediate and the later fate of the premature infant is dependent on the degree to which he is traumatized at birth.

It has become evident that failure of a normal onset of the respiratory function immediately after birth in a considerable percentage of cases is due to some damage of the respiratory center. It certainly accrues to the benefit of the new-born infant if the attending physician accepts every deviation from normal in either the infant's respiratory activity or his behavior and actions as suggestive of possible traumatization, which is not necessarily intracranial. This point deserves special emphasis because, with most of the interest lately concentrated on intracranial damage, sight has been lost of the frequent occurrence of other injuries, such as spinal column and cord lesions, hepatic rupture, suprarenal hemorrhages and other accidents that promptly or within a few days lead to death.

Injuries of the infant incident to birth, whatever part of his body they may involve, practically without exception are of a traumatic origin due to various interacting mechanical factors. Their occurrence, however, is greatly influenced and favored by such other conditions as fragility of the bones and blood vessels (prematurity, syphilis), and their consequences are aggravated, for instance, by a lack of ability of extravasated blood to coagulate normally. Under such unfavorable conditions the mechanical forces (especially pressure) at play during every labor might, even in the course of a normal and spontaneous labor, lead to serious damage of the infant. Careful analysis in the individual case, as a rule, will permit acceptable conclusions in regard to the origin of

an excessive force which proved incompatible with the integrity of certain structures. This excess might arise entirely independent of any action on the part of the attending obstetrician as, for example, in a very stormy labor. Most often, however, such damaging compression of the head, shoulders, thorax or abdomen or excessive bending or twisting of the vertebral column will be found to stand in definite connection with intervention of some sort (the administration of an oxytocic, the application of forceps, extraction in breech labor or after version, etc.) or with manipulations incident to resuscitation.

From these and other facts, well founded deductions can be made in regard to the possibility of preventing birth injuries and thus reducing neonatal mortality: Any artificial intervention should be limited to well defined indications and, if possible, should be resorted to only under favorable external conditions. (Forceps extractions made at home will always be more dangerous to both mother and infant than those performed in a hospital.) When interference with labor is decided on solely in the interest of the infant, the selected method of delivery should be practically free from danger to the mother and should not add to the already present risks for the infant. When intervention seems justified in the interest of the mother, the almost inevitably associated risk to the baby should not be disregarded.

While in some instances traumatization of the infant actually cannot be avoided, the incidence and extent of such an accident to a very large degree are determined by the judgment and skill of the obstetrician.

Present information concerning the frequency and variety of birth traumatisms of all kinds leaves no doubt but that it is only a relatively small percentage of cases in which such traumatization proves promptly fatal on account of its severity (fractures of the cranial bones or of the vertebrae, extensive hemorrhages in the skull, spinal canal, abdominal cavity, etc.), as the result of its particular localization (small hemorrhages in the brain, suprarenals, etc.), or under the influence of unfavorable contributory factors (prematurity, hemorrhagic diathesis, etc.). In the majority of instances these injuries are only slight. They may remain unnoticed (abrasions in the mouth, clavicular fractures, slight intracranial damage without hemorrhage, etc.), or the observed effects may disappear quickly and completely (edema of the brain, cephalematoma, facial palsy, etc.). There remains still another large group in which the baby immediately after delivery exhibits such disquieting symptoms as asphyxia or other anomalies of respiration, increased reflex irritability and even convulsions, paralysis of one or more extremities, etc. This group has given rise to the complex question of possible later sequelae and of the significance of birth trauma in later infant and child morbidity. If the aforementioned or similar symptoms persist, one often is finally enabled to arrive at a definite diag-

nosis, such as an intracranial hemorrhage, the central origin of a facial palsy, a serious brachial plexus injury (frequently associated with anomalous respiration as the result of a simultaneous injury to the phrenic nerve), a spinal cord compression by hemorrhage or by a fractured vertebra, fractures of the long bones, and dislocations of the shoulder and other joints, etc. Physical abnormalities noticed early in life commonly are interpreted as congenital while, as a matter of fact, they may be the consequences of injuries sustained in birth.

Reasonable doubt may be entertained whether there exists a direct causative relation, as is claimed by some writers, between intracephalic trauma and spastic vomiting, between minute hemorrhages in the pituitary or suprarenals and deficiencies in later physical growth, between testicular trauma in a breech labor and later azoospermia, or between hemorrhages in the eye or interior ear and later defects of vision or hearing. Certainly in some cases the immediate connection between a birth trauma and a deficiency manifesting itself in later life can be traced. Such a consequent defect is not necessarily of a physical nature. Of the greatest practical interest today is the possible etiologic relation of nonfatal intracranial damage to mental deficiency. It thus can be seen how important it has become from this point of view alone to observe closely the behavior and actions of the new-born infant and to record for later reference even the slightest deviation from normal.

The manifestly exaggerated tendency prevailing during the past decade among pediatricians, neurologists and orthopedic surgeons, of explaining practically all physical and mental deficiencies of younger children on the basis of birth injuries, now has given place to the more reasonable view that such injuries represent the causative factors only in certain cases. In the individual case such an etiologic relation can be established only if precise information is available concerning certain symptoms observed immediately after birth. The mere assertion of the mother or even the ascertained fact that the labor was "long," "difficult," "abnormal" or terminated artificially is insufficient. Neurologists at present seem to agree that in the case of a definite hereditary disposition this factor is more likely to represent the etiologic element. It is more logical to explain the repetition of the same or similar defects in several children of the same mother on the basis of heredity than, as has been done, by an anomaly of the pelvis.

The rôle of the obstetrician in the problem of immediate and delayed consequences of birth traumatization is twofold. In many cases he may prevent the trauma, and he should be able at any time to supply data concerning the new-born that may be indispensable for a correct diagnosis. Prevention of traumatization beyond doubt would reduce

infant mortality during and soon after birth, and would better the chances of the new-born infant for normal development.

Considerable progress has been made of late as the result of more exact information in regard to anatomic and mechanical factors leading to this great variety of possible injuries of the child, and as the result of better knowledge in regard to their possible sequelae.

As far as specific conditions in the United States are concerned, at least two seem to call for serious consideration and correction.

Information concerning fetal and neonatal mortality, as at present furnished by the Bureau of Vital Statistics, does not enable obstetrician or pediatrician to gain precise insight into the relative importance of birth trauma as the actual cause of death. Diagnoses on death certificates such as asphyxiation, congenital debility or prematurity without further qualifications are practically meaningless. It must be admitted that frequently the immediate cause of death can be ascertained only by a thorough autopsy, but it seems likely that more and better information could be secured through appropriate changes in the official birth certificates and death certificates for stillborn or newborn infants. It is hoped that the physicians of this country would not object to the additional work entailed by filling out more elaborate certificates if they be made to understand that additional information given by them will represent one of the most potent aids in the general endeavor of reducing neonatal mortality and infant morbidity rates. (The standard birth certificate gives thirteen reasons for its practical importance, all of a social or economic nature and none mentioning its medical value!)

In view of the unmistakable relation of traumatization of the child to artificial delivery, the rapid growth of an operative trend in the obstetric practice of this country cannot fail to prove alarming. Various reasons for this phenomenon can readily be recognized, some fully justified, others intolerable. But whether the blame rests with physician or patient, it seems that excess in this respect could best be curbed by wide propagation among the women of this country of the fact that ready compliance with their ever-increasing insistence on a short and comfortable labor is not fully compatible with the principles of sane conservative obstetrics and inevitably implies certain risks to themselves and their infants.

3720 Washington Boulevard.