

Compression hypoxic birth trauma

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ABSTRACT

In the fetus in childbirth, birth traumatic, compression hypoxic, and hypoxic-ischemic brain injuries occur. In clinical and pathoanatomical practice, problems arise in their differentiation. It is proposed that birth traumatic injuries be divided into two types: (1) Obvious traumatic injuries and (2) compression hypoxic injuries. This allows compression hypoxia to be attributed to birth trauma and not to hypoxic-ischemic encephalopathy. For the 1st time, it is proposed to use the term “compression hypoxic birth trauma.”

Key words: Birth damage, birth trauma, compression hypoxia, fetal brain, obvious traumatic injuries

INTRODUCTION

There are birth traumatic, compression hypoxic, and hypoxic-ischemic injuries of the fetus and newborn brain. If the fetus or newborn does not have gross traumatic injuries, then compression hypoxic injuries (CHIs) are either ignored or referred to as hypoxic-ischemic, which is not entirely true. How to distinguish between the considered lesions? The correct diagnosis and prevention of diseases depends on this. Birth trauma (BT) is caused by a pathological configuration and excessive action of mechanical forces on the fetal head during childbirth. CHIs result from compression of the skull and brain during childbirth, causing venous stasis, hypoxia, and acidosis of the fetal brain tissue. Hypoxic-ischemic encephalopathy (HIE) occurs as a result of hypoxia and acidosis of the brain tissue in violation of the uteroplacental and umbilical cord circulation, as well as diseases of the mother and fetus during childbirth.

In terms of the nature of damage and pathogenesis, CHIs are close to HIE, and in terms of etiology, CHIs are close to BT. Earlier I tried to separate BT and compression hypoxia^[1,2] and referred the latter to the types of hypoxia. This is due to the fact that in practical medicine, compression hypoxia in children is referred to as “hypoxic-ischemic encephalopathy.” Now I have revised my ideas and I think this division is not entirely correct: I attribute compression hypoxia to the manifestations

of BT and call it compression hypoxic BT. The division of the lesions under consideration occurs according to etiology – the primary cause of the resulting damage. With BT and CHI, this is a mechanical factor. With HIE, this is systemic hypoxia in the fetus, causing corresponding brain damage. With CHI, hypoxia is local, limited to the brain, while other organs and tissues of the fetus may not lack oxygen.

WHAT IS BIRTH TRAUMA?

BT is (1) birth traumatic injury and (2) disease (nosological unit). Birth traumatic injury can be insignificant (for example, a birth tumor and hemorrhage in the cerebellar tentorium) does not worsen the child’s health, that is, it can exist without disease. Birth traumatic injury can affect the state of the body (for example, subdural hemorrhage) and even lead to death; in this case, BT is a disease.

BT can occur spontaneously during naturally occurring childbirth (this is spontaneous BT) or as a result of the actions of an obstetrician, midwife, surgeon using hands or instruments (this is obstetric BT).

The action of physical forces on the fetal head is carried out by two main mechanisms: (1) Rupture and stretching of structures and (2) compression. Therefore, physical action is accompanied by two groups of injuries: (1) Ruptures of the

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cerebellar tentorium, falx, bridging and other veins, fractures and (2) compression of the membranes, vessels, and brain tissue. The former leads to significant hemorrhages and is easily diagnosed. The latter can usually be accompanied by minor hemorrhages, but venous congestion and hypoxic-ischemic damage to neurons predominate in the brain tissue; it is difficult to prove that the detected lesions belong to BT and not to intrapartum hypoxia. To prove the traumatic genesis of brain damage, it is important to study the cerebellar tentorium and identify intradural hemorrhages in it.^[3]

WHAT IS COMPRESSION ENCEPHALOPATHY?

It should also be borne in mind that most of the widespread hypoxic-ischemic brain lesions are caused by BT, since many cerebral circulation disorders accompanied by hypoxia and cerebral ischemia are not caused by disorders of the uteroplacental and umbilical cord circulation, but by compression of the head during childbirth. Such lesions are called compression hypoxic or circulatory hypoxia.^[4,5] CHIs are caused primarily by hypoxia of the brain due to impaired blood circulation in it with pathology of the skull configuration and compression of the head. Hypoxia of the brain can occur without disturbances of the uteroplacental and umbilical cord circulation. The brain can undergo hypoxia in the absence of systemic fetal hypoxia. There is ample evidence that when the skull is compressed, the fetal heart rate slows down, intracranial pressure increases, cerebral blood flow decreases, oxygenation of the brain blood decreases, etc.^[6,7] These data were obtained, for example, when modeling BT by compressing the heads of animal fetuses. Lindgren^[8] suggests to allocate “cerebral compression ischemic encephalopathy,” and Schiffrin *et al.*^[9]—“Craniocerebral Compression Ischemic Encephalopathy.” Iova^[10] suggests the condition of newborns with the presence of excessive head compression and cerebrovascular accidents to be called “fetal head compression syndrome” in childbirth. Previously, the concept of “traumatic hypoxia” was distinguished.^[4,11] I call such injuries during compression of the head “compression hypoxic” or “compression hypoxia.”^[12] The data presented prove the necessity of the existence of the indicated concept.

TWO TYPES OF BIRTH TRAUMATIC INJURIES

The results of our own pathological studies of fetuses and newborns show that two groups can be attributed to traumatic brain injuries during childbirth (of a mechanical nature) [Figure 1]: (1) Obvious (unmistakable, undoubted) traumatic injuries (OTI) and (2) compression hypoxic-ischemic injuries (CHIs).

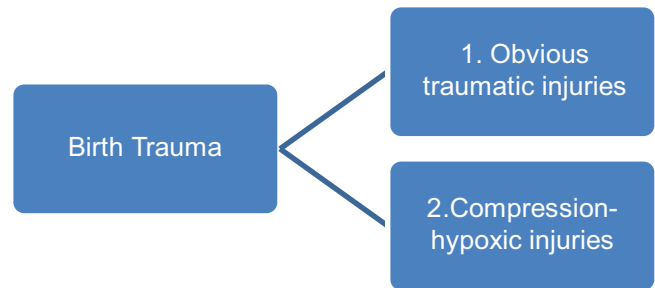


Figure 1: Types of birth injury

OTI includes injuries, the origin of which is clearly traumatic. These are fractures, dislocations, ruptures of veins, cerebellar tentorium, falx, sinuses, the appearance of deep grooves of cerebral compression, epidural, subdural, certain types of subarachnoid and subpial hemorrhages, and some others. The identification of these injuries makes it possible to have no doubt about their traumatic genesis since both mechanical injuries and hemorrhages caused by these injuries are determined during the diagnosis.

With CHI, traumatic injuries are poorly diagnosed and may even be absent, especially in the clinical study of newborns. For example, hemorrhages in the tentorium cerebelli or falx are not diagnosed, since their presence is not important for the child's clinic. The degree of head configuration is not determined. Pathological examination of deceased children reveals all the changes characteristic of CHI.

CHIs caused primarily by venous congestion of blood in the tissues of the head and brain include intradural hemorrhages in the tentorium cerebelli, falx, cephalohematoma, certain types of subarachnoid hemorrhages, hemorrhages in the region of the quadrangular lobules of the cerebellum, subpial, subependymal and perivascular hemorrhages, ischemic and hypoxic changes of neurons, focuses disappearance neurons and periventricular leukomalacia, necrosis of glial cells, and astrogliosis. CHI should be differentiated from hypoxic brain damages (HIE) caused by disorders of the uteroplacental and umbilical cord circulation and other reasons. Since their mechanical nature is not so obvious in CHI, it is difficult to prove the mechanical genesis of hemorrhages, there may be no large focal hemorrhages and there is an obstetrician's desire to hide BT, often such children are exposed to an amorphous diagnosis of “hypoxic-ischemic encephalopathy.” For cases of damage to the brain caused by its compression with a pronounced configuration of the head, the term “compression cerebral ischemic encephalopathy” has long been proposed.^[13] At present, I consider the term “compression hypoxic birth trauma” to be justified. You can use the terms “compression hypoxia” or “compression encephalopathy” and assume that these are manifestations of BT.

CONCLUSION

In the process of pathological configuration of the fetal head in labor (excessive, rapid, and asymmetric),^[14] not only severe traumatic injuries (fractures, ruptures, and hemorrhages) occur but also hypoxic-ischemic brain damage. Since these lesions are caused by mechanical factors, they should be called compression hypoxic BT. Compression encephalopathy (hypoxia) is a type of BT. It is dominated by hypoxic-ischemic brain lesions. It is incorrect to refer to it as HIE, which is mainly caused by disorders of the uteroplacental and umbilical cord circulation, systemic hypoxia in the fetus.

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