



Perinatal asphyxia and medical professional liability: A case series

Andrea Verzeletti*, Anna Leide, Francesco De Ferrari

Medical and Surgical Specialties, Radiological Sciences and Public Health Department, University of Brescia, Brescia, Italy

Received 28 September 2015; revised 13 March 2016; accepted 21 March 2016

KEYWORDS

Medical malpractice;
Perinatal asphyxia;
Causal relationship

Abstract In the context of medical professional liability, obstetrics is one of the most involved medical specialties because the unfavorable outcome of a pregnancy is difficult to accept for parents, who tend to reduce it to inappropriate care that occurred during pregnancy or birth. 32 cases of perinatal asphyxia were evaluated by the Institute of Forensic Medicine in Brescia during the period between 1999 and 2014 (13 in Civil Court and 19 in Penal Court). 9 out of the 32 pregnancies were twins, so the considerations were carried out on a total of 41 fetuses/newborns. Profiles of inadequacy were identified in 66% of cases (85% of the cases evaluated in Civil Court; 53% of the cases evaluated in Penal Court). The existence of a causal relationship between the medical conduct and the onset of asphyxia was recognized in 79% of civil cases and in 38% of penal cases. There is a “greater rigor” in the verification of causal relationship and malpractice profiles in penal cases compared to civil ones: this is in harmony with the most recent Italian Court decisions, characterized by compelling suspect’s protection in the presence of a reasonable doubt in criminal matters and by victim’s protection in civil ones.

© 2016 The International Association of Law and Forensic Sciences (IALFS). Production and hosting by Elsevier B.V. All rights reserved.

1. Introduction

In the context of medical professional liability, obstetrics is one of the most involved because the unfavorable outcome of a pregnancy is difficult to accept for parents, who often claim medical deficiencies during pregnancy or birth.

One of the most relevant conditions is perinatal asphyxia, a pathological condition that can occur before, during or immediately after the birth. In perinatal asphyxia there is a decrease in the oxygen content in fetal blood, caused by a not sufficient supply through the placenta before or during birth, or, after birth, by an alteration of the adaptation mechanisms to extrauterine life, such as the beginning of breathing, which may not correctly start.¹ The incidence of perinatal asphyxia is variable: the lower one in Scandinavian countries (about 5–1000 live birth), while in the underdeveloped countries it’s 20–30 times higher.² Birth asphyxia is one of the recognized causes of perinatal mortality and childhood disability: a percentage between 20% and 50% of the asphyxiated infants dies in the perinatal period; 25% of the newborns will develop

* Corresponding author at: Università degli Studi di Brescia, Piazzale Spedali Civili 1, 25123 Brescia, Italy. Tel.: +39 030 3995480; fax: +39 030 3995839.

E-mail address: andrea.verzeletti@unibs.it (A. Verzeletti).

Peer review under responsibility of The International Association of Law and Forensic Sciences (IALFS).

<http://dx.doi.org/10.1016/j.ejfs.2016.03.004>

2090-536X © 2016 The International Association of Law and Forensic Sciences (IALFS). Production and hosting by Elsevier B.V. All rights reserved.

serious neurological problems, such as hypoxic-ischemic encephalopathy, cerebral palsy, mental retardation, learning disorders and epilepsy.³ The mechanisms that determine perinatal asphyxia can be acute or chronic and can originate from the mother, from fetal adnexa (umbilical cord, placenta) or from the fetus/newborn. Regarding the mother, the cause is an insufficient oxygen supply to the fetus through the placental circulation. These events can occur during pregnancy or during labor because of maternal blood pressure changes or diseases lowering maternal blood oxygenation, or because of uterine contractions occurring outside labor, that reduce oxygenation through the umbilical vessels and depress fetus' cardiovascular and nervous system. If uterine adnexa are involved, the asphyxial event is connected to an interruption of umbilical circulation (because of a compression of the umbilical cord), or it can be caused by an alteration of placental gas exchange, as in the case of placenta previa, placental insufficiency or placental abruption. If the asphyxial mechanism originates from the fetus/newborn, the most frequent cause of asphyxia is his inability to breathe immediately after the birth and to put in place the mechanisms of neonatal adaptation: this can be the result of respiratory center depression caused by an excessive administration to the mother of analgesic drugs, or it can be the direct consequence of pathology of the fetus/newborn. The main risk factors for perinatal asphyxia are diabetes mellitus, high blood pressure, pre-eclampsia, second and third trimester hemorrhages, infections, poly-oligohydramnios, preterm birth, multiple pregnancy, drugs or toxic substance administration, intrauterine growth restriction. One of the most important target organs of perinatal asphyxia is the brain: there can be cerebral edema and hemorrhages, that can lead to an elevation of intracranial pressure, to alterations in cerebral blood flow and in regulatory mechanisms of the brain district, where there can be an irreversible cellular damage, up to hypoxic-ischemic encephalopathy.⁴ There are three forms of hypoxic-ischemic encephalopathy: mild, moderate and severe.⁵ Newborns who have the *mild* form (clinically characterized by increased irritability, normal muscle tone or mild hypotonia without seizures) generally have a normal psychomotorial development. Newborns who have the *moderate* form of encephalopathy (clinically characterized by lethargy, hypotonia, diminished spontaneous body movements, diminished reflexes with or without associated seizures) have a 20% probability to develop a severe brain disability. Newborns who have the *severe* form of encephalopathy (coma, flaccid muscle tone, tetraplegia, absence of primitive reflexes, seizures, need for mechanical ventilation) have a high probability of death or, if they survive, to develop a severe encephalopathy.⁶ The prevention of perinatal asphyxia is essentially based on the identification of risk factors which are present before and during pregnancy, on careful controls during gestation and on an accurate and timely assistance during labor and to the baby immediately after birth. Before and during childbirth, prevention is based on cardiotocography (CTG), which considers the variability of the fetal heart rate and can give important information about the presence of fetal distress, conditioning also the approach to childbirth.⁷ If there are signs or parameters allowing to detect asphyxia, the first measure is cesarean section; natural childbirth, in fact, could lead to a worsening of fetal distress, and it should be limited to cases in an advanced stage of labor.

2. Methods

32 cases of perinatal asphyxia were evaluated by the Institute of Forensic Medicine in Brescia, Italy, during the period 1999–2014: 13 cases in Civil Court and 19 in Penal Court. 9 out of the 32 pregnancies were twins (3 dealt in Civil Court and 6 in Penal Court), so the considerations were carried out on a total of 41 fetuses/newborns (16 in Civil Court and 25 in Penal Court). All cases were evaluated in association with the specialist obstetrician. According to Italian law civil field refers to the duty to repair the economic consequences of the damage; in penal field physician can be pursued by a crime committed during his work. These two fields are independent of each other: a physician can be pursued for the one or the other or both, according to the patient's will.

3. Results

The different maternal risk factors and the alarm signals whose presence correlates with a higher probability of an asphyxial episode before, during and after labor were considered (Table 1).

In 37% of cases, the delivery took place in a natural way, while in the remaining 63% a cesarean section was done. The distribution of Apgar score in the cases is shown in Table 2.

The cardiotocographic monitoring was performed in 63% of cases; in 65% of cases in which the monitoring was carried out, it was altered because of: the absence of fetal heart rate, decreasing variability, reduced fetal active movements, late decelerations (Table 3).

Ultrasound was performed in 38% of cases. In 17% of cases in which this examination was carried out no pathological findings were detected; in 83% of cases, ultrasound showed alterations, such as the absence of fetal heart rate, oligohydramnios or polyhydramnios, increased resistance of umbilical artery, areas of placental abruption, placenta previa, placental insufficiency, diffuse brain damage, intrauterine growth retardation (IUGR); only in one case, finally, the alteration detected by ultrasound examination was not specified (Table 4).

Table 1 Maternal risk factors and alarm signals.

Twin pregnancy	28%
Vaginal bleeding	22%
Premature rupture of membrane	19%
Placental abruption	19%
Preterm delivery risk	16%
High blood pressure/Preeclampsia	13%
Meconium-stained amniotic fluid	9%
Diabetes mellitus	6%

Table 2 Distribution of Apgar score.

Score	I minute (%)	V minute (%)	X minute (%)
8–10	10	42	60
4–7	50	32	20
≤3	40	26	20

Table 3 Cardiotocography.

Normal findings	35%
Pathological findings	65%
Absence of fetal heart rate	23%
Decreasing variability	23%
Reduced fetal active movements	15%
Late decelerations	8%
Other (not specified alterations)	31%

Table 4 Ultrasound.

Normal findings	17%
Pathological findings	83%
Absence of fetal heart rate	40%
Polyhydramnios	10%
Partial placenta previa	10%
Increased resistance of umbilical artery	10%
IUGR + oligohydramnios + placental insufficiency + placental abruption	10%
Diffuse brain damage	10%
No specified alterations	10%

The gynecological examination was performed in 31% of cases; in all cases, no pathological findings were detected; in 70% of cases the medical examination was associated with cardiotocographic monitoring, while in the remaining 30% it was associated with ultrasound.

Regarding the evaluation of the medical conduct, profiles of inadequacy were identified in 21 out of 32 cases (66%), and in particular in 11 out of 13 cases (85%) evaluated in the Civil Court and in 10 out of 19 cases (53%) evaluated in the Penal Court.

Inadequate medical behavior was identified in:

- Not correct cardiotocographic monitoring (15 of 32 pregnancies; 47% of cases) because of: misreading of the trace, too short or interrupted monitoring, diagnostic failure due to lack of monitoring of uterine contractions;
- Delay of cesarean section (8 of 32 pregnancies; 25% of cases);
- Omission of clinical and/or instrumental controls (5 of 32 pregnancies; 16% of cases);
- Omission of hyaline membrane disease prophylaxis and failure to transfer to neonatal intensive care (1 pregnancy of 32; 3% of cases);
- Incorrect execution of the Kristeller maneuver (1 pregnancy of 32; 3% of cases).

It was finally examined the existence of a causal relationship between medical behavior and the onset of asphyxia. The existence of a causal relationship was established in 62% of cases assessed in Civil Court and in 25% of cases evaluated in Penal Court.

4. Discussion

The analysis of the case study was focused on two main elements: the evaluation of the physicians' behavior during pregnancy and during delivery, as well as the verification of the causal relationship between that behavior and the onset of

asphyxia. Profiles of inadequacy in physicians' conduct were detected in 27 fetuses/infants out of 41 (66%), so their conduct was censurable. In civil matters, inadequate medical conduct was recognized in 14 out of 16 cases (88%); in the remaining 2 cases (12%) there were no censurable behaviors. In the penal field, the situation was more balanced: the medical conduct was inadequate in 13 cases out of 25 (52%); in the remaining 12 cases (48%) no censurable behavior was found. The most frequent inadequate behavior was related to cardiotocographic monitoring and to ultrasound examination. Particularly, in relation to the interpretation of cardiotocographic reports, incorrect behaviors were primarily reading errors of the cardiotocographic trace or an incorrect execution of CTG (it was too short or too early interrupted). This was followed by an inadequate medical care during childbirth (failure or delay in execution of cesarean section or incongruous timing in the performance of childbirth). Inadequate assistance due to failure to perform ultrasound or clinical control was less frequent, recognized in 7 out of 32 pregnancies (22%); this lack led to predictable complications at childbirth.

With regard to the assessment of the causal link between the medical conduct and the onset of asphyxia, the existence of the causal relationship was recognized in 16 fetuses/infants out of 41 (39%). In the civil field, the causal relationship was verified in 11 of the 14 cases characterized by an inappropriate behavior (79%); in the remaining 3 cases (21%), even in presence of profiles of medical conduct inadequacy, the causal relationship was absent.

The detailed analysis of the three cases in which causal relationship was excluded allows the following considerations.

A case showed a not optimal behavior related to medical assistance during labor and childbirth; however the baby did not present the clinical signs which are usually found in the case of neurological damage caused by perinatal hypoxic suffering; in the medical history of the mother there were factors in favor of a prenatal etiology of the disease so there was insufficient evidence to suggest that the disease of the baby was attributable to deficiencies in birth care.

In the second case, there was reckless behavior: physicians delayed the cesarian section, although there were indicative elements of fetal distress; however, considered the normality of baby's clinical presentation in the first days after birth and in the first month of life, there was no evidence to prove that the disease was due to the delay in the cesarean section.

In the third case, the medical behavior during labor was censored because of the absence of a continuous cardiotocographic monitoring, of the omitted evaluation for the execution of an emergency cesarean section and of instrumental operations to accelerate the expulsion of the fetus, but even a more careful assistance during childbirth would not have changed the clinical situation, which was already compromised because of the presence of a previous maternal preeclampsia.

In the penal field, causal relationship was found in 5 out of the 13 cases characterized by inappropriate behavior (38%); in the remaining 8 cases (62%), even in the presence of profiles of inadequacy, a causal link was absent.

The analysis of the cases in which causal relationship was excluded allows the following considerations: in a case of twin pregnancy, although cardiotocographic monitoring and ultrasound highlighted the death of a fetus and the suffering of the other one, the decision to proceed to cesarean section was adopted more than an hour after these conditions were found;

about the first fetus, causal link was excluded because at the time of monitoring the fetus was already dead. In the second case, after the detection, through a Doppler velocimetry, of umbilical artery increased resistance, it would be recommended to repeat the examination after a few days; without this test it is however impossible to confirm that a new examination carried out after a few days could have prevented the onset of perinatal asphyxia. In the third and in the fourth cases, a vaginal swab, which is mandatory in twin pregnancies before the 20th week of gestation to diagnose ascending infections, was never executed; but there are no reasonable elements to support the existence of a causal relationship between the failure to perform such a test and the death of one twin; in the second twin, despite the inappropriate medical behavior, there were no notable clinical consequences. In the fifth and sixth case inappropriate behavior by the gynecologist was reported: while he was visiting the patient that complained since a few days about a decrease in fetal movements, he noted the presence of fetal heart rate and fetal active movements, but an ultrasound performed during the same day in the emergency room showed the absence of fetal heart rate and after the induction of abortive labor, alterations typical of fetal maceration were highlighted in both fetuses; these alterations allowed to affirm that the intrauterine death occurred at least 48 h before. This finding allowed to exclude that fetuses were still alive at the time of the first gynecological visit; in that occasion the visit was supposed to be associated with an ultrasound examination, the execution of which would not in any case have modified the negative outcome of pregnancy. In the seventh case, doctors should have executed a cesarean section more quickly, considering the pathological findings in cardiotocographic trace; elements emerging from the analysis of health documentation date fetal distress at 6–48 h prior to hospital admission; there was an insufficient evidence to assert that the delay in execution of cesarean section aggravated the neurological injury previously suffered by the fetus.

In the light of the explained cases, it is evident the “greater rigor” that guides the verification of the causal relationship and the malpractice profiles in penal matters compared to civil ones: this is in harmony with the most recent Italian Court decisions, characterized by suspect’s protection in the presence

of a reasonable doubt in criminal matters and by victim’s protection in civil ones.

Funding

None.

Conflict of interest

None declared.

Informed consent

None declared.

Ethical approval

None declared.

References

1. Marcante K, Kliegman RM. *Nelson essentials of pediatrics*. Saunders; 2015.
2. Wyatt JS, Gluckman PD, Liu PY, Azzopardi D, Ballard R, Edwards AD, Ferriero DM, Polin RA, Robertson CM, Thoresen A, Whitelaw A, Gunn AJCoolCap Study Group. Determinants of outcomes after head cooling for neonatal encephalopathy. *Pediatrics* 2007;**119**(5):912–21.
3. Shankaran S. The postnatal management of the asphyxiated term infant. *Clin Perinatol* 2002;**29**(4):675–92.
4. Al-Macki N, Miller SP, Hall N, Shevell M. The spectrum of abnormal neurologic outcomes subsequent to term intrapartum asphyxia. *Pediatr Neurol* 2009;**41**:399–405.
5. Shevell MI. The “Bermuda triangle” of neonatal neurology: cerebral palsy, neonatal encephalopathy, and intrapartum asphyxia. *Semin Pediatr Neurol* 2004;**11**:24–30.
6. Pin TW, Eldridge B, Galea MP. A review of developmental outcome of term infants with post-asphyxia neonatal encephalopathy. *Eur J Paediatr Neurol* 2009;**13**:613–8.
7. Chandraharan E, Arulkumaran S. Prevention of birth asphyxia: responding appropriately to cardiotocograph (CTG) traces. *Best Pract Res Clin Obstet Gynaecol* 2007;**21**:609–24.