

ORIGINAL ARTICLE

## Analysis of 127 peripartum hypoxic brain injuries from closed claims registered by the Danish Patient Insurance Association

LARS DAHLGAARD HOVE<sup>1</sup>, JOHANNES BOCK<sup>2</sup>, JENS KROGH CHRISTOFFERSEN<sup>2</sup> & MORTEN HEDEGAARD<sup>3</sup>

<sup>1</sup>Department of Anaesthesia, Rigshospitalet, University of Copenhagen, <sup>2</sup>The Danish Patient Insurance Association, and <sup>3</sup>Department of Obstetric, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

### Abstract

**Background.** One of the most feared complications in medicine is hypoxic brain damage to a newborn. The authors investigated the circumstances of registered peripartum hypoxic brain injuries in order to identify potential opportunities to improve patient safety and prevent injuries. **Methods.** The authors retrospectively investigated peripartum hypoxic brain injuries registered by the Danish Patient Insurance Association. **Results.** From 1992 to 2004, 127 approved claims concerning peripartum hypoxic brain injuries were registered and subsequently analysed. Thirty-eight newborns died, and a majority of the 89 surviving children suffered from major handicaps, primarily cerebral palsy. In 69 of the cases, misinterpretation of or late action on an abnormal cardiotocography (CTG) were the reasons for the majority of the hypoxic brain injuries. **Conclusions.** All injuries could potentially have been avoided using established obstetric practice. CTGs are often misinterpreted. In the authors' opinion, education and training in CTG interpretation is essential. The use of ST-analysis of the fetus ECG (STAN) could probably reduce the number of these injuries.

**Key words:** *Asphyxia, fetal monitoring, preventable, compensation*

### Introduction

In Denmark, Parliament passed a Patient Insurance Act in 1991, which came into effect on 1 July 1992. According to this law, patients may file a claim if their medical treatment results in an injury or an unexpected side effect. The independent Danish Patient Insurance Association (DPIA) considers these claims. The DPIA operates on a no-blame basis and does not take any legal action beyond assessing damages. As a result, patients can file a claim with the DPIA free of charge with the purpose of seeking financial compensation. Thus, the injured patient is spared going to court. Since its foundation in 1992, the DPIA has received 42,000 claims, 43% of which have been approved. The proportion of obstetric claims is about 2%.

One feared complication of obstetric medical treatment is fetal hypoxic brain injury. Based on

the DPIA files covering claims from 1992 to 2004, we evaluated the cases related to fetal peripartum hypoxic brain injuries.

The aim of this study was to describe the set of claims that resulted from fetal peripartum hypoxic brain injuries, and to identify potential opportunities to improve patient safety and to prevent patient injuries. Similar patient injuries from Finland have previously been published (1).

### Methods

The study used a retrospective design that followed submitted claims concerning peripartum hypoxic brain injury as listed in the DPIA database.

For each claim, the DPIA creates a patient folder where the documents of the case are kept. Furthermore, the DPIA maintains a database where all submitted claims are registered according to the

ICD-10 code of the World Health Organisation (WHO). We used this database to identify all submitted claims concerning birth injuries. All folders of these claims were identified by the computer system and read, and 2 obstetric specialists selected cases concerning fetal peripartum hypoxic brain injuries for evaluation.

The injured patient, the patient's relatives, or the hospital can make a claim for financial compensation. When the DPIA receives a claim, the first step is to collect all medical records regarding the case. Then a lawyer evaluates the claim in agreement with the medical specialist. Since 1992, a permanently employed professor in obstetrics and gynaecology, who provides an evaluation as to whether standard practice (compliance with general recommendations and guidelines) has been followed, deals with all cases regarding obstetrics.

In general, financial compensation is granted: (1) if an experienced specialist would have acted differently whereby the injury could have been avoided; (2) if defects in or failure of the technical equipment were of major concern with respect to the incident; (3) if the injury could have been avoided by using alternative treatments, techniques, or methods if these were considered to be equally safe and potentially offer the same benefits; and finally, (4) if the injury is rare, serious and more extensive than the patient would be expected to endure.

At least 1 of the 4 conditions must be fulfilled before compensation is granted. Compensation is paid providing it exceeds DKK 10,000. In this study, all cases were approved after criterion (1). A lawyer in agreement with the medical adviser determines whether a claim qualifies for financial compensation, and the decision is forwarded to the patient. The compensation is calculated based on the extent of pain and suffering, reduced income, reduced ability to work and medical expenses, and it is considered whether the injury would be expected to be permanent. The patient may appeal the decision of the DPIA to the Patient Damage Appeal Board and further to the Courts of Law.

This review is based on information drawn from the internal data system and from a detailed review of the folders of all implicated patients. We searched the database for submitted claims to injuries related to births in Denmark during the period 1992–2004. All cases concerning neonatal peripartum hypoxic brain injury were selected for a thorough evaluation.

If a cardiotocography (CTG) was recorded, we used the FIGO classification to classify the CTG (2). This classification divides the CTG into 4 grades of severity.

## Results

Between 1992 and 2004, the total number of births in Denmark was 861,168. A total of 153 submitted claims concerning peripartum hypoxic brain injuries were analysed. Some 127 of these were approved—that is an obstetrics expert judged that an experienced specialist would have acted differently, whereby the injury could have been avoided. Of the 127 avoidable hypoxic brain injuries, all were compensated except 19 children because the funeral expenses did not exceed DKK 10,000. Of the 127 patients with approved claims, 29 died during the neonatal period and 9 died at between 1 and 6 years of age. In total 38 children died. The 89 surviving children suffered from a combination of the following handicaps which were registered when the children were 2–4 years old: 78 suffered from cerebral palsy, 35 had impaired vision, 9 had hearing loss, 58 had decreased intelligence, 65 had psychometric disability, and 62 had epilepsy.

The 127 approved claims could be divided into subgroups depending on the issue where an experienced specialist would have acted differently:

1. CTG: in total 96  
Misinterpretation: 53  
No CTG despite indication: 19  
CTG illegible no action taken: 5  
Delayed response despite severe pathologic CTG: 16  
Long duration with attempt at vaginal delivery despite severe pathologic CTG: 3
2. Caesarean not performed in an appropriate time frame: 5  
Abruptio placenta on arrival: 3  
Doctor at call from home: 1  
Transfer to another hospital: 1
3. Unrecognised disproportion between the fetus and the birth channel: 9
4. Medical neglect during pregnancy: 7  
No medical follow up despite diabetes: 2  
Severe pre-eclampsia and delivery at term: 3  
No medical follow up despite rhesus-antibodies: 1  
Severe growth-retarded not recognised: 1
5. No surveillance at all: 4
6. Haemorrhagic shock after instrumental vaginal delivery: 1
7. No handling or delayed handling despite pathologic scalp sampling: 3
8. Over stimulation with oxytocin resulting in rupture of uterus: 2

In total \$20,211,444 was paid out in compensation. The average compensation for each child was \$159,145 (range: \$1,850–510,000).

Nearly all had normal CTG patterns on the admission test, but as the delivery progressed, the majority developed abnormal CTG patterns.

## Discussion

The DPIA registered 127 births in Denmark that resulted in serious brain damage to the newborn. Twenty-nine of these children died subsequently. All of the 127 injuries could potentially have been avoided if the obstetric handling had followed the practice of a standard specialist. All children were term or near-term (>33 weeks), except 1 child who was 27 weeks old at delivery.

Brain damage from fetal asphyxia depends on the duration and severity of asphyxia. Studies have demonstrated that total fetal asphyxia lasting more than 12 min and partial fetal asphyxia lasting more than 60 min may cause brain damage (3–7). Fetal asphyxia may be a recurrent event, and repeated episodes may have the cumulative effect of brain damage, even if individual episodes would not have caused brain damage (8,9).

Therefore, it is essential to react when signs of asphyxia are seen on the CTG. Delayed response despite serious pathologic CTG (FIGO Grade 3 or 4) happened in 16 cases. Furthermore, in 53 cases the CTG was misinterpreted resulting in a delayed response. In these cases, the time from occurrence of the abnormal CTG to the start of the operation was more than 40 min. Despite the pathologic CTG, a scalp sample was not taken in any of these 69 cases. Ideally, an emergency caesarean section should be performed within 15 min, but 30 min is considered appropriate as a minimum standard by published guidelines for perinatal care.

The recommendation of the Anglo-American countries states that a unit should be able to perform a crash emergency caesarean section within 30 min (decision-to-delivery time) (10). This time span may seem long, especially when taking into consideration that total fetal asphyxia lasting more than 12 min may cause brain damage. The German Society of Gynaecology and Obstetrics states that the time span for decision-to-delivery in crash emergency caesarean should be less than 20 min.

Why were these caesarean sections delayed? In 53 cases, the CTG was misinterpreted. CTG misinterpretation is one of the most common sources of alleged negligence in obstetric litigation. CTG interpretation should be improved with formal education and training.

The analysis of fetus ECG (STAN analysis) is a method to measure fetus wellbeing. The use of STAN in combination with a CTG and fetal scalp sampling has been shown to reduce the number of emergency caesareans and reduce the number of children born with metabolic acidosis when compared to CTG and fetal scalp sampling alone (11,12). In addition to CTGs, the use of STAN requires proper introduction and training. A Cochrane review recommends the use of STAN to high-risk deliveries (13).

Other studies confirm our results. A study from Finland found similar results and concluded that the most serious obstetric complications are associated with a delay in the diagnosis of fetal asphyxia (1). A Swedish study analysed malpractice claims and found that shortcomings in the interpretation of the CTG and lack of fetal scalp sampling were the major factors resulting in disciplinary actions against midwives and physicians (14).

Our data show that obstetric handling in Denmark needs to be improved. Of 127 injured children, 4 suffered minor handicaps, 85 suffered serious handicaps (cerebral palsy, mental retardation) and 38 died. All injuries could potentially have been avoided by the use of standard obstetric care. In the authors' opinion, education and training in CTG interpretation is essential. The use of STAN might reduce the number of hypoxic injuries, but education and training is also mandatory for this tool.

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