Ten years of neonatal autopsies in tertiary referral centre: retrospective study

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Abstract

Objectives To measure the neonatal autopsy rate at a tertiary referral centre and identify trends over the past decade. To identify factors that may influence the likelihood of consent being given for autopsy. To examine any discordance between diagnoses before death and at autopsy.

Design Retrospective review of patients' records.

Setting Tertiary neonatal referral centre affiliated to university.

Outcome measures Sex, gestational age, birth weight, type of delivery, and length of stay in neonatal unit for baby. Maternal age, marital status, history of previous pregnancies, and details of who requested permission for autopsy. Concordance between diagnoses before death and at autopsy.

Results An autopsy was performed in 209/314 (67%) cases. New information was obtained in 50 (26%) autopsies. In six (3%) cases this information was crucial for future counselling. In 145 (74%) there was complete concordance between the clinical cause of death and the findings at autopsy. From 1994 onwards the autopsy rate in the neonatal unit fell. The only significant factor associated with consent for autopsy was increased gestational age.

Conclusions Important extra information can be gained at neonatal autopsies. This should help parents to make an informed decision when they are asked to give permission for their baby to have an autopsy. These findings are of particular relevance in view of the recent negative publicity surrounding neonatal autopsies and the general decline in the neonatal autopsy rate over the decade studied.

Introduction

Autopsy has been important in medicine since the 15th century[1] and has contributed greatly to clinical knowledge.[2–4] Neonatal autopsy has a particularly valuable role in the counselling of families after the loss of an infant as it can help the grieving process, improve parental understanding, and alleviate concerns over prenatal events.[5–9] Genetic conditions or obstetric factors of relevance to future pregnancies may also be identified.[10]

Recently the rate and perceived importance of autopsies of adults has declined considerably.[11–14] Conversely rates of neonatal autopsy have generally remained higher, with previous reports ranging from 59% to 81%.[3 10 13–17] In 2000, however, the neonatal autopsy rate declined in Illinois.[18] Parental consent is thought to be the major limiting factor.[16] The public's exposure to the purposes and value of the autopsy is sparse, and perceptions are often dominated by melodramatic treatment in the media.[19]

We measured the rate of neonatal autopsy at a tertiary referral centre over the past decade to investigate the role of various factors in determining consent for autopsy. We also examined the yield of new information in terms of discordance between diagnoses before and after death.

Methods

We carried out the study in a neonatal unit in the main tertiary neonatal referral centre for the south east of Scotland. We included records of all deaths in the neonatal unit from 1 January 1990 to 31 December 1999. The policy in the unit is that a senior clinician, normally the relevant consultant, approaches relatives for consent for autopsy after each death. Autopsies were performed only after parental consent or at the request of the procurator fiscal. Each examination was performed by one of four consultant paediatric pathologists using standard techniques.[20]

We recorded the cause of death from the original death certificate, which was normally completed by a consultant. We obtained maternal and infant details from the original medical records and abstracted autopsy findings from the concluding summary of the pathologist's report. Death certificates were not available for 1990-2; in these cases the cause of death was determined by a consultant neonatologist after review of the patients' records.

We used a modified version of previously published schemes[11 18] to classify the concordance between autopsy findings and diagnoses before death (table 1). We compared the proportion of events in each group using the χ^2 test for discrete variables and Student's t test for numerical variables.

Results

In over a quarter of cases new information was obtained at autopsy (see table A on bmj.com for further details). A single class Ia diagnosis of sigmoid volvulus was identified along with five class Ib diagnoses with implications for genetic advice—namely, Smith-Lemli-Opitz type II syndrome, De Lange's syndrome, ornithine carbamyltransferase defi-

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P+ *Three tables with further data can be found on bmj.com*

Table 1 Classification of concordance between diagnosis before death and at autopsy*

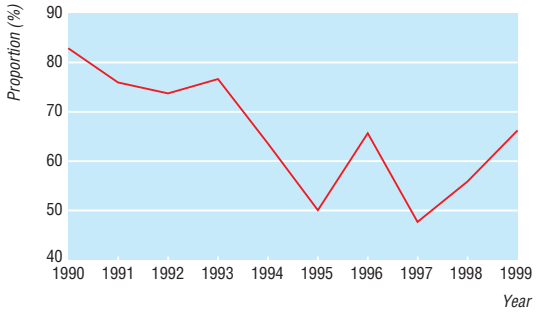
Class	Description
IA	Diagnosis that, had it been detected before death, would probably have led to change in management that might have resulted in cure or prolonged survival
IB	Diagnosis with significant implications for future genetic advice
II	Diagnosis that, had it been detected before death, would probably not have led to change in management or survival because: • No appropriate therapy was available at the time • Appropriate therapy was given even though the diagnosis was unknown at the time • Patient had acute cardiopulmonary arrest that was appropriately managed, but patient did not survive for definitive management • Patient had "do not resuscitate" status
III	Diagnosis that may or may not have been related to main disease process and was contributory cause of death
IV	Diagnosis unrelated to outcome and may or may not have affected eventual prognosis of patient
V	Complete concordance between diagnosis before death and findings at autopsy

*Modified from Kumar et al[18] and Goldman et al.[11]

Table 2 Factors related to baby and mother according to whether autopsy was performed

Category	Autopsy performed		No autopsy		P value*	Data not available
	Mean (range)	SD	Mean (range)	SD		
Gestational age (weeks)	32.2 (22-42)	6.44	30.1 (23-42)	6.79	0.0066	15
Birth weight (g)	1828 (400-5250)	1179	1669 (365-5230)	1246	0.1402	7
Length of stay (days)	15.4 (1-210)	35.6	14.2 (1-240)	32.3	0.3807	6
Age at death (days)	15.8 (1-210)	35.6	15.2 (1-210)	34.8	0.4465	28
Maternal age (years)	27.3 (15-43)	5.81	28.0 (16-42)	6.16	0.1923	51

*Mean of each group compared with Student's *t* test.



Autopsy rate in neonatal unit (1990-9)

ciency, DiGeorge syndrome, and GM_1 gangliosidosis. An autopsy was performed in 209 of the 314 cases studied (see table B on bmj.com). The overall rate of neonatal autopsy of 67% remained substantially higher than the prevailing rate in adults. From 1994 onwards, however, the annual autopsy rates dropped below levels earlier in the decade (figure). Gestational age was the only factor that was found to differ significantly between the groups who did and did not give permission for autopsy, with means of 32 and 30 weeks respectively (table 2). Details of other factors that we examined and that were not associated with consent for autopsy can be found in table C on bmj.com.

Discussion

Earlier studies have reported higher yields of new information from neonatal autopsies, ranging from 34% to 48%, though classification criteria and procedures varied between publications.[10 13–15 18 21] In our study a single observer classified the level of concordance between diagnoses before death and at autopsy. Review by a multidisciplinary team, including a pathologist, may have resulted in a higher yield. We abstracted clinical diagnoses from the death certificates when they were available. The reliability of death certificates largely depends on how accurately clinicians record clinical information.[22] In Edinburgh certificates were normally completed after consideration of the case by the consultant in charge.

Demographic features such as the sex of the infant and maternal age or marital status have never been identified as significant determinants of consent for neonatal autopsy.[3 16 17] VanMarter et al[17] and Maniscalco and Clarke[3] also found gestational age to be a significant factor. Possibly clinicians are less likely to encourage parents to give consent for autopsy in extremely preterm infants.[17] In general the strength of requests for individual autopsies is likely to vary because clinicians will have different views as to its importance in a specific case.

The finding that in about a quarter of cases new information was gained is likely to be of use to bereaved families when they are considering permission for an autopsy. The proportion of neonatal deaths attributed to major genetic or congenital abnormalities has increased. Accurate diagnosis in such cases, either before or after death, is highly important for future counselling. Information obtained at autopsy may not have directly affected clinical management but is essential for audit or educational purposes.[21] Arguably the greatest value of the neonatal autopsy is to families during the grieving process. Such unique benefits are far more difficult to quantify.[9 23]

The apparent reduction in the neonatal autopsy rate in Edinburgh over the decade studied warrants serious debate. There is no obvious single explanation but possible influences include a shift in the attitude of clinicians towards autopsies or a change in the public's willingness to grant permission. Economic or procedural considerations did not feature during the period studied. The recent high profile disclosure concerning organ retention in the United Kingdom[24] can only have served to harm the public's view of autopsies. A concerted effort will be needed to promote the value and purposes of the neonatal autopsy.

What is already known on this topic

The neonatal autopsy rate dropped in Illinois during the 10 years from 1984 to 1993

Over recent years there has been a large amount of negative publicity surrounding neonatal autopsies in the United Kingdom

What this study adds

Over a quarter of neonatal autopsies yielded new information; in 3% of cases this information was crucial

This finding is likely to be of use to bereaved parents who are asked to give permission for autopsy and provides a more positive perspective on the utility of neonatal autopsies

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paper, and will act as guarantor. JWK and KJMcK provided advice during the study and commented on the paper.

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Synergism between allergens and viruses and risk of hospital admission with asthma: case-control study

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The full version of this article appears on bmj.com

Abstract

Objective To investigate the importance of sensitisation and exposure to allergens and viral infection in precipitating acute asthma in adults resulting in admission to hospital.

Design Case-control study.

Setting Large district general hospital.

Participants 60 patients aged 17-50 admitted to hospital over a year with acute asthma, matched with two controls: patients with stable asthma recruited from the outpatient department and patients admitted to hospital with non-respiratory conditions (inpatient controls).

Main outcome measures Atopic status (skin testing and total and specific IgE), presence of common respiratory viruses and atypical bacteria (polymerase chain reaction), dust samples from homes, and exposure to allergens (enzyme linked immunosorbent assay (ELISA): Der p 1, Fel d 1, Can f 1, and Bla g 2).

Results Viruses were detected in 31 of 177 patients. The difference in the frequency of viruses detected between the groups was significant (admitted with asthma 26%, stable asthma 18%, inpatient controls 9%; P=0.04). A significantly higher proportion of patients admitted with asthma (66%) were sensitised and exposed to either mite, cat, or dog allergen than patients with stable asthma (37%) and inpatient controls (15%; $P < 0.001$). Being sensitised and exposed to allergens was an independent associate of the group admitted to hospital (odds ratio 2.3, 95% confidence interval 1.0 to 5.4; P=0.05), whereas the combination of sensitisation, high exposure to one or more allergens, and viral detection considerably increased the risk of being admitted with asthma (8.4, 2.1 to 32.8; P=0.002).

Conclusions Allergens and viruses may act together to exacerbate asthma.

Introduction

Asthma costs 1-2% of the total health budgets in direct costs, with equally large indirect costs for time lost from work and reduced productivity.[1 2] Much of these costs come from hospital admissions. Being admitted to hospital with asthma is also an important risk factor for death from the condition.[3]

Of 450 000 adults admitted yearly with asthma to emergency departments in the United States, an estimated 200 000 were sensitised to mite, cat, or cockroach allergen.[4] Viral respiratory infections have been associated with most acute exacerbations of wheeze in childhood.[5] In the early part of each school term there is an increase in hospital admissions for asthma associated with the acquisition of new viruses.[6] An interaction has been suggested between sensitisation and virus infection in exacerbating asthma in children.[7] Few studies have been conducted in adults, although there is evidence that viral infections are associated with many exacerbations of asthma.[8] In experimental studies synergistic effects have been shown between allergens and viruses.[9 10] No studies have investigated an interaction between sensitisation, exposure to allergens, and viral infections in real life exacerbations of asthma. We therefore determined their relative importance in

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