
CLINICAL INVESTIGATIONS

Neurological complications associated with pregnancy

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Summary

Prospective multidisciplinary audit from both hospital and community has identified neurological complications persisting for more than 6 weeks in association with pregnancy and delivery. They occurred at a frequency of 1 in 2530 deliveries in the North West Thames Region. Extradural analgesia was considered contributory to a neurological disorder in one of 13007 patients. The woman had prolonged paraesthesiae along a nerve root. The types of sensory, motor and sympathetic neurological problems presented ranged from transient problems to more serious disorders resulting in death in one case. Seven of 19 patients had a continuing neurological disability for more than 1 yr. Although obstetrics may be associated with lumbar and sacral neurological disorders, problems occurred with the same frequency in the upper as in the lower half of the body. Significant morbidity is not being recognized in hospitals where women are being delivered and it is within the community that these disorders are recognized. This has implications for training, audit and risk assessment. (*Br. J. Anaesth.* 1995; **75**: 522–526)

Key words

Complications, neurological. Pregnancy. Anaesthesia, audit.

Transient neurological dysfunction in the form of paraesthesiae and motor weakness of less than 72 h duration after labour and delivery has been reported to be associated with 18.9 in 10 000 deliveries [1]. The frequency was increased in patients who had received extradural or general anaesthesia. In this study, data were obtained from hospital records in the USA and an interview from those patients who had received an anaesthetic. None of the other patients was interviewed and no data were obtained after discharge from hospital. These omissions have limited the value of the study. An epidemiological study [2] using patient questionnaires, months or years after delivery from one hospital in the UK, recorded symptomatology such as “tingling” and “backache” which had often not come to the attention of their doctor. More severe neurological complications have been reported from a large retrospective study in the UK [3] in which only obstetric patients who had undergone extradural blocks were selected. Permanent neurological disability occurred in five of 258000 deliveries and a

total of 108 serious complications, mainly neurological, were identified. Within a general, obstetric population surveyed many years ago, neurological morbidity of one in 1000 [4] and 2600 [5] was reported.

During the past 20 yr there have been significant improvements in maternity services which have resulted in a decrease in maternal mortality [6]. The improvements may also have reduced morbidity. A survey lasting 1 yr within an NHS region was initiated to identify parturient women who presented to their consultant or general practitioner with neurological problems of 6 weeks or more duration after delivery.

Patients and methods

The study to document prolonged neurological damage in association with obstetrics was sited in the North West Thames Region in the UK, because obstetric epidemiological data were available from two computer networks, and it was considered that an adequate number of cases would be reported. Approval for the study was obtained from the Quality of Practice Committee of the Royal College of Anaesthetists, the Royal College of Obstetricians and Gynaecologists, the Royal College of Midwives and the Royal College of General Practitioners, and from all Ethics Committees of the hospitals in the region. The North West Thames regional officers provided all personnel details for the study.

It was anticipated that women may present to a variety of practitioners, and therefore in order to achieve maximum reporting of prolonged neurological problems after delivery, individual hospital specialists (obstetricians, anaesthetists, neurologists, rheumatologists, urologists and orthopaedic surgeons) and general practitioners in the region were informed regularly about the study and requests for notification of cases made. Health visitors also agreed to participate in the study within their districts. The study period was 1 yr (April 1, 1991 to March 31, 1992, inclusive) but the mailings were

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conducted before the study started, during the study period and at regular intervals, up to 30 months after commencement of the survey, to allow time for women to report problems to their medical practitioners.

Confidentiality of information was maintained and so this precluded any neurological assessments that were not part of normal patient care. When a notification was received, details of the patient's delivery were requested from the obstetrician in charge and, if necessary, from the attending anaesthetist, neurologist and midwife. These details, in the form of a questionnaire, were coded so that the notifying person, patient, hospital and attending physicians could not be identified. The questionnaire data were then assessed by an independent specialist panel comprising a neurologist, an obstetrician and an anaesthetist. Evidence for neurological diagnoses and any obvious precipitating factors for the neurological disorder were sought.

When questionnaire data were not available or were incomplete, contact was made with the appropriate hospital specialist or hospital notes were traced. General practitioners often used their computerized database systems to identify patients and many allowed access to these systems by one member of the research team so that data collection would be complete.

Results

Fifty-seven notifications were received and 22 were excluded from the survey: 12 were not within the study period and 10 were patients living in the North West Thames region but delivered in hospitals outside the region where approval for the study had not been received. Three hundred consultants and 1940 general practitioners received requests for notifications. Five consultants, 28 general practitioners and two health visitors provided the 35 notifications considered. Seventeen notifications were received in 1991, 24 in 1992 and 16 in 1993.

The obstetric delivery statistics for the North West Thames region during the study year are shown in table 1. One of the two computer databases did not include information on general and spinal anaesthesia. There was a total of 48 066 deliveries in the regional hospitals, of which 71 % were spontaneous vaginal deliveries and 15 % lower segment

Table 1 Obstetric delivery statistics from the North West Thames Region for the period April 1991 to March 1992, showing for each type of delivery the total number of deliveries and the number of women who require anaesthesia: extradural, spinal or general. * Of a total of 43 986 deliveries

Type of Delivery	No. of deliveries	Anaesthesia		
		Extradural	Spinal*	General*
Normal	35 335	5 355	28	9
Caesarean	6 720	3 698	531	3124
Forceps	3 834	2 702	65	49
Breech	509	272	3	6
Ventouse	1 637	980	12	7
Unknown	11			
Total	48 066	13 007	629	3195

Table 2 Independent specialist panel's analysis of neurological disorders notified to the study

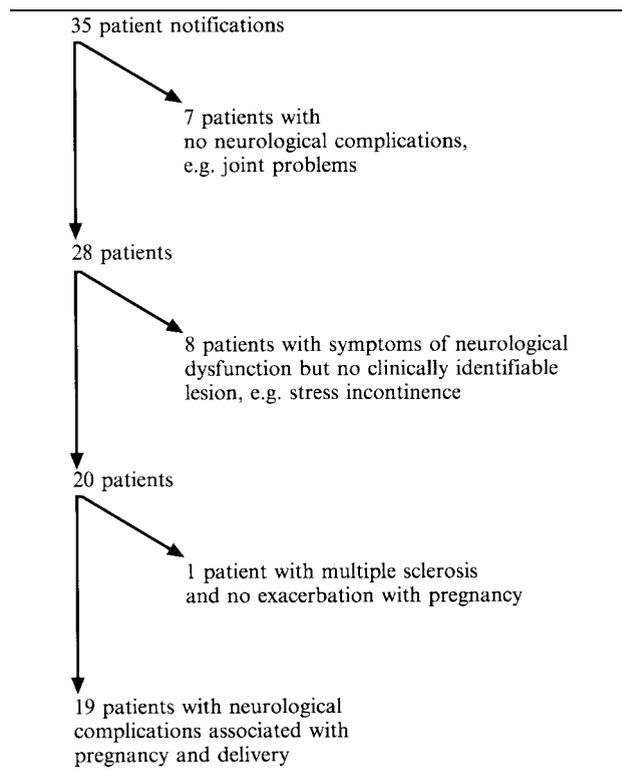


Table 3 Patient and infant data from the 35 notifications received (mean (SD) [range] or number)

Age (yr) (<i>n</i> = 28)	29.3 [20–42]
Gestation (weeks) (<i>n</i> = 26)	38.6 (2.3) [32–41]
Duration of labour (min)	
Stage 1	552 (303) [72–1215]
Stage 2	94 (76) [2–280]
Stage 3	7 (6) [2–22]
Height (cm) (<i>n</i> = 23)	160.9 (6.2) [148–173]
Infant weight (g) (<i>n</i> = 29)	3310 (577) [2140–4540]
Weight (kg)	
Pre-pregnant (<i>n</i> = 22)	60.5 (9.3) (49–85)
Pregnant (<i>n</i> = 22)	74.3 (11.8) [58–98]
Body mass index (pre-pregnant) (kg m ⁻²)	No. of women
< 20	3
20–24.9	9
25–29.9	6
> 30	3

Caesarean sections. Anaesthesia associated with the latter would have been a combination of extradural, spinal and general anaesthesia, depending on the requirements for labour and delivery.

Seven of the 35 notifications (table 2) were not considered to represent neurological complications. Three patients had joint problems and the others had cholangitis, muscular strain, transient paraesthesiae in the fingers, and "aching leg syndrome", with confirmed psychiatric depression. Sixteen of the remaining 28 patients were primiparous and the remainder multiparous. Two of the primiparous women delivered twins. The age, height and weight of the women are shown in table 3. Weights and heights were not available in all women because they were omitted in some of the obstetric notes. The

Table 4 Details of neurological disorders notified after delivery. GA = General anaesthesia, CS = Caesarean section, SVD = spontaneous vaginal delivery. * Women who had a neurological consultation reported

Neurological disorder	No. of Patients	Details of outcome	Precipitating factor/s	Type of operative delivery	Method/s of anaesthesia
Inadequate cerebral oxygenation	2	(a) Spastic tetraparesis*	Severe hypotension with associated severe postpartum haemorrhage	Ventouse	Extradural/GA
		(b) Cardiac arrest with death after 6 weeks	Hypertrophic cardiomyopathy	CS	GA
Nerve root involvement	5	(a) Cervical segments 5/6	Severe neck flexion at delivery	SVD	N ₂ O/O ₂
		(b) Bell's palsy (lower motor neurone VII)	Fluid retention (pre-eclampsia)	Forceps	Extradural
		(c) Lumbar 5/sacral disc herniation		Forceps	Extradural
		(d) Sciatica	Sciatica present before delivery, exacerbated afterwards	CS	Combined/spinal extradural
		(e) Foot drop baby	Small pelvis, macrosomic	SVD	N ₂ O/O ₂
Symptomatic paraesthesiae along nerve root distribution	2	(a) Present before delivery		CS	Pethidine/GA/extradural
		(b) Occurred after delivery	Labour/extradural	SVD	Extradural
Central nervous system space occupying lesion	2	(a) Glioma*	Incidental	CS	GA
		(b) Spinal arachnoid* cyst	Incidental	SVD	Pethidine
Peripheral nerve palsy	3	(a) Lateral popliteal nerve lesion	Lithotomy for 1 h for repair of tear	SVD	Extradural
		(b) Ulnar nerve lesion*	Pregnancy	Forceps	Extradural
		(c) Meralgia paraesthetica*	Pregnancy ?nerve involvement: long labour and large baby	Forceps	Extradural
Medical	3	(a) Diabetic neuropathy	Diabetes, pregnancy, obesity, hyperthyroidism	CS	Extradural
		(b) Multiple sclerosis	Pregnancy	SVD	Extradural
		(c) Meningitis		SVD	Extradural
Back pain	2	(a) Severe pain	Twins	SVD II/Forceps I	Extradural
		(b) Severe pain and disability	Pregnancy	SVD	N ₂ O/O ₂

mean height of the women reported in this study was 160.9 cm. Of the 21 women for whom full data were available, six had a body mass index of 25–30 kg m⁻² and two more than 30 kg m⁻², before pregnancy.

Half of the 28 women had spontaneous vaginal deliveries, and of these, seven of 14 had extradural analgesia. Eight women had lower segment Caesarean section. Four of these were emergencies and all but one had general anaesthesia. Five women required forceps deliveries and except for one woman, extradural anaesthesia was used. Three patients had a ventouse extraction.

Eight of the 28 patients had no identifiable neurological lesion, but symptoms suggestive of neurological dysfunction could not be excluded. Symptoms of back pain, stress incontinence and paraesthesiae often suggested mechanical rather than neurological disorder. These problems persisted in one woman with stress incontinence for more than 1 yr, but the majority of women had a symptomatic history limited to 3–6 months.

The remaining 20 patients had neurological dysfunction persisting for more than 6 weeks after delivery and in seven patients persisting for more than 1 yr. Five patients saw a neurologist and one patient died just over 6 weeks post partum (table 4).

One patient with multiple sclerosis was considered not to have had an increase in her pre-delivery neurological symptoms after delivery. There was therefore a total of 19 patients whose neurological complications were considered to be associated with their pregnancy. Two of these women had severe life threatening neurological complications because of cerebral hypoxia, an incidence of 1 in 24 033 patients. The woman with an undiagnosed glioma presented with loss of consciousness after a grand mal seizure. She was treated appropriately and has now improved. The mother who developed a foot drop was 148 cm in height and delivered a baby of 4330 g. Her disability was noticed at 6 weeks in the community and persisted for 3 months. There was no indication in her hospital notes of any neurological problems, although her disability on walking was present after delivery. This was her sixth child and she was described as being uncomplaining and belonged to an ethnic minority.

Discussion

Neurological complications associated with pregnancy and delivery occurred with a minimum frequency of one in 2530 and, although they

originated within the hospital environment, the majority of cases were only identified within the community. Hospital-based audit systems would fail to identify these types of problems, would give false information to their purchasers on quality of care, and would not provide any feedback of the complications their patients experienced. We sought to obtain maximum compliance with notification, but there must be some cases who were not identified. Data from patients residing in the region, but delivered outside it, were lost. This could not be compensated for by surveying those who delivered inside the region but lived outside it. The dynamics of cross boundary movements of childbearing women in the 3 yr required for notifications could not be determined in this study. It would have been helpful for this type of regional multidisciplinary audit study to have had a more comprehensive ethics approval system in operation.

There was also a difference between hospital and general practitioners' computerized databases. The hospital systems were very slow to provide information and there was an incomplete record of techniques used and complications occurring during hospitalization. One of these systems had been used to assess maternal morbidity [7], and not surprisingly no neurological problems were found. The systems used by general practitioners allowed confidential but speedy access by personnel familiar with personal computers, and had information pertinent to this study.

The investigation uncovered a wide range of symptoms with which patients presented but which could not be directly attributed to a neurological cause. Despite initial screening by 33 medical practitioners, a total of 16 of 35 notifications were excluded by the rigorous specialist appraisal used in this study. Where non-specialist audit data collection is used, these cases may have been included in the analysis and would have increased the calculated frequency of complications. Although they were excluded, these patients had symptoms significant enough for them to seek medical advice. These problems are important to an individual patient if they cause disability, and make it harder to look after babies and children. MacArthur, Lewis and Lenox [8] recorded maternal complaints of "aches" and "tingles" following 8.2% of deliveries surveyed. This neurological study found nerve root symptomatology of pain and paraesthesiae of about one in 4000 cases. Both studies considered prolonged symptoms. Patients were failing to bring these problems promptly to the attention of their general practitioner. Notifications to the study continued over 1.5 yr after the study period expired and in 1993 almost the same number of notifications were received as in 1991. If the reporting study period had been extended, more complaints would probably have been received. Patients are often falsely reassured that symptoms will be transient. Most of the non-neurological complications notified to this study were transient, but one-third of neurological problems were present for more than 1 yr.

A wide variety of neurological cases were identified. This study has not been able to quantify the

incidence of particular disorders because of the relatively small population of the region and rarity of many of the disorders. It is significant that there was a death in this survey and a case of global cerebral damage. Two incidental space occupying lesions were identified, both of which were managed optimally. One was a cyst but the glioma could have caused serious morbidity if not recognized. Neurological complications associated with pregnancy and delivery might be expected to present mainly in the lower half of the body. The diagnoses presented in this study demonstrated that problems in the upper half of the body occurred in the same proportion as in the lower half.

An assessment was made of factors which are likely to have precipitated these neurological problems. Whether or not these factors could have been ameliorated or prevented necessitates a more detailed assessment, such as is followed in the mortality reports. Maternal mortality associated with anaesthesia [6] relates to four patients, of whom three were obese. The number of women in this study with a pre-pregnant body mass index of more than 25 kg m^{-2} [9] represented 60% of women with pregnancy associated neurological problems. This relationship deserves further study. Only three patients had fortuitous or incidental factors. Medical conditions were associated with complications in three patients, but in the remainder more direct factors were defined. Where there has been a dramatic reduction in the past two decades in maternal mortality, it appears from the results of this study that neurological maternal morbidity has remained static, although it can cause serious distress and disability.

None of the different techniques of anaesthesia could be identified as contributory factors to any particular neurological complication. General anaesthesia was given to three patients who had severe neurological dysfunction. Extradural anaesthesia was used more frequently in the group with neurological complications compared with the remainder of the population, and operative delivery was more common. Neurological complications in association with extradural anaesthesia have been reported for both surgical and obstetric procedures. Usubiaga [10] found an incidence of one in 11 000 from 780 000 surgical cases. Crawford [11] identified an incidence of one in 2400 for obstetric extradurals for the period 1968–1985, excluding elective Caesarean section deliveries. Thirteen patients in the present study who had extradural analgesia had neurological complications, but of these only one patient was considered to have had complications attributable to extradural analgesia. This is comparable with the values presented by Usubiaga. Therefore, despite improvements in equipment, techniques and management of extradurals, improvements in morbidity have yet to be established.

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