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INTRACRANIAL ABNORMALITIES IN PRETERM INFANTS, FOLLOW-UP AT AGE 3.

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Intracranial abnormalities may be demonstrated by ultrasound in 20 to 60 % of all sick preterm infants. The significance of these lesions for neurodevelopmental outcome is not yet fully understood. We studied the relationship between neonatal and one year ultrasound images of the brain and neurodevelopmental outcome at age 3 .
107 preterm infants (gestational ages 26 to 35 weeks M=31, birthweights 850 to 3880 grams M=1440) were studied. 52 had normal neonatal cranial ultrasound scans, 28 had abnormal neonatal scans without (abnormal -) and 27 with (abnormal +) ventricular dilatation. A repeat scan was made at one year to visualize the endstage of neonatal lesions : 3 of the 52 children with normal neonatal scans and 19 of the 55 children with abnormal neonatal scans had abnormal scans at 1 year. All abnormal scans showed ventricular dilatation, indicating persistant posthaemorrhagic dilatation and/or cerebral atrophy.
At age 3 (3,4 to 3,11 years M=3,8) we assessed: neurologic and motor function (Touwen), cognitive function (Stanford-Binet), language development (Reynell), and behaviour (a behavioural observation scale, adapted from the BSQ of Richman and Graham).

NEONATAL SCAN	ONE YEAR SCAN	PATIENTS	FOLLOW-UP AT AGE 3				
		N=	neurol. CP	cogn. St.B <-2SD	lang. Reyn. <-2SD	severe behav. problems	all abnormal children
normal	normal	49	2	4	3	3	8
normal	abnormal+	3	0	0	0	0	0
abnormal -	normal	26	1	6	6	1	8
abnormal -	abnormal+	2	0	0	0	0	0
abnormal +	normal	10	1	1	1	0	2
abnormal +	abnormal+	17	8**	5	4	5	13**
	TOTAL	107	12	16	14	9	31
χ^2 test, Df=5			p<0,001	NS	NS	NS	p<0,001

Six of the 8 children with large haemorrhages extending into the parenchyma (ICH) and 3 of the 4 with cystic periventricular leucomalacia (PVL) had cerebral palsy, 3 of the 4 children with PVL had IQ's<-2SD and severe behavioural problems.
CONCLUSION:1.There is a significant overrepresentation of abnormal children in the group with ventricular dilatation at 0 and 1 year, 2. The incidence of cerebral palsy is high in the group of children with ICH and/or PVL, in the group of children with PVL there is also a great risk of mental retardation and severe behavioural disturbances.

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NEUROLOGICAL DEVELOPMENT OF VLBW-INFANTS
First results of a regional survey in Hamburg.

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The mortality of premature infants has decreased over the last two decades with significantly more high risk infants surviving. Different results exist concerning the neurological outcome of these infants. Most follow-up studies were performed only with patients of single neonatal care units. In 1983 a prospective multicenter follow-up study of VLBW-infants (< 1500 g) was initiated for the whole region of Hamburg, West Germany.
In the first year 125 of the surviving 147 VLBW-infants could be followed up to at least 18 months of age. In 94 % of these cases a cerebral ultrasound was performed at 64 weeks conceptual age. Major changes from periventricular leucomalacia were seen in 18 %.
At 18 months of age 14 cases (11.2 %) had cerebral palsy. 9 % had signs of minimal brain dysfunction, 17 % were developmentally retarded without any neurological signs. Compared with AGA more SGA-infants were retarded at follow-up, but only one had cerebral palsy. Major changes at ultrasound examination coincided with neurological abnormalities in 90 %, 52 % had cerebral palsy.
Compared with previous studies from single neonatal centers, our results are less favourable probably because of our multicenter approach covering the entire region. Permanent major periventricular changes visualized by ultrasound are of important prognostic value.

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Preterm or small for gestational age: a neurological follow-up at six years.

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From 1655 consecutively born singleton infants 285 were born prematurely or/and small for gestational age. 190 were born at term (FT SGA), 66 were preterm with an appropriate birthweight (PT AGA) and 29 were preterm as well as small for gestational age (PT SGA).

At the age of 6 years a neurological examination was carried out with emphasis on the presence of minor neurological dysfunction (MND). Data could be obtained of 246 children (Table).

	Neurological classification at six years				
	normal	postural hypotonia	MND	abnormal	Total
FT SGA	102 (61%)	21 (13%)	40 (24%)	3 (2%)	166
PT AGA	30 (57%)	7 (14%)	14 (26%)	2 (4%)	53
PT SGA	11 (41%)	2 (7%)	10 (37%)	4 (15%)	27

Overt neurological abnormalities were more frequent among girls, MND was more often observed in boys. The relation between neonatal neurological diagnoses and neurological findings at six years was evident in the FT SGA group, in the PT AGA's it was less clear, however.

The frequency of children with neurological sequelae was increased in infants with a birthweight below 2.3% or a gestational age below 35 weeks. The relation of single obstetrical variables as toxaemia, acidaemia and low Apgar scores with the outcome at 6 years appeared to be limited to the neonatally deviant infants only.

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Neurological follow-up at 9 years of normal, suspect and abnormal newborns.

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143 from the 160 neurologically abnormal newborns from a 3-years cohort (n=3162) were re-examined at 9 years of age, together with two at random selected groups of neurologically suspect (n=207) and normal (n=229) newborns (Perinatal Project Groningen).

Severe neurological sequelae (3%) were found only in the abnormal and suspect subgroups. The majority of abnormal and suspect newborns recovered, however. Minor neurological dysfunction (MND) was found more frequently in the suspect and especially in the abnormal group, and more boys were affected than girls.

Within the neonatally abnormal groups there appeared to be a relationship between obstetrical variables such as birthweight and Apgar scores and neurological sequelae at 9 years. This relationship was less clear in the neonatally normal group.

MND at 9 years appeared to be related to speech development and schoolproblems. Behavioural problems also occurred more frequently in this category. These relationships became stronger when the neonatal neurological condition is taken into consideration.

It is concluded that the neonatal neurological condition is a sensitive indicator for the risk of later neurological and behavioural problems. The specifity, however, is low.

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PSYCHOLOGICAL DEVELOPMENT OF INFANTS OF WOMEN WITH TYPE-1-DIABETES.

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In the University Hospital of Groningen since 1981 pregnant women with type-1-diabetes are treated with Continued Subcutane Insuline Infusion (CSII). We studied the psychological development of 40 infants of these women to investigate if there is a delay in development despite the tight metabolic control during pregnancy. At the time of the study the ages of the infants varied from 9 months to 4 years. A control group was selected by the method of matched pairs. The items on which we focused the examination of the infants are: assessment of mental and motor development; assessment of the environment of the infants by means of a questionnaire about the functioning of the family and by scoring (at home) of the Home Observation Scale; furthermore assessment of the temperament of the children with the help of questionaires according to the theories of Thomas and Chess. The first results regarding 25 study- and 25 control infants showed no difference between infants of diabetic mothers (I.D.M.) and control infants in their mental and motor development. Our preliminary inspection of the data showed a significant difference between the two groups in favour of the I.D.M.'s with respect to their "Rythmicity" which can mean that the I.D.M.'s are "easier to handle". The tendency to form a too strong cohesion was found to be less in the diabetic families than in the control families. This can mean that members of diabetic families are more free to live as they like and show more respect for each other. It is possible that these findings indicating a good development of I.D.M.'s are due to protective factors (origin unknown as yet).

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CONTINUOUS NON-INVASIVE MONITORING OF CEREBRAL OXYGENATION IN SICK NEWBORN INFANTS BY NEAR INFRARED SPECTROPHOTOMETRY.

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The purpose of this study was to explore whether quantitative indices of cerebral oxygenation could be obtained in infants by near infrared spectrophotometry. Portable apparatus was designed and built so that near infrared light emitted by laser diodes at four different wave lengths could be directed into the head through fibre optic bundles and collected on the other side. Changes in near infrared absorption were analysed, using algorithms derived from studies on fluorocarbon exchange transfused rats, to give signals proportional to the concentrations of haemoglobin (Hb), oxy-haemoglobin (HbO_2) and oxidised cytochrome a,a_3 in the light-path. Changes in cerebral blood volume were estimated from the sum of the Hb and HbO_2 signals. All the indices were displayed at the cot-side. Ten preterm and term infants were studied for periods of one to six hours. Highly significant and reproducible changes in cerebral oxygenation and blood volume were observed in response to alterations in arterial oxygen and carbon dioxide tensions, to tilting head up and head down, and following the administration of indomethacin. Marked differences in the indices were detected between normal infants and some infants with cerebral disorders.

Near infrared spectrophotometry is a practical non-invasive technique that gives valuable information about cerebral oxygenation and blood volume in sick newborn infants.