Hyperechogenicity of the thalamus and basal ganglia in very preterm infants.

No registrations found.

Ethical review	Positive opinion
Status	Recruiting
Health condition type	-
Study type	Interventional

Summary

ID

NL-OMON27393

Source
NTR

Brief title
N/A

Health condition

Preterm infants born after a gestational age of less than 32 weeks

Sponsors and support

Primary sponsor: N/A
Source(s) of monetary or material Support: This research will be undertaken with financial support from ZonMW (Agiko-stipendium).

Intervention

Outcome measures

Primary outcome

The origin and clinical significance of ED/TBG in very preterm infants.

Secondary outcome

Improvement of the prediction of the neurological prognosis of individual preterm infants and the understanding of maturational and pathological processes in the preterm brain.

Study description

Background summary

Infants born very prematurely (gestational age < 32 weeks) are at risk of deviant neurological development. Their brains are vulnerable to hemorrhagic, ischemic and inflammatory damage. Brain damage, acquired during the perinatal period, is a major cause of adverse neurological outcome in these infants. However, even without demonstrable brain damage, many infants born very prematurely show a less favourable neurodevelopment than term born infants.
During the neonatal period serial cerebral ultrasonography (CUS) is a reliable and safe tool to demonstrate cerebral injury and to follow brain development. On CUS, the initial stages of cerebral damage often show as increased echogenicity in certain, involved areas of the brain. MRI can be used to confirm CUS findings and/or to demonstrate localization and extent of lesions more precisely. In addition, MRI shows maturational processes, normally taking place in the preterm brain, in detail.
Serial CUS examinations often show (transient) echodensities (ED) in the preterm brain. In the periventricular areas these ED may resolve with time, or undergo cystic changes. If periventricular ED are present for a longer period of time (> 1 week), and/or evolve into cystic lesions, they represent ischemic damage to the preterm brain white matter (periventricular leukomalacia) and are associated with adverse motor outcome (i.e. cerebral palsy). However, in preterm infants, transient periventricular ED, especially if symmetrical, more homogeneous and located in the frontal white matter, can also be a normal physiological phenomenon, related to migrating glial cells.
On CUS, ED are also often seen in the area of the thalami and basal ganglia (TBG). If encountered in term infants after profound perinatal asphyxia, this represents ischemic damage to TBG and is an unfavourable prognostic sign.
In preterm infants, ED in TBG can be unilateral and localized, representing ischemic and/or hemorrhagic injury of TBG. This finding is associated with suboptimal motor performance during infancy.
Linear or punctate hyperechogenic lesions in TBG can occur both in term and in preterm infants and may represent ischemic and/or inflammatory damage with possible consequences for neurological development.
Echogenicity changes in TBG in preterm infants can also be subtle, "hazy" and more diffuse. The incidence of this diffusely increased echogenicity in TBG, from now on referred to as ED/TBG, has been reported by us to be as high as 26% (37/143) in infants < 32 weeks. The origin has remained unclear and the significance for neurological development unknown. It may represent normal maturational changes, occurring in the preterm brain in TBG and/or the surrounding tissue. However, like long-lasting periventricular ED in preterm infants and ED in TBG in term infants after perinatal asphyxia, it may represent ischemic damage. If so, it is likely to be of clinical significance.

With this study we want to establish the origin (pathological changes or normal maturation?) and clinical significance of diffuse ED/TBG in very preterm infants.
For this purpose, serial neonatal CUS examinations according to the standard protocol, and a single cerebral MRI examination around term date will be performed in each very preterm infant born during the inclusion period. Diffuse ED/TBG will be defined as diffusely increased echogenicity of TBG as compared to the surrounding area of the brain, visible in both coronal and sagittal planes on one or more CUS examinations. Evaluation of all the CUS scans will result in a division of the very preterm infants into a group with ED/TBG and a group without ED/TBG. All the included infants will visit our follow-up clinic around term date and at corrected ages of 12 and 24 months, when standardized neurological examinations will be performed. In addition, at 12 and 24 months a standardized developmental test will be done and health status and quality of life will be measured. We will strive to obtain cerebral autopsy and histology, or, if this is not possible, post-mortem MRI of the brains of infants who die within the neonatal period.
The findings obtained from CUS and MRI examinations, follow-up, and possibly cerebral autopsy or post-mortem MRI will be compared between the infants with and the infants without ED/TBG. MRI findings as well as histological findings will help us to establish the origin of ED/TBG, while the clinical findings will reveal the consequences of ED/TBG for neurological development. The results of this research will improve the prediction of the neurological prognosis of individual preterm infants and the understanding of maturational and pathological processes in the preterm brain.

Study objective

The principal aim of this research project is to establish the origin of increased echogenicity in the thalami and basal ganglia (ED/TDG), an ultrasonographic finding fequently encountered in very preterm infants. It is not known whether ED/TBG is a normal maturational phenomenon or a pathological process with consequences for neurological development. ED/TBG may, like transient ED in the frontal white matter, represent normal maturational changes occurring in the thalamus, basal ganglia, and/or the surrounding brain tissue. However, it may also represent damage to the developing brain, like more inhomogeneous ED in TBG in (near) term infants, unilateral/localized ED in TBG in preterm infants, linear and/or punctate ED in TBG in preterm and term infants, and long-lasting ED in the periventricular white matter in preterm infants do. If so, ED/TBG is an important finding and may be associated with an unfavourable or even poor neurological prognosis. We want to explore whether ED/TBG is a pathological phenomenon or a normal (maturational) phenomenon occurring in the immature brain, and to establish the possible consequences of ED/TBG for short- and longer-term neurological outcome of very preterm infants.

Intervention

In all very preterm infants born after a gestational age of less than 32 weeks, serial CUS examinations will be performed according to the standard protocol. All CUS examinations will be evaluated for presence of diffuse ED/TBG (see brief summary). This will result in a division of all preterm infants into two groups, i.e. a group of preterm infants with ED/TBG and a group of preterm infants without ED/TBG. All infants (infants with and without ED/TBG) will

undergo a single cerebral MRI examination around term date. In addition, they will visit our follow-up clinic around term date and at corrected ages of 12 and 24 months, when their (neuro)development will be assessed. The results obtained from CUS, MRI and follow-up will be compared between the infants with ED/TBG and the infants without ED/TBG.

The only difference between the two groups of infants is that in one group ED/TBG is detected on CUS whereas in the other group ED/TBG is not detected. There is no difference between groups in kind and number of examinations.

Contacts

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Eligibility criteria

Inclusion criteria

Infants born after a gestational age of less than 32 weeks in the Leiden University Medical Center between May 2006 - August 2007.

Exclusion criteria

Congenital anomalies or serious acquired abnormalities of the central nervous system,

chromosomal disorders, metabolic disorders and neonatal meningitis and sepsis.

Study design

Design

Study type:	Interventional
Intervention model:	Parallel
Masking:	Open (masking not used)
Control:	N/A , unknown

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	03-04-2006
Enrollment:	140
Type:	Anticipated

Ethics review

Positive opinion

Date:	04-04-2006
Application type:	First submission

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
NTR-new	NL617
NTR-old	NTR676
Other	: N/A
ISRCTN	ISRCTN25932453

Study results

Summary results

Leijser LM, Klein RH, Veen S, Liauw L, Van Wezel-Meijler G. Hyperechogenicity of the thalamus and basal ganglia in very preterm infants: radiological findings and short-term neurological outcome. Neuropediatrics 2004;35(5):283-9