

Case study on the feed-and-sleep MRI in newborns:

Patient selection, work processes and the selection of suitable aids - implementation of the feed-and-sleep MRI in an interdisciplinary environment

Dr. Friederike Prüfer, Lead Physician in radiology at University Children's Hospital Basel UKBB

Background

At the University Children's Hospital Basel (UKBB), until now newborns and infants were sedated with propofol for spontaneous breathing MRI examinations and, in rare cases, intubated and ventilated.

In selected cases, the scan can be carried out as a "feed-and-sleep MRI" (MRI in natural sleep) so as to avoid sedation. The little patient is given a feed shortly before the examination, which is subsequently carried out with the newborn being immobilized in a stable positioning aid.



Fig. 1: Newborn with positioning aid in head coil

The following comments on the relevant aspects which are considered when carrying out the feed-and-sleep MRI at UKBB.

Patient selection

The selection of patients for whom the MRI is carried out in natural sleep is made using the following criteria:

<p><i>Age:</i></p> <ul style="list-style-type: none"> - Full-term infants (≥ 37 0/7 WG) - Former pre term babies at expected date (≥ 37 0/7 WG) - infants up to gestational age of < 55 0/7 WG
<p><i>Condition:</i></p> <ul style="list-style-type: none"> - Clinically stable for at least 24 hours (Vital signs, no need for O₂, no spasms) - Body weight ≥ 2000 g
<p><i>Urgency of investigation:</i></p> <ul style="list-style-type: none"> - Elective or semi-elective, i.e. such that in case of cancellation, the investigation may be delayed by one day
<p><i>Special situations:</i></p> <ul style="list-style-type: none"> - Ill newborns (e.g. perinatal asphyxia) according to assessment by neonatal unit

Table: Criteria for selection of suitable patients for feed-and-sleep MRI

This reduced the number of patients who could be considered in the early phase of the feed-and-sleep MRI implementation and enabled initial findings to be collected in a clearly specified environment. With growing experience and a further escalated routine in all departments, it should in future be possible to further expand the patient selection.

Work processes

Termination

The feasibility and the duration of the feed-and-sleep MRI are less reliable to plan than MRI examinations under sedation and require a high degree of flexibility from all disciplines involved (radiology, neonatal unit).

The duration of the MRI examination is planned in for approx. 30-45 minutes depending on indications.

To increase the likelihood of a successful examination, wherever possible, the natural sleeping times of the infant should be taken into account when choosing appointment times. However, in everyday routines, this is often not possible.

Preparation and Examination

All work processes are focused on being able to examine the newborn in a sleep state wherever possible. All prepared measures for clarification, patient monitoring and support are completed prior to feeding so that the newborn is allowed to (get to) sleep with minimal disturbance.

The preparations start approx. 60 minutes before the planned start of the MRI and are carried out by the responsible radiographer at the assigned ward (neonatal unit, ICU, general ward etc.). The required material for patient support and monitoring is brought along by the radiographer.

Firstly, the parents are informed of the process and the usual MRI safety checks (e.g. clothing) are carried out. Giving the parents a calm and detailed explanation helps to release tension, and experience tells us that this has a calming effect on the newborn.

After the explanation, patient monitoring in the form of an ECG, a pulse oximetry and temperature probe is applied. In addition, the ear protection (mini ear muffs and headphones) and the support aids are laid out. The feeding can now be carried out by the mother approx. 30-45 minutes before the planned examination and after the 3-4 hours without meal.

Once the feeding has taken place, the newborn is transported to the MRI machine and the examination is carried out with constant patient monitoring by the neonatal unit. In doing so, an attempt is made to limit the proceedings to approx. 20-30 minutes.

While the feed-and-sleep MRI is being carried out, chloral hydrate can also given as required to ensure that a smooth examination procedure is carried out according to plan

Patient support

A great deal of importance is given to adequate support of the newborn in the feed-and-sleep MRI since it has a direct influence on the success of the examination being carried out. When choosing the right aids, the following aspects in particular are considered:

- Compact, stable and comfortable support for the newborn
- Simple and practical application by the radiology professionals as well as parents
- Compatibility with patient monitoring and MRI coils
- Hygiene: Residue-free cleaning and disinfection

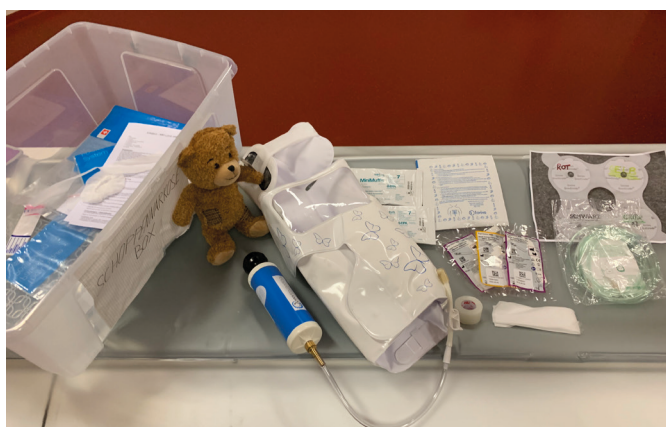


Fig. 2: Feed-and-sleep material box UKBB

At UKBB, the BabyFix Cocoon (Pearl Technology AG, Schlieren, Switzerland) is used for patient support. Once the patient monitoring is in place (as described above), the children are first of all wrapped in cotton wool and then wrapped up in the BabyFix Cocoon.

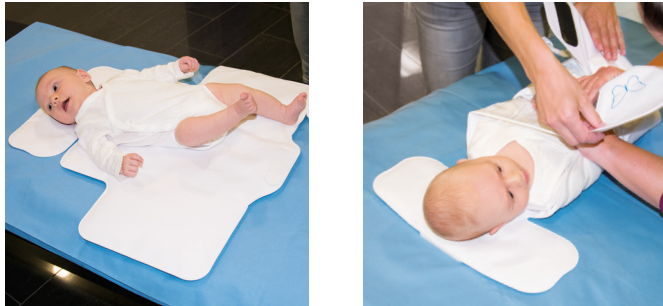


Fig. 3 and 4: Positioning the newborn into the MR safe bodysuit on the support aid, wrapping in cotton wool and wrapping in the BabyFix Cocoon

The support aid is partially vacuum-packed using a hand pump and the newborn is supported stably and without pressure points. This tight support usually soothes the children well, allowing the subsequent breast or bottle feeding to work without a problem.



Fig. 5 and 6: Breast or bottle feeding by the mother. Then placing the newborn into the MRI coil.

In addition to the optimum immobilization, good heat insulation could also be established which protects the small patients from getting cold. The BabyFix Cocoon is therefore now also used for sedated children up to 7kg. Due to the simple handling and the agreeable fixation, the BabyFix Cocoon is also used for CT scans.

Results and conclusions

Since the start of the "Feed-and-sleep MRI" project at UKBB, numerous newborns have been examined with "at least satisfactory image quality" in a natural sleep state. Even when moderate sedation using chloral hydrate is still carried out as required, the success rate of the "feed-and-sleep MRI" has been gradually increasing. The selection of suitable patients, the implementation of clear processes in interdisciplinary teams and the choice of appropriate aids thus play a decisive role in the success and the acceptance for patients, parents and clinical professionals.

About UKBB

The University Children's Hospital Basel (UKBB) is an independent, university centre of excellence for paediatric medicine as well as for teaching and research and one of the three independent children's hospitals in Switzerland. UKBB guarantees cantonal paediatric healthcare with its superior medical offering and also serves the regional and nationwide healthcare sector. UKBB is thus one of the leading university paediatric centres in Switzerland.

About Pearl Technology AG

Pearl Technology AG, based in Schlieren, offers innovative solutions for the placement, positioning and immobilization of patients in radiology and radiotherapy. The products are manufactured in Switzerland according to ISO norm 13485 and are characterized by simple handling, high patient comfort and excellent hygiene which guarantees smooth and safe examination processes.