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ORIGINAL ARTICLE

Magnetic resonance imaging without sedation in neonates☆,☆☆

N. Ureta-Velasco[a,*], A. Martínez-de Aragón[b], M.T. Moral-Pumarega[a], N. Núñez-Enamorado[c], E. Bergón-Sendín[a], C.R. Pallás-Alonso[a]

[a] *Departamento de Pediatría, Servicio de Neonatología, Hospital Universitario 12 de Octubre, Madrid, Spain*
[b] *Servicio de Radiodiagnóstico, Neurorradiología Infantil, Hospital Universitario 12 de Octubre, Madrid, Spain*
[c] *Departamento de Pediatría, Neuropediatría, Hospital Universitario 12 de Octubre, Madrid, Spain*

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Abstract
Introduction: The ability to perform magnetic resonance imaging (MRI) without sedation in the neonatal period increases patient safety, availability and profitability of the diagnostic tool. The aim in this study was to evaluate a new protocol of MRI without sedation during a 20-month period. In the protocol, the patients are prepared in the neonatal unit.
Patients and method: Prospective descriptive study, from May 2012 to December 2013. Patients included were neonates requiring MRI, clinically stable and not requiring ventilatory support. The method was based on the application of developmental centred care and the use of a vacuum mattress to immobilise the baby. The principal outcome parameter of interest was the percentage of successfully completed MRIs. The duration of the MRI and the number of interruptions, was also studied from October 2012.
Results: A total of 43 MRIs without sedation were carried out on 42 patients: 41 cerebral and 2 spinal. The success rate was 97.7% (42/43). The mean MRI time was 26.3 min (95% CI 23.3–29.3 min; range 16–50 min). MRIs were completed without interruption in 20 of the 34 cases (58%) in which the duration was recorded. The number of interruptions per procedure varied from 0 to 3, with a mean of 0.6 (95% CI 0.3–0.8) and a median of 0.
Conclusion: The protocol had a success rate of over 90%. Thus MRI without sedation seems applicable in Spanish hospitals, with most of the preparation being performed in the neonatal unit, in order to reduce the occupation of the MRI unit, as well as minimising stress to the baby.

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* Corresponding author.
E-mail addresses: noevel@hotmail.com, noelia.ureta@gmail.com (N. Ureta-Velasco).

PALABRAS CLAVE
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Resonancia magnética sin sedación en recién nacidos

Resumen
Introducción: La posibilidad de llevar a cabo RM sin sedación en el período neonatal aumenta la seguridad del paciente, la disponibilidad y rentabilidad de la prueba. El objetivo fue describir la experiencia de 20 meses con el nuevo protocolo de RM sin sedación, en el que la preparación del paciente se realiza en la unidad neonatal.
Pacientes y método: Estudio descriptivo prospectivo, de mayo del 2012 a diciembre del 2013. Los pacientes incluidos fueron neonatos con indicación de RM, estables y sin soporte ventilatorio. El procedimiento se fundamentó en la aplicación de cuidados centrados en el desarrollo y el uso de un colchón de vacío como sistema de inmovilización. La variable resultado principal fue el porcentaje de RM completadas con éxito. Desde octubre del 2012 se recogieron además la duración de la prueba y el número de interrupciones.
Resultados: Se llevaron a cabo 43 RM sin sedación, 41 cerebrales y 2 de columna vertebral. La tasa de éxito fue del 97,7% (42/43). La media de tiempo de RM fue 26,3 min (IC del 95%, 23,3–29,3 min; rango 16–50 min). Se completó la prueba sin interrupciones en 20 de los 34 casos (58,8%) en los que se recogió este dato. La media de interrupciones fue 0,6 (IC del 95%, 0,3–0,8; rango 0–3) y la mediana 0.
Conclusiones: El protocolo tuvo una tasa de éxito superior al 90%. Por tanto, la RM sin sedación parece factible en nuestro medio, realizando gran parte de la preparación en la unidad neonatal para así disminuir la ocupación de la sala de RM.

Introduction

The use of magnetic resonance imaging (MRI) in the neonatal period has increased in recent years, partly due to the growing concern with the neurologic prognosis of premature or severely ill newborns (NBs). Until a few years ago, it was considered necessary to sedate or anaesthetise NBs that were going to be subjected to an MRI scan to avoid motion artefacts and obtain images with good quality. But this practise involves exposing the patient to the risks associated with sedative or anaesthetic drugs, a decrease in the availability of the test, an increase in healthcare costs and the need for time-consuming monitoring of the patient following the examination.[1–3] The possibility of performing MRI without sedation or anaesthesia (MRWS) in the neonatal period increases the safety of the patient as well as the availability and the cost-effectiveness of the test, which allows for expanding its indications.[4,5]

Few studies have been published on the subject, but they all show excellent results, as they reported the acquisition of images of good quality in a high percentage of the tests[4–8] and demonstrated that the procedure is safe in term NBs as well as preterm NBs if the scan is performed at term-equivalent age.[4,9,10]

Protocols to perform MRWS in the neonatal period have been described in detail.[1,4,6] Most authors use a vacuum mattress for immobilising the NB in order to reduce the appearance of motion artefacts.[1,4–7,9]

In light of the good results reported by other centres, we decided to form a multidisciplinary team and launch our own MRWS protocol. The aim of this study was to describe our 20-month experience with the new MRWS protocol, which specifies that the preparation of the patient be carried out in the neonatal unit.

Patients and methods

We conducted a descriptive prospective study from May 2012 to December 2013. Before the study started, we developed a MRWS protocol that involved the use of a vacuum mattress (BPOD2-002 vacuum mattress fitted with an exothermic mattress compatible with the BabyPod II EVO4, Adaro Tecnología S.A., Gijón, Spain) to immobilise the NB.

In the 4 months preceding the implementation of the MRWS protocol, we formed a multidisciplinary team consisting of a paediatric neurologist, a paediatric neuroradiologist, and a neonatologist from our centre. We reviewed the literature, and the principal author gained practical experience at the Erasmus Medical Centre-Sophia in Rotterdam, the Netherlands. We developed the MRWS protocol and offered educational workshops in the paediatrics and neonatology departments attended by paediatricians, paediatric neurologists and radiologists.

The inclusion criteria for the MRWS protocol were: NB in whom MRI is indicated, clinically stable and not requiring ventilatory support.

The primary endpoint was the percentage of MRI attempts completed successfully. Success was defined as achieving images of the same quality as images obtained up to that point in MRI studies with sedation, allowing the interpretation of all the requested and performed sequences. From October 2012, we also documented the duration of the procedure and the number of interruptions required during it. The duration of the procedure was defined as the time elapsed from the moment the child entered the MRI room to the time the scan was considered done, expressed as mean and confidence interval. Any adverse events were documented in writing.