Normal comparisons of myelination patterns at multiple time points: A PACS infrastructure answer to a common diagnostic dilemma
Authors/Disclosures

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Background

• Assessment of pediatric myelination is difficult and arduous

• Requires robust knowledge of expected evolution of numerous structures at multiple ages

• Currently available resources are limited, and include:
  • Text descriptions of myelination patterns
  • Single-slice images (e.g. in textbooks)
  • Electronic comparisons outside an institution’s PACS
Purpose

Create a list of normal pediatric brain MRIs in our institution’s PACS that can be used as a reference for myelination
Materials and Methods

• PACS database was searched for normal pediatric brain MRIs
  • Patients had no identifiable abnormality on imaging
  • Confirmed normal myelination on retrospective review

• Examinations were collected of patients at ages separated by approximately 1 month:
  • E.g. Term birth, 4 weeks, 8 weeks, etc.
  • Up to 24 months of age
  • Also premature (e.g. born at 36 weeks gestation age)

• Ages based on gestational age
  • E.g. an exam at 2 weeks of age in an infant born at 38 weeks was considered “term birth”
Plan

1. To upload list of normal examinations within the PACS
2. To make such archived exams available for direct comparison within the PACS
3. To make radiologists at our institution aware of this resource
Example 1: Term birth

T2WI (A) and T1WI (B-C) axial images demonstrate normal myelination at 0 weeks of age. On T2, there is normal myelination of the posterior limb of the internal capsule (PLIC) (A). T1WI also show myelination of the PLIC (B), as well as the middle cerebellar peduncles (C) and dorsal brainstem (D).
Example 2: 4 weeks

T1WI (A-B) and T2WI (C-D) of a normal 4 week old infant. On T1, there is myelination of the isthmus and splenium of the corpus callosum (A) and anterior limb of the internal capsule (B). On T2WI, myelination remains limited to the PLIC (C), as well as some of the corona radiata (D).
Example 3: 7 weeks

T1WI (A-B) and T2WI (C) of a normal 7 month old patient. There is myelination of the genu of the corpus callosum (A) and nearly all of the periventricular white matter (B). Myelination has progressed to include the ALIC on T2WI (C).
Example 4: 24 weeks

This is the oldest age group chosen, as myelination has reached its adult form in most patients. T2WI show near-complete myelination throughout, except for some peri-atrial terminal zones of myelination.
Potential benefits of this project

- Examinations can be visually compared to normal patients
- Data within the PACS allows for direct comparison in a single interface
  - Similar imaging techniques
  - Allows image manipulation (e.g. windowing)
Future directions

• Further work still need to ensure normal studies can be anonymized within the PACS
• Different options being explored to choose best way to make studies easily accessible
• Ideally, this work can serve as a roadmap for other institutions to explore similar projects
Conclusions

• A list of normal pediatric brain MRIs within an institution’s PACS is a viable resource option for radiologists

• Such a list should include a range of patient ages, from premature patients (e.g. 36 weeks gestation age) to 24 months old (age of adult myelination pattern on MRI)