

Case Study

# Leveraging the Clinical Power of Volumetrics and Reporting from SyMRI

// We use the volumetric data generated by SyMR to aid in clinical decision making, enhancing our ability and confidence beyond what we could do with standard imaging alone. //



**Blaise Jones, MD - Chief of Pediatric Neuroradiology  
Cincinnati Children's Hospital Medical Center  
Cincinnati, OH - USA**

Dr. Blaise Jones possesses a passion for unraveling mysteries and finding solutions to problems, coupled with a genuine fondness for working with children. These interests guided Dr. Jones toward a career as a pediatric neuroradiologist. Dr. Jones holds a distinguished tenure as the chief of the Neuroradiology section at Cincinnati Children's Hospital Medical Center spanning two decades. Past leadership roles include the presidency of the American Society of Pediatric Neuroradiology, and ongoing involvement in the American Board of Radiology—an organization dedicated to testing radiologists to ensure their medical qualifications.



**James (Jim) Leach, MD - Radiologist  
Cincinnati Children's Hospital Medical Center  
Cincinnati, OH - USA**

With a background as chief resident in Radiology and a neuroradiology fellowship at the University of Cincinnati Medical Center, Dr. James Leach brings extensive experience to his role. His career includes serving as a staff neuroradiologist at the University of Cincinnati, private practice at Margaret Mary Community Hospital, and a subsequent return to the University of Cincinnati.

Notable achievements involve directing the Radiology Residency Program and earning the Harold B. Spitz Award for excellence in resident education. Since September 2007, Dr. Leach has dedicated his focus to pediatric neuroradiology at Cincinnati Children's Hospital Medical Center, previously serving as the fellowship director. Currently, he holds the position of clinical professor of Radiology at the University of Cincinnati College of Medicine.

## About Cincinnati Children's Hospital Medical Center

Describing Cincinnati Children's Hospital Medical Center as a bustling institution is an understatement. As the exclusive level 1 pediatric trauma center in Southwest Ohio, the facility stands as the home to the nation's most active pediatric emergency department. Beyond its substantial patient throughput, the 700-bed facility consistently secures its position as one of the preeminent children's hospitals in the country. In 2023, Cincinnati Children's Hospital Medical Center was ranked #1 in pediatric hospitals by US News & World Report.



Objective decision support in a single fast scan



Rapid visualization of reliable quantitative data

## SyMRI NEURO Volumetric Protocol and Reporting

SyMRI NEURO utilizes curve fittings to analyze T1, T2, and PD measurements from a single fast scan lasting less than 5 minutes. SyMRI is utilized in every MRI examination of children under 1 year old at Cincinnati Children's Hospital Medical Center (CCHMC), as well as in all studies conducted to evaluate hydrocephalus or other cerebrospinal fluid (CSF) disorders. The reports for these examinations contain the subsequent indices generated by SyMRI:

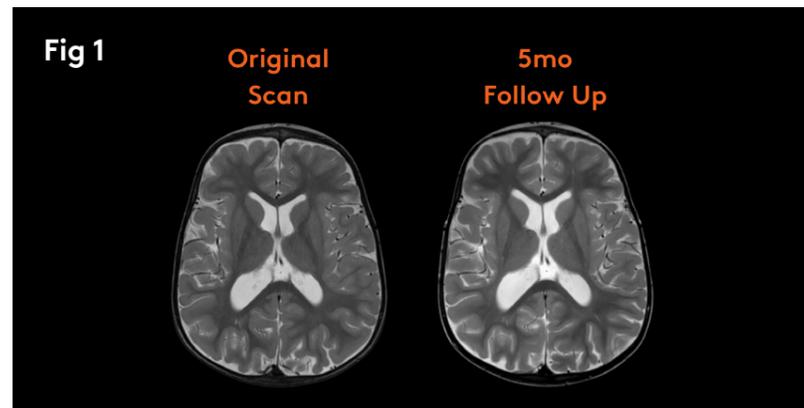
- Intracranial volume (ICV)
- Brain parenchymal volume (BPV)
- Cerebrospinal fluid volume (CSF)
- Brain parenchymal fraction

These indices collectively contribute to a comprehensive assessment, providing valuable insights into the structural components and volumes of the brain. The utilization of SyMRI ensures a detailed analysis and quantification of these parameters, playing a pivotal role at Cincinnati Children's Hospital Medical Center in evaluating brain health, guiding clinical decisions, and facilitating a more personalized approach to patient care.

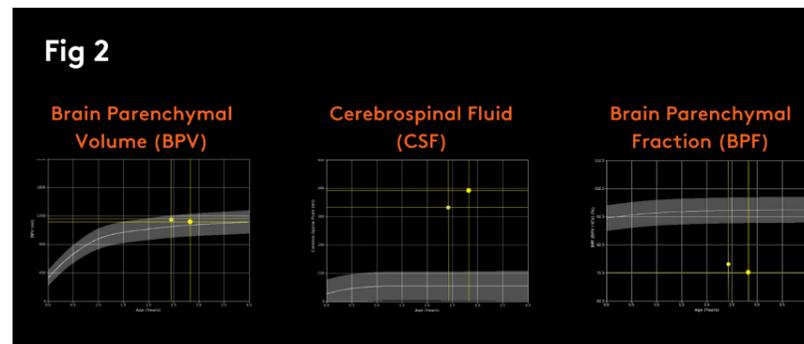
## Case 1

34 month old with achondroplasia.

Patient displaying typical developmental patterns but presenting with macrocephaly, alongside documented foramen magnum stenosis and ventriculomegaly. Imaging results indicate subjective stability over a 5-month period (Figure 1).



Evaluation of SyMRI's age-stratified reference curves reveals a 5% decline in brain parenchymal volume during the 5-month period. Additionally, the SyMRI CSF volume measurement indicates a 16% rise in CSF volume over the same 5-month interval. The SyMRI BPF calculation demonstrates a 4% reduction in the ratio of brain parenchyma to intracranial volume over the specified period (Figure 2).

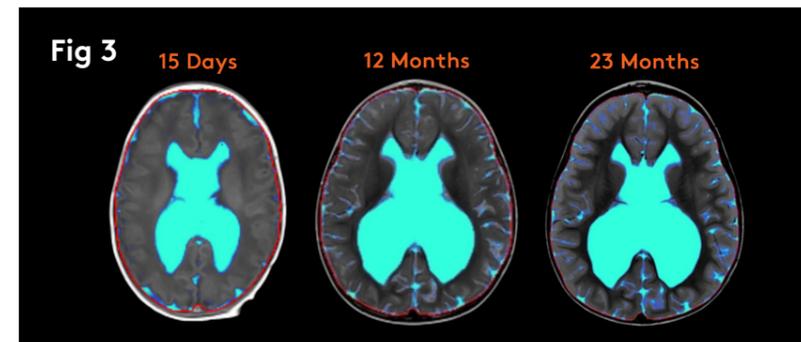


The data provided by SyMRI revealed a stable intracranial volume (ICV) over the 5-month period. The decision for surgical intervention was supported by the concurrent increase in CSF volumes and decrease in parenchymal volumes before the manifestation of overt symptoms. Neurosurgeons consider SyMRI calculations as a key part of a broader set of data points to assess the necessity and timing of intervention.

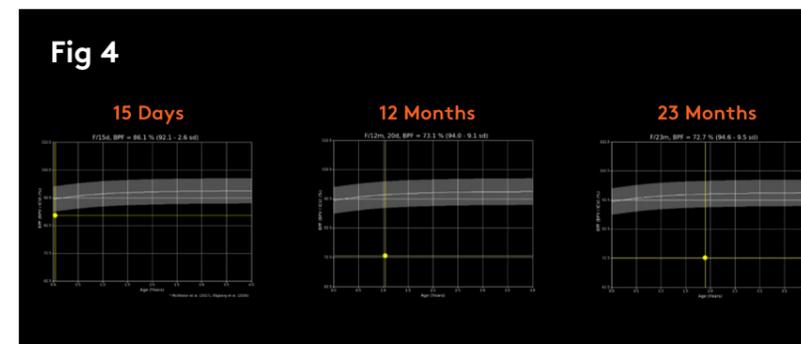
## Case 2

In utero repair of myelomeningocele.

Repairing myelomeningocele in utero has demonstrated a significant decrease in the percentage of children requiring post-natal cerebrospinal fluid (CSF) diversion for Chiari 2 malformation, dropping from 90% to 40% when compared to those undergoing post-natal repair.\*



SyMRI's SyMaps delineate boundaries for the intracranial cavity (ICV) with a red outline and cerebrospinal fluid (CSF) with a blue outline, facilitating the computation of CSF and intracranial volumes (Figure 3). Notably, the lateral ventricles exhibited a significant size increase between the 15-day and 12-month intervals. These visual representations enable radiologists to validate the precision of designations and ensure comparability across examinations.



The shaded gray region illustrates the spectrum of Brain Parenchymal Fraction (BPF) values observed in the general population from ages 0 to 4 years. A notable decrease in BPF is observed between 15 days and 12 months, while no discernible change is noted between 12 and 23 months (Figure 4). This stability provided reassurance to the neurosurgeon, indicating the absence of progressive hydrocephalus necessitating cerebrospinal fluid (CSF) diversion.

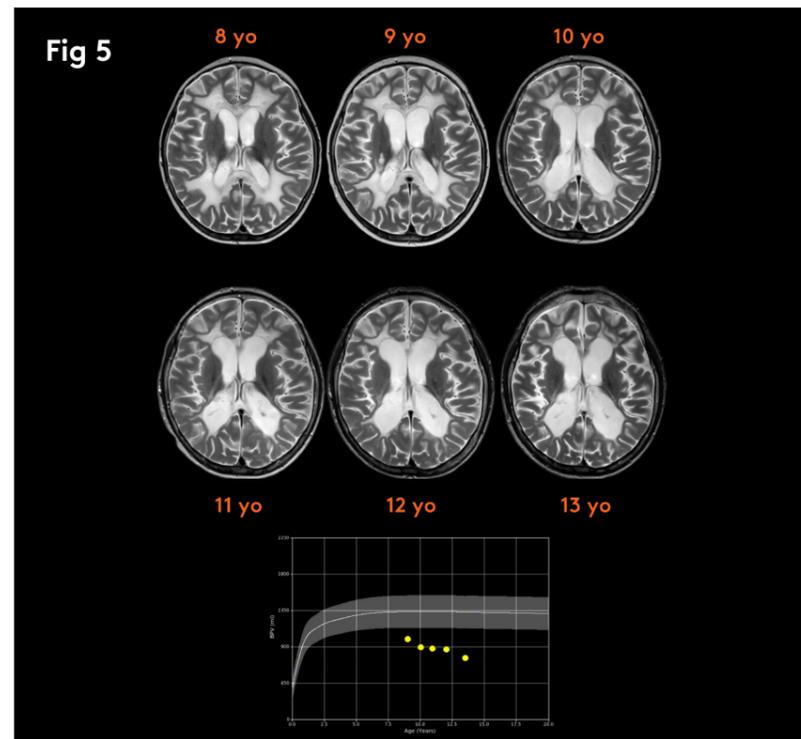
SyMRI's precise evaluation of CSF volumes and brain parenchymal fraction is crucial for neurosurgeons to make informed decisions regarding the necessity of CSF diversion.

\*Adzick NS, et al. N Engl J Med 2011; 364:993-1004. DOI: 10.1056/NEJMoa1014379

## Case 3

13 yo with ACOX-1 gain of function mutation.

ACOX-1, also known as Acyl-CoA oxidase 1, functions as a peroxisomal enzyme engaged in the beta-oxidation process of very-long-chain fatty acids. Mutations in the gene associated with this enzyme, leading to a gain of function, result in a gradual onset of neurodegeneration, characterized by volumetric reduction and the development of leukoencephalopathy.



Annual MR examinations utilizing SyMRI's volumetric data distinctly reveal a continuous decline in brain volume from the 9th to the 13th year. The SyMRI-generated brain volume data, illustrated in yellow, effectively highlights a continuous decline in volume from the 9th to the 13th year (Figure 5). This meticulous analysis, when plotted against the normal range of values in gray, provides a clear visual representation of the consistent and gradual decrease in brain volume over the specified age range.

SyMRI proves invaluable in longitudinal monitoring of brain health through its annual magnetic resonance (MR) examinations. The utilization of SyMRI's advanced volumetric analysis becomes particularly crucial in discerning and tracking subtle changes in brain volume over time. Such precision and clarity make SyMRI an indispensable tool for early detection and monitoring of changes in brain health, enabling timely intervention and personalized care.

[www.syntheticmr.com](http://www.syntheticmr.com)

## About SyMRI

SyMRI offers confident care through intelligent imaging. It combines an MR sequence with post-processing MR software, and includes multiple contrast-weighted images, fully adjustable for TE, TR, and TI values for optimal flexibility. Using only a single scan and with a post-processing time of less than 10 seconds, SyMRI enables automatic segmentations and volume measurements of tissues such as white matter, gray matter, cerebrospinal fluid, and myelin. This allows users to track disease progression or compare against control groups.

SyMRI which is FDA cleared for patients of all ages, is available both as a stand-alone solution or be fully integrated into the clinical workflow.

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