IMAGING MACROCEPHALY

Tiffany Lewis BA⁴, Lisa H. Lowe MD, FAAP²,³ and Cynthia Taylor, MD²,³

¹Kansas City University of Medicine and Biosciences College of Osteopathic Medicine
²Department of Radiology, Children’s Mercy Hospitals and Clinics and the
³Department of Radiology, University of Missouri Kansas City

Reductions in both unnecessary imaging and radiation exposure in children are the focus of the Image Gently Campaign, a nationwide, multidisciplinary effort including organizations such as the American Academy of Pediatrics and the Society of Pediatric Radiology. In continued support of this campaign to reduce radiation and unnecessary imaging, we will discuss the imaging approach to macrocephaly.

Macrocephaly refers to a head circumference greater than two standard deviations above the mean (>95%) for age, sex, race and gestation. The differential diagnosis of macrocephaly most often includes the normal variation of benign enlarged subarachnoid spaces (BESS). Less often, it is due to a pathological state such as subdural hematoma, hydrocephalus and, extremely rarely, an intracranial mass. When imaging is considered, the type of imaging is based on the child’s development and age (see table below).

<table>
<thead>
<tr>
<th>Clinical Presentation &amp; Age</th>
<th>Imaging approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmentally normal infant/child with open fontanel</td>
<td>Head ultrasound</td>
</tr>
<tr>
<td>Developmentally normal infant/child with closed fontanel</td>
<td>CT or MRI</td>
</tr>
<tr>
<td>Developmentally abnormal infant/child with open or closed fontanel</td>
<td>MRI</td>
</tr>
</tbody>
</table>

In developmentally normal infants (normal neurological exam) with open fontanels short term clinical follow-up with serial measurements of the head circumference alone with or without head ultrasound is reliable and safe [1]. If the head circumference stabilizes, imaging is not suggested. If the head continues to enlarge disproportionately to the child’s growth, ultrasound is useful to screen for severe hydrocephalus, or rarely, a mass so large it may cause macrocephaly.

In developmental normal children with a closed fontanel, ultrasound is not possible. Instead, CT or MRI of the brain are required if imaging is performed. In these cases, the utility of close follow-up with serial head circumference measurements versus risks of imaging (radiation with CT or sedation risk with MRI) must be considered on a case by case basis [2]. In certain circumstances one mode of imaging may offer an advantage over the other, such as if visualization of the bones is important, then CT is preferred [3].

In developmentally abnormal infants or children, MRI is needed to carefully evaluate the brain parenchyma, as well as the extraxial spaces [2, 3]. Parenchymal brain signal changes of rare metabolic disorders, such as Alexander and Canavan disease, may present with macrocephaly and are best visualized with MRI.

To learn more about the Image Gently Campaign, and take the pledge to reduce radiation in children along with thousands of other pediatric clinicians, please visit http://www.pedrad.org/associations/5364/ig/.

Further information regarding the imaging approach to pediatric disorders may be found at the American College of Radiology Web site (imaging appropriateness criteria) at http://www.acr.org/SecondaryMainMenuCategories/quality_safety/app_criteria.aspx. You may also contact the Department of Radiology at Children’s Mercy Hospitals and Clinics at 816-234-3270.

References: