Pediatric Neurosurgery

Five Things Physicians and Patients Should Question

by
Canadian Pediatric Neurosurgery Study Group

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In partnership with the Canadian Medical Association

1 Don't order a CT to initially investigate macrocephaly (order an ultrasound or MRI).

A common pediatric neurosurgery referral is a young child with a rapidly increasing head circumference crossing percentiles. The differential diagnosis is broad and includes benign expansion of the subarachnoid spaces (BESS), subdural collections, hydrocephalus, and neoplasm. When the fontanelle is open, the etiology can usually be diagnosed on head ultrasound, and this should therefore be the initial screening test of choice. In the absence of an open fontanelle, or if there are other signs and symptoms of acute raised intracranial pressure (vomiting, headache, irritability, drowsiness, full fontanelle, sun setting eyes), the etiology should be diagnosed with MRI, if available, in order to limit radiation exposure. There is growing evidence that exposure to radiation through CT imaging increases a child's life long risk of cancer, and so all care should be taken to minimize this exposure as much as possible. Ultrasound (when fontanelle open), and/or MRI (when fontanelle closed), are therefore the screening tests of choice to investigate macrocephaly.

2 Don't image a midline dimple related to the coccyx in an asymptomatic infant or child.

Sacrococcygeal dimples (also called simple sacral dimples or sacrococcygeal pits) are common findings in newborns, with a prevalence of approximately 2 to 5%. They are not associated with any increased risk of occult spinal dysraphism (e.g., low lying conus, fatty filum, lipomyelomeningocele, split cord malformation, dermal sinus tract, etc.) compared with the general population of infants without sacrococcygeal dimples. There is therefore no need to investigate infants with this finding, with either ultrasound or MRI. Red flags for which investigating would be indicated include the presence of midline tuft of hair, sacral dimple or sinus tract above the gluteal cleft, hemangioma, dermal appendage, and/or a subcutaneous lump. The ideal choice for initial investigation (ultrasound or MRI) would depend on the specific cutaneous findings and clinical symptoms present.

3 Don't use CT scans for routine imaging of children with hydrocephalus. Fast sequence non-sedated MRIs or ultrasounds provide adequate information to assess patients without exposing them to radiation or an anesthetic.

Children with hydrocephalus, on average, obtain two head imaging assessments annually until the age of 20. Their lifetime increase risk of fatal cancer is estimated to be 1 excess case of fatal cancer per 97 patients if standard head CT is used, or 1 excess case of fatal cancer per 230 patients if low-dose head CT is used. Head ultrasound (in infants with open fontanelles), and rapid sequence MRI (in all other children) do not require ionizing radiation and adequately assess for radiographic change in ventricle size. A rapid sequence MRI can be obtained without sedation and in under 3 minutes. It is therefore recommended that ultrasound (in infants with open fontanelles), or rapid sequence MRI (in all other children) be used for surveillance imaging in hydrocephalus at minimum, and ideally in emergency assessments as well when available. In the emergent setting, or when MRI is not available, low-dose non-contrast CT is appropriate.

4 Don't recommend helmets for mild to severe positional flattening.

Positional flattening is very common, affecting up to 40% of infants since the Back to Sleep campaign began in 1992. There is now prospective, randomized control trial evidence that helmeting is no better at improving head shape in mild to severe positional flattening compared with physical therapy and providing general positioning recommendations such as maximizing tummy time while awake, and limiting time in swings and car seats. New guidelines from the Congress of Neurological Surgeons, following a systematic literature review including a review of the randomized trial mentioned above, consider helmeting as an option for severe cases of positional flattening. The prevalence of positional flattening in teens from the era following the Back to Sleep campaign but before helmets were widely used was less than 2%, suggesting that regardless of both the intervention used and the severity of the flattening, the vast majority of cases of positional flattening will cosmetically normalise. The cost of helmeting is also significant; a helmet costs thousands of dollars, and requires frequent adjustments over several months to adjust to an infant's growing head. There are also risks associated with helmeting, including pressure sores and interference with parental attachment. With its associated high cost and only very weak evidence of benefit in treating positional flattening, there is no clear additional value in recommending helmets for infants with mild to severe positional flattening in addition to traditional positioning recommendations and physiotherapy.

5 Don't do routine surveillance imaging for incidentally discovered Chiari I malformation.

Chiari I malformation, defined as cerebellar tonsillar herniation greater than or equal to 5mm below the foramen magnum on MRI brain, is a frequent incidental finding in children, with an estimated prevalence of 1 to 3%. The vast majority of children with incidentally discovered, asymptomatic Chiari I malformations have no clinically significant progression of tonsillar descent on routine follow-up, and symptom development is often unassociated with radiographic change. Radiographic follow-up in the absence of new symptomatology is therefore unnecessary.

How the list was created

The Canadian Pediatric Neurosurgery Study Group (CPNSG)'s membership is composed of pediatric neurosurgeons practicing in Canada. Contact information for the group's members was used to invite pediatric neurosurgeons practicing in Canada to complete two anonymized emailed questionnaires, first to brainstorm recommendations, and then to rate them. Recommendations that had overall support were presented for discussion at the CPNSG annual meeting in 2016. From this list, suggested recommendations were eliminated if they were felt by the study group to not be adequately evidence-based, or if they were felt to not be significantly impactful on a pediatric neurosurgical patient population. A final questionnaire was then sent out to Canadian pediatric neurosurgeons, asking each participant to rank each of the final suggested recommendations. The top five suggested recommendations with the strongest support were then selected as the Choosing Wisely Canada recommendations for pediatric neurosurgery and presented to Choosing Wisely Canada for final approval and endorsement.

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About The Canadian Pediatric Neurosurgery Study Group

The Canadian Pediatric Neurosurgery Study Group (CPNSG) is a proud partner of the Choosing Wisely Canada campaign. The CPNSG is a national collaborative representing all provincial pediatric neurosurgery centres across Canada and is dedicated to optimizing Canadian pediatric neurosurgical patient care through collaborative data collection, clinical research and innovation.

About Choosing Wisely Canada

Choosing Wisely Canada is a campaign to help physicians and patients engage in conversations about unnecessary tests, treatments and procedures, and to help physicians and patients make smart and effective choices to ensure high-quality care.

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