Subdural hygromas and arachnoid cysts

To The Editor: In their recent paper, Maher et al. (Maher CO, Garton HJL, Al-Holou WN, et al: Management of subdural hygromas associated with arachnoid cysts. Clinical article. J Neurosurg Pediatr 12:434–443, November 2013) review their extensive experience in managing subdural hygromas associated with arachnoid cysts. For several years now, we also have been tracking cases of arachnoid cysts that are associated with subdural hygromas. We would like to present our series of patients treated with observation (Table 1) and treated with surgery (Table 2) and contrast our management strategy for these unique and challenging patients.

Similar to Maher et al., we noted a temporal relationship between the history of head trauma and onset of symptoms in 6 of our 7 patients. We agree with the authors that the commonly described association with a preceding trauma suggests that head injuries are probably causative of, or at least contributory to, the pathogenesis of these lesions rather than coincidental. We echo Maher et al.’s belief that the subdural hygroma is likely the reason that these usually asymptomatic lesions become symptomatic but believe that the exact mechanism remains enigmatic.

As is well documented in the literature, the management of arachnoid cysts is varied and controversial. The treatments proposed for intracranial arachnoid cysts include observation with serial imaging, bur hole evacuation of the subdural hygroma with or without subdural drain placement, cyst fenestration (using either craniotomy or endoscopic techniques), cyst-to-ventricle shunting, and cyst-to-peritoneal shunting. As was the case in the series presented by Maher et al., conservative management was initially employed in all our patients (Tables 1 and 2). However, unlike their series, the majority of our patients (5 of 7) eventually required surgical treatment. This was surprising as the indications for surgery were similar—namely, the persistence of symptoms of elevated intracranial pressure and/or radiographic increase in the size of the arachnoid cyst or the subdural hygroma. The fact that the majority of our patients required surgery may be explained by the fact that it is a relatively small series, or, more likely, we had a lower threshold to intervene when symptoms persisted. Until now, we have been proactive in cases involving worsening signs and symptoms of elevated intracranial pressure, especially in patients in whom we have felt that there was imminent neurological compromise. With the information provided by Maher et al., we will consider extending our period of observation. We add that our experience is in agreement that the mere presence of a hygroma is not in itself an absolute indication for surgical treatment. It is hoped that as more experience with these cases is gleaned, the indications for and timing of surgical intervention will become better defined and perhaps less subjective.

We are also hopeful that more experience with these cases will define the most appropriate surgical intervention and also shed some light on how to counsel patients with asymptomatic arachnoid cysts who are desirous of playing sports, especially those involving direct contact or with a risk for head trauma. Our approach to the latter thus far has been permissive, in that we do not limit activity but do admonish the family that should symptoms occur after a head injury, medical treatment be sought as soon as feasible.

We greatly enjoyed Maher et al.’s presentation of management of subdural hygromas associated with arachnoid cysts and congratulate them on their article, which will surely serve as a benchmark for future investigation of these perplexing lesions.

GRIFFIN R. BAUM, M.D. 1
NATHAN C. ROWLAND, M.D., PH.D. 2
JOSHUA J. CHERN, M.D., PH.D. 1,3
ANDREW REISSNER, M.D. 1,3
1Emory University School of Medicine
Atlanta, GA
2University of California, San Francisco
San Francisco, CA
3Pediatric Neurosurgical Associates
Children’s Healthcare of Atlanta
Atlanta, GA

TABLE 1: Cases of arachnoid cyst associated with subdural hygroma treated without surgery*

<table>
<thead>
<tr>
<th>Age (yrs), Sex</th>
<th>Cyst Location</th>
<th>Trauma History</th>
<th>Interval From Injury to Pres</th>
<th>Interval Growth</th>
<th>HA</th>
<th>Nausea &amp;/or Vomiting</th>
<th>Papilledema</th>
<th>Diplopia</th>
<th>Tx</th>
<th>Clinical</th>
<th>Cyst Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>6, F</td>
<td>lt MF</td>
<td>yes</td>
<td>1 mo</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>good</td>
</tr>
<tr>
<td>2, M</td>
<td>rt MF</td>
<td>yes</td>
<td>2 days</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>good</td>
</tr>
</tbody>
</table>

* HA = headache; MF = middle fossa; Pres = presentation; Tx = treatment; unk = unknown.
Response: By sharing their experience with the management of 7 additional patients with this combined pathology, Dr. Baum and his distinguished colleagues have provided a service to all neurosurgeons who are interested in subdural hygromas associated with arachnoid cysts and their management. They noted several similarities between their series and our own, including the tendency for previously asymptomatic arachnoid cysts to occasionally present with symptomatic subdural hygromas following trauma. They reported on 2 additional symptomatic patients who were treated nonsurgically and had excellent outcomes.

When comparing any small case series to another, differences in treatment and outcomes are expected. It is inevitable that different groups may have slightly different surgical indications that will result in different rates of surgical intervention. Unlike our own series, most patients presenting to Dr. Baum and colleagues were treated surgically. We agree that the greater percentage of patients in their series undergoing surgery may be due to a different threshold for surgical intervention between our institutions. It is of interest that in this group of patients, 4 of 5 required at least one further surgical procedure and 3 of 4 who were initially treated with bur hole evacuation eventually required shunt placement. These surgical outcomes are consistent with those of prior reports

Given the available data on the treatment of subdural hygromas associated with arachnoid cysts, a wide spectrum of practices for this condition can be justified. Since the symptomatic natural history of the condition is often self-limiting, we prefer to reserve surgery for only the

Disclosure

The authors report no conflict of interest.

References

Neurosurgical forum

most recalcitrant or concerning cases. We hope that our own report as well as the excellent contribution of Dr. Baum and his colleagues will lend support to the consideration of nonsurgical management for well-selected patients.

CORMAC O. MAHER, M.D.
University of Michigan
Ann Arbor, MI

References


Avoiding routine postoperative head CT in children

To The Editor: We read with interest the article by Morton and coauthors1 (Morton RP, Reynolds RM, Ramakrishna R, et al: Low-dose head computed tomography in children: a single institutional experience in pediatric radiation risk reduction. Clinical article. J Neurosurg Pediatr 12:406–410, October 2013) reporting on the implementation of a reduced-dose head CT protocol in 624 pediatric patients in their center. The quality of the images was adequate in every case, and as a result of this protocol and a concurrent fast MRI protocol, the total number of full-dose CT scans performed in children was reduced from 3730 in the prior year to 2774 scans, of which 2150 were full-dose.1,12

This is an important paper that highlights the need to reduce exposure of the pediatric population to unnecessary CT-related ionizing radiation.5,31 As the authors state, imaging indications must be constantly reviewed to ensure the necessity of performing scans.11 However, of these 624 low-dose CT scans, the majority were routine postoperative CT studies performed to evaluate craniosynostosis repair (12%, 75 patients) or to assess catheter placement (70%, 434 patients).11 Avoiding routine CT following craniosynostosis repair and shunt placement could further reduce radiation exposure.

For routine postoperative CT to be warranted, the relative benefits of detecting a clinically silent management-altering radiological finding (for example a hematoma or hardware malplacement) must outweigh the risks, which, in addition to radiation exposure, include exposing the patient to the risk of unprotected environment during transfer or scanning, which may result in CSF over- or underdrainage, inadvertent extubation, arterial cannula or surgical drain pull-out, demand on personnel, cost, and medical instability.5,9 To be justified, routine postoperative CT would have to predict a change in clinical care or ultimately a return to the operating room (OR) in a significant proportion of patients. However, there is recent evidence in both the pediatric4 and adult6,9 literature that routine (< 24 hours) postoperative CT following cranial surgery is of low clinical yield. When performed routinely less than 7 hours after surgery, head CT generally fails to predict the need for immediate reoperation (0%–0.4%).5,9

A review of 84 cases involving patients who underwent cranial vault remodeling or bifrontal craniotomy for the treatment of craniosynostosis showed that routine postoperative CT should not be performed, as there are frequent incidental findings (for example, small epidural blood collections without mass effect) that do not predict clinical events.3 In the 3 patients who had clinical events in this study (syndrome of inappropriate diuretic secretion [SIADH] in 2, seizure in 1), the initial CT findings were normal and follow-up CT was performed after the clinical event, revealing small epidural bleeds that did not change management. The only exceptions in this study were patients with ventriculoperitoneal (VP) shunts, in whom a 29% shunt malfunction rate occurred postoperatively, but all patients had clinical signs and underwent CT for that specific clinical indication.2 In a retrospective study of 903 patients who underwent routine immediate postoperative CT scans, including 203 for hydrocephalus operations, CT was found to be of low yield following endoscopic procedures or VP shunt placement for hydrocephalus as compared to tumor or intracranial hemorrhage operations.8 Of the 0.4% of immediate postoperative CT studies that warranted urgent reoperation, all were tumor related.8

We do not think CT should be routinely performed following shunt placement, and this may be especially true when catheters are placed using neuronavigation or ultrasound guidance.10 Although the benefit of detecting a misplaced ventricular catheter cannot be underestimated, shunt location can be reliably assessed with anteroposterior and lateral skull-abdomen shunt series, which has the advantage of assessing the location of the entire shunt and has a much lower effective dose estimate (0.047–0.086 mSv depending on age) than CT in children (4.2–1.4 mSv depending on age).1

Routine CT scan is more justified following cranial surgery at high risk of finding a management-altering finding, such as malignant/vascular tumor removal, stereotactic tumor biopsy, or intracranial hemorrhage surgery. For indications such as craniosynostosis or shunt catheter placement, CT should be reserved for select cases in which there has been an intraoperative event (for example, bleeding or removal of an adherent proximal catheter) or following an unexpected change in neurological status. When a CT scan is performed following an unexpected change in neurological status, 30% patients return to the OR, compared to 0%–1% when it is done routinely.9 This correlates well with the trauma literature, where CT predicts return to the OR in 38% of cases fol-
ollowing a change in neurological status compared to 0%–1% for routine follow-up CT.4

Finally, although the relative ionizing radiation dose is clearly decreased in this study by the reduction in tube current (mA), the actual amount of ionizing radiation received with both standard and “reduced dose” CT is not known, because this depends on multiple other variables. Providing the weighted average CT dose index (CTDIw) for a slice (mGy) and the dose-length product (DLP) for a complete CT scan (mGy-cm) at the given tube currents (mA) may give a better idea of how low a “low-dose” CT is at this institution in comparison to the standard pediatric dose (http://www.acr.org/Quality-Safety/accreditation/CT).5

In conclusion, the best way to reduce radiation exposure from CT scans is to only do scans when indicated clinically or when the potential risk of CT is less than the value of the information provided. Every test should have a purpose, and unnecessary tests add unnecessary risks and un-indicated procedures. This criticism does not detract from the benefit of introducing newer techniques for reducing radiation exposure without compromising on the quality of images, when indicated. The authors are to be complimented on their work.

Alexander G. Weil, M.D., F.R.C.S.C.
John Raghieh, M.D.
Toba N. Niazi, M.D.
Sanjiv Bhatta, M.D.
Miami Children’s Hospital
Miami, FL

Disclosure

The authors report no conflict of interest.

References


RESPONSE: We appreciate the comments from Dr. Weil and colleagues. All neurosurgeons should be sensitive to the need for reducing ionizing radiation exposure in our patients. Shunt-treated hydrocephalic children made up the largest portion of our study population, and the concern raised by Dr. Weil et al. over routine postoperative CT scans to assess catheter placement warrants careful consideration.

We agree that for routine postoperative scans to be justified, these scans would have to predict a change in clinical care in a meaningful proportion of patients. The key question is, what constitutes a “change in clinical care” and a “meaningful proportion” of shunt-treated hydrocephalic children?

Many authors consider “return to the OR” as the primary end point when studying the justification of routine postoperative scans. This number is thankfully very low in all series as Dr. Weil and his team point out. However, we believe this end point may be too restrictive: even if a routine postoperative scan does not necessitate a return to the OR, it may still prompt a change in clinical care, making such scans worthwhile. A study by Jung and colleagues1 assigned a grading scale to quantify the utility of routine scans after neurosurgical procedures: Level I, urgent information that prompted a return to the OR; Level II, high level of attention should be paid because of possible urgent surgical procedure in near future; Level III, useful for understanding a postoperative change in a patient’s status; and Level IV, no significant gain.

They found that about 9% of routine scans provided useful clinical information: Level I (0.4%), II (4.9%), or III (3.5%). This is arguably a meaningful proportion of postoperative pediatric neurological surgery patients. However, is the additional radiation exposure worth it to capture this 9%? This cost/benefit analysis of radiation exposure and disease detection is not new to the neurosurgical field. Indeed, a recent article in Stroke has recommended the routine use of catheter angiography in patients with positive findings of lumbar puncture but negative CT angiography findings because the yield of finding a lesion was 5%.2 We concur that a 5% chance of finding a life-threatening vascular lesion is worth the risk, radiation, and cost of a catheter angiogram that will be negative 95% of the time. But what about in our group of pediatric patients after shunt placement? This stance like-
ly varies among institutions—and individual surgeons. However, a Jung Level II or III scan could prompt postoperative intensive care unit admission, or a shunt valve adjustment, which could prevent a return to the OR. We feel that the information gained from such routine scans is clinically useful. This is the basis for our development of the reduced-dose CT protocol, which mitigates the additional radiation while still providing valuable clinical information.

Another factor to consider is that the majority of shunt-treated hydrocephalic patients present at some later time with symptoms and imaging concerning for shunt failure. Having an immediate postoperative scan from shunt placement for comparison can often be invaluable, potentially avoiding an unnecessary shunt exploration. It may be methodologically difficult to capture such instances in a controlled research study. Regardless, all neurosurgeons should continuously question the utility of routine imaging in an attempt to improve both resource utilization and patient safety.

References
