Thunderclap headache (sudden and severe headache, maximum in intensity at onset) should raise concern for several life-threatening conditions, including subarachnoid hemorrhage (SAH). The traditional work-up for SAH is a noncontrast head CT followed by a lumbar puncture (LP) if the CT shows no apparent diagnosis. Patients with thunderclap headache and a normal examination, CT and cerebrospinal fluid analysis do not require angiography or other studies to exclude SAH.

Several cases1–3 suggest otherwise and have reported patients with thunderclap headache and normal CT and LP results who are subsequently found to have aneurysms on digital subtraction angiography. These reports raise the point that some aneurysms cause headache by expansion, dissection or thrombosis and that angiography is important even after a negative standard work-up out of concern for incipient aneurysmal rupture.

However, headache is a very common symptom and aneurysms detected on angiography do not necessarily imply that they are symptomatic. Approximately 2% to 6% of the general population harbors asymptomatic aneurysms. Therefore, another interpretation is that these cases detected incidental aneurysms in patients with thunderclap headache. Other conditions may have explained the clinical features. For example, in one report,1 angiography also found diffuse cerebral vasospasm which suggests a cerebral vasoconstriction syndrome such as Call-Flemming. A different case report5 noted aneurysm in 6 of 116 patients with sudden headache. Three of the 6 had a normal CT and LP. Of these 3 patients, 2 had middle cerebral artery aneurysms by formal angiography whereas the third was normal (falsely positive CT angiography). The clinical examination findings were not reported in any patients. One of the patients with a middle cerebral artery aneurysm refused surgical treatment and had no reported adverse events in a 1-year follow-up,10 suggesting that the aneurysm was incidental. In fact, the number of aneurysms detected is exactly what one would expect in an unselected population. Although symptomatic aneurysms are more likely to rupture, it is by no means clear that the patients in the various case reports truly had symptomatic aneurysms.

Finding an aneurysm comes with several costs. Procedural complications from digital subtraction angiography are estimated to occur between 0.25% and 1%, including stroke, contrast-induced nephropathy, and dye reactions, the latter 2 of which also occur with CT angiography (which may also have false-positives). There are also financial costs of additional studies and procedures that may be provoked by the angiogram. Thirdly, finding an incidental aneurysm may pose...
psychological burdens over the need for treatment and the risks of rupture. Lastly, a meta-analysis of 28 separate reports of the results of elective surgery for unruptured asymptomatic aneurysms in 733 patients found a morbidity rate of 4.1% and a mortality rate of 1%.\textsuperscript{11} These reasons account, in part, for why AHA guidelines do not recommend screening the general population for unruptured aneurysms.\textsuperscript{12}

This debate could be resolved by a prospective trial. If the true proportion of missing a SAH after negative CT/LP approached 0.5\%, and we estimate that rate such that the upper one-sided 95\% CI is 1.0\% or less, this prospective trial would require about 667 observations, each of these cases requiring angiography. Because that number is about 3 times the total number of patients in the 6 extant longitudinal studies combined, it is unlikely that the definitive study will be forthcoming.

In occasional cases, when the history and examination suggest such conditions as arterial dissection, cerebral venous thrombosis, pituitary apoplexy, or cerebellar infarction, additional studies are warranted to exclude these diagnoses. However, in neurologically intact patients with normal CT and cerebrospinal fluid analysis, we believe that any form of angiography is not only unnecessary but also carries some significant costs.

\textbf{Disclosures}

None.

\textbf{References}


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Thunderclap Headache With Normal CT and Lumbar Puncture: Further Investigations Are Unnecessary: For
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