Is a Head CT Necessary After Uncomplicated Coiling of Unruptured Intracranial Aneurysms?

Mouhammad A. Jumaa, MD, Amin Aghaebrahim, MD, Syed F. Zaidi, MD, Brian Jankowitz, MD, Tudor G. Jovin, MD, Michael B. Horowitz, MD

From the UPMC Stroke Institute, Department of Neurology, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania (MAJ, AA, SFZ, TGJ); Department of Neurological Surgery, University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania (BJ, MBH).

ABSTRACT

In this study, we sought to determine whether routine head computed tomographies (CTs) after uncomplicated coil embolization of intracranial aneurysms can add any significant clinical value.

METHODS

We retrospectively reviewed the medical records of 139 patients with unruptured aneurysms who underwent 150 elective coiling procedures between January 2008 and June 2010. A total of 6 head CTs were obtained emergently after intraprocedural complications and 122 head CTs were obtained routinely after uncomplicated coil embolization of intracranial aneurysms.

RESULTS

The 122 head CTs that were obtained routinely after uncomplicated coil embolization of unruptured intracranial aneurysms did not show any acute or subacute changes.

CONCLUSION

A head CT after uncomplicated coil embolization of an intracranial aneurysm does not add any significant clinical value and should not be ordered routinely.

Introduction

Treatment options for intracranial aneurysms include surgical clipping and endovascular coiling. Elective coiling of unruptured intracranial aneurysms has low procedural morbidity and mortality.1 In one series thromboembolic events occurred in 3.4% of patients. While routine follow-up head computed tomography (CT) is often performed in the first 24 hours after treatment, the value of these routine scans remains unclear. The negative impact of routine postprocedure imaging includes: (1) medical costs. (2) The concern about the long-term effects of cumulative diagnostic radiation exposure which may increase the risk of adult gliomas, particularly in individuals who may be more genetically susceptible to a brain tumor formation.2 Efficient and timely completion of routine diagnostic studies for inpatients can also be challenging for nursing staff, intra-hospital transport services, and radiology departments. In this study, we examined the value of routine head CT obtained in the first 24 hours after uncomplicated coiling of unruptured intracranial aneurysms.

Methods

- Patients and aneurysms: The medical records of 139 patients with unruptured aneurysms who underwent 150 elective coiling procedures between January 2008 and June 2010 were reviewed. Six patients had two aneurysms that were treated sequentially and 5 patients underwent staged treatment for the same aneurysm. A total of 145 aneurysms were selectively occluded with detachable coils. Forty-two aneurysms were located in the anterior circulation and 103 aneurysms were in the posterior circulation. The mean size was 7.2 mm.
- Coiling procedure: All procedures were performed in a bi-plane angiographic unit under general anesthesia and neuro-physiology monitoring (continuous electroencephalogram, somatosensory evoked potentials, and brainstem auditory evoked responses). Treatment protocol included systemic heparinization during the procedure to maintain an activated coagulation time at more than 250 and low dose Heparin infusion (500 units/hour) for 24 hours after the procedure. Single antiplatelet therapy with aspirin 325 mg was initiated immediately after the procedure if no complications were noted. An intravenous bolus of 180 mcg/kg of Eptifibatide was administered during the procedure and dual antiplatelet therapy was also immediately initiated after the procedure if a neck remodeling device was used. All aneurysms were treated using Micrus (Micrus Endovascular, San Jose, CA) and Axium (EV3, Irvine, CA) coils. Four patients were treated with Onyx HD500 (EV3) in conjunction with platinum coils.
- Supporting devices: The hyperglide remodeling Balloon (EV3) was used in 4 cases. A neck remodeling device, Enterprise stent (Cordis, Bridgewater, NJ) or Neuroform stent (Boston Scientific, Natick, MA) was used in 45 aneurysms.
- Imaging: A non-contrast head CT was obtained within 24 hours of treatment or immediately after the procedure in patients with intraprocedural complications.
Results
A routine head CT was obtained in the first 24 hours after the procedure in 139 out of 150 cases. Head CT was not available in 11 cases. Head CT was obtained immediately after the procedure in 6 cases due to aneurysm perforation in 4 cases and thromboembolic complications in 2 cases. Those 6 CTs were abnormal. All other head CTs were normal.

Discussion
The rapid rise in imaging spending prompted Congress and CMS in 2008 to request the US Government Accountability Office to review imaging services in Medicare. The resulting 6-year analysis demonstrated that advanced imaging expenditures, including CT and magnetic resonance imaging (MRI), increased faster than other imaging modalities, with CT spending rising from $975 million in 2000 to $2.17 billion in 2006. The total number of CT examinations performed annually in the United States has risen from approximately $3 million in 1980 to nearly $70 million in 2007. At our institution, the charge for a noncontrast head CT is $2,900 US dollars. The Medicare reimbursement for a CPT code 70450 for an outpatient non-contrast CT of the head is $230.54 US dollars according to the 2007 tables. While the cost for an inpatient imaging study is usually included in the total admission reimbursement based on a diagnosis related group, the total dollar amount that could have been saved in our series of patient is $28,126 USD for a total number of 122 routine CTs and a reimbursement of $230.54 USD per study. Routine follow-up head CT is one of the most common and frequently obtained studies in neurology and neurological surgery practice. Previous studies have shown no significant value of routine postoperative CT scans, obtained after cranial surgery, in determining the probability of returning to the operating room. Also, the utility of repeated HCT performed solely for routine follow-up in patients with blunt head trauma has also shown that in the absence of clinical indicators or risk factors, repeat HCT after blunt head injury does not alter patient management and is unnecessary. The low cost, simple but elegant neurological examination was superior to routine head CT in both studies. Another prospective study examined the value of serial head CT after traumatic brain injury. Similarly, the utility of routine serial head CT in patients without neurologic deterioration was not supported by the findings of this study. One could argue that a routine head CT is a relatively safe and easy to obtain screening study. It is, however, known that the rising number of imaging studies ordered routinely can sometimes overwhelm the workflow efficiency of nurses and techns in inpatient units, in-hospital transportation personnel, and radiology departments. The risk of accumulating radiation in patients is also not negligible. A typical CT scan delivers 20 millisieverts with an increased risk of cancer reported at levels of radiation equivalent to 2–3 scans.

Our study demonstrates that routine head CT after an uneventful coiling of an unruptured intracranial aneurysm produces no clinically useful information. We think this is an important observation considering the rapid rise in imaging spending, the over-utilization of hospital resources and personnel, and the increasing concerns regarding avoidable medical exposure to ionized radiation.

Conclusion
Routine head CT after uneventful coiling of unruptured intracranial aneurysms may not be necessary.

References