Multislice computerized tomography angiography in the evaluation of intracranial aneurysms: a comparison with intraarterial digital subtraction angiography

MAX WINTERMARK, M.D., ANTOINE USKE, M.D., MARC CHALARON, M.D., LUCA REGLI, M.D., PHILIPPE MAEDER, M.D., RETO MEULI, M.D., PH.D., PIERRE SCHNYDER, M.D., AND STEFANO BINAGHI, M.D.

Departments of Diagnostic and Interventional Radiology and Neurosurgery, University Hospital, Lausanne, Switzerland

**Object.** The goal of this study was to assess the diagnostic accuracy of computerized tomography (CT) angiography performed with the aid of multislice technology (MSCT angiography) in the investigation of intracranial aneurysms, by comparing this method with intraarterial digital subtraction (IADS) angiography.

**Methods.** Fifty consecutive adult patients, who successively underwent MSCT angiography (four rows) and IADS angiography of intracranial vessels, were prospectively identified. The MSCT angiography studies consisted of 1.25-mm slices, with 0.8-mm reconstruction intervals, a pitch of 0.75, and timing determined by a test bolus. Two neuroradiologists, who were blinded to the initial interpretation of the MSCT angiograms as well as to those of the IADS angiograms, independently reviewed the MSCT angiograms for the detection and characterization of intracranial aneurysms.

Forty-nine intracranial aneurysms were identified in 40 patients; 33 of these lesions were responsible for subarachnoid hemorrhage. The sensitivity, specificity, and accuracy of MSCT angiography in the detection of intracranial aneurysms were 94.8%, 95.2%, and 94.9%, respectively, on a per-aneurysm basis and 99%, 95.2%, and 98.3%, respectively, on a per-patient basis. Interobserver agreement was 98%. There was an excellent correlation between aneurysm size assessed using MSCT angiography and that determined by IADS angiography (slope = 0.916, r = 0.877, p < 0.001); however, 2 mm stood as the cutoff size below which the sensitivity of MSCT angiography was statistically lower. That method displayed great accuracy in characterizing the morphological characteristics of the aneurysm.

**Conclusions.** Multislice CT angiography is an accurate and robust noninvasive screening test for intracranial aneurysms. It performs better than that reported for single-slice CT angiography. Introduction of eight- and especially 16-row MSCT angiography will provide further progression through thinner slices, a lower pitch, and a purely arterial phase.

**Key Words** • cerebral aneurysm • multislice computerized tomography • computerized tomography angiography • digital subtraction angiography
Multislice CT angiography to assess intracranial aneurysms

considerable vessel overlap, such as the paraclinoid and terminal ICA segments or the MCA bifurcation. On the other hand, the diagnostic accuracy of SSCT angiography has been reported to be similar for both anterior and posterior circulation aneurysms.

Recently, implementation of multidetector row technology has led to considerable progress in the field of CT angiography, notably for visualizing coronary arteries. Multislice CT angiography offers a reduction in acquisition time despite the use of pitch values inferior to unity. The resulting increase in data overlap improves the quality of 2D and 3D reconstructions. Moreover, MSCT angiography enables increased arterial opacification and, accordingly, increased spatial resolution through an improved coincidence between MSCT angiography data acquisition and passage of iodinated contrast material within the volume of interest. These factors allow us to lower the volume of iodinated contrast material that is used and helps reduce arterial overlap from confusing venous structures.

The purpose of this study was to determine whether MSCT angiography has increased accuracy with respect to the detection and characterization of intracranial aneurysms compared with IADS angiography, which was selected as the standard reference method.

Clinical Material and Methods

Patient Population

Conventional cerebral CT scans and MSCT angiograms were obtained in 425 consecutive adult patients evaluated in our department between July 1999 and September 2001. The vast majority of these patients were admitted to the emergency department for headaches that raised a clinical suspicion of SAH. Five patients were admitted for a programmed investigation of a known intracranial aneurysm.

Among the 435 patients who underwent conventional cerebral CT scanning and MSCT angiography, 50 patients (22 men and 28 women, median age 51 years, range 20–77 years) were included in the present study. Inclusion criteria included the successive performance of both MSCT and IADS angiography studies within a 0- to 5-day interval, without any intervening endovascular or surgical therapy. Intraarterial DS angiography was performed as part of the standard treatment of the enrolled patients. In no case was IADS angiography performed only for the purpose of the present study.

Three hundred sixty-two patients for whom there was a low clinical suspicion of SAH did not have SAH and did not harbor intracranial aneurysms; IADS angiography was not performed in these patients. Thirteen patients underwent emergency surgical decompression of a life-threatening cerebral hematoma and preoperatively scheduled IADS angiography sessions had to be canceled in these patients.

This study protocol was approved by our review board and institutional informed consent guidelines were followed.

Imaging Protocols

The MSCT angiography examinations were performed with a four–detector row CT unit based on a standardized protocol. A timed test injection was used to determine the optimal timing of the MSCT angiographic data acquisition. It consisted of 20 identical 10-mm-thick slices (80 kVp/100 mA) obtained from the level of the top of the frontal sinus to a point 1 cm below the foramen magnum, to encompass the posterior inferior cerebellar arteries in the volume analysis. The injected volume (in milliliters) of iodinated contrast material was calculated according to the following formula: 17 to 21 ml of contrast material was detected. Three-dimensional rotational IADS angiography was performed in six patients; 17 to 21 ml of contrast material was selectively injected into the aneurysm-related ICA at a rate of 2.5 to 3 ml/second during the rotation time of the angiographic gantry, which was fixed at 7 seconds to cover a rotation of 180°. No 3D angiogram was obtained by enhancing the vertebral arteries.

Review Process

Three experienced interventional neuroradiologists, who were not involved in the interpretation of MSCT angiograms, performed the IADS angiography studies and evaluated the results. The review of the IADS angiograms was performed on the same workstation to maintain a dynamic flow analysis and to modify the subtraction parameters of the angiographic images as required.

Two neuroradiologists independently reviewed the MSCT angiographic data. They were blinded to the initial interpretations of the MSCT angiograms as well as to those of the IADS angiograms. The review of the MSCT angiograms was performed on a workstation to allow interactive reconstruction and interpretation, which has proved to be more accurate than an isolated review of hardcopy images. Reviewers evaluated axial raw images, multiplanar 2D re-

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constructions and STS-MIPs, and 3D SSD reconstructions, which were segmented from the axial raw data by using commercial software. Use of shuttered views to allow visualization of arterial branches without superimposition was preferred to threshold bone extraction. The review of the MSCT angiograms lasted typically 10 to 15 minutes for each patient.

The same interpretation criteria were applied to both MSCT and IADS angiograms, focusing on elements of practical interest regarding management of the aneurysm. The criteria that were applied are summarized in Table 1. In addition to the absence or presence of intracranial aneurysms, their number, location, size, shape (saccular or fusiform), and orientation, as well as possible thrombosis or calcification, were assessed. Aneurysms were also assessed for any possible signs of rupture (apical tear) as well as for possible arterial branches originating from the aneurysm. The sac/neck ratio was evaluated using both imaging techniques and classified into four categories: less than 1, 1 to 1.4, 1.5 to 1.9, and 2 or more. Finally, for both MSCT and IADS angiography, reviewers were required to evaluate the possibility of radiological hypoplasia of elements of the circle of Willis, as reported in Table 2. These vessels were evaluated to determine the development of a collateral circulation, which is a major concern in the planning of intracranial aneurysm surgery.

Statistical Analysis

The two-by-two tables were constructed from true-positive, false-positive, false-negative, and true-negative results for MSCT angiography compared with the results of the gold standard IADS method, both on a per-aneurysm basis and on a per-patient basis. The rationale in considering a per-patient basis is that, should MSCT angiography be followed by IADS angiography, missing one of several aneurysms in a patient (one false negative for the aneurysms, but a true positive for the patient) leads to less severe possible consequences than missing all aneurysms in a patient (false negative for the patient).

The sensitivity, specificity, and positive and negative predictive values, as well as the accuracy regarding the detection of an intracranial aneurysm, were calculated. The same procedure was applied regarding possible arterial branches originating from the aneurysm as well as the presence of radiological hypoplasia of elements of the circle of Willis. Exact 95% confidence intervals based on binomial probabilities were calculated.

### Table 1

<table>
<thead>
<tr>
<th>Interpretation criteria applied to both MSCT and IADS angiography</th>
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<tbody>
<tr>
<td>absence or presence of intracranial aneurysms</td>
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<tr>
<td>no. of aneurysms</td>
</tr>
<tr>
<td>location of aneurysms</td>
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<tr>
<td>size of aneurysms</td>
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<tr>
<td>shape (saccular or fusiform)</td>
</tr>
<tr>
<td>sac/neck ratio (&lt;1, 1–1.4, 1.5–1.9, &amp; ≥2)</td>
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<tr>
<td>orientation</td>
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<tr>
<td>possible thrombosis</td>
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<tr>
<td>possible calcification</td>
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<tr>
<td>possible sign of rupture (apical tear)</td>
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<td>possible arterial branches originating from the aneurysm</td>
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</table>

### Table 2

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>PCOA</th>
<th>P, Segment</th>
<th>Global</th>
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<td>lesion appears</td>
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<td>4.0 lt</td>
<td>28.0</td>
<td>14.0 rt</td>
<td>—</td>
</tr>
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<td>small or hypoplastic on IADS angiography</td>
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<td>98.0</td>
<td>82.7</td>
<td>92.0</td>
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<tr>
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<td>undetermined</td>
<td>96.0</td>
<td>66.7</td>
<td>84.3</td>
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<tr>
<td>accuracy</td>
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<td>98.0</td>
<td>86.0</td>
<td>89.0</td>
<td>84.5</td>
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<tr>
<td>positive predictive value</td>
<td>100.0</td>
<td>100.0</td>
<td>98.4</td>
<td>95.3</td>
<td>97.7</td>
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<tr>
<td>negative predictive value</td>
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<td>0.0</td>
<td>64.9</td>
<td>53.3</td>
<td>40.5</td>
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</tbody>
</table>

*All values are percentages. — = not applicable.

Linear regression analysis, with calculation of Pearson linear correlation coefficients, was used to assess the level of intermodality and interobserver agreement regarding the size of the aneurysms. Statistical significance was set at 0.001.

Finally, Pearson chi-square statistics (α) were performed to determine the intermodality and interobserver agreement for categorical parameters such as the sac/neck ratio. An α value of 20% or less implies poor agreement, one of 21 to 40% fair agreement, one of 41 to 60% moderate agreement, one of 61 to 80% good agreement, and an α value of 81 to 100% excellent agreement.

### Results

**Patient Population**

The studied population consisted of 50 patients. The MSCT angiography session was well tolerated by all patients, with slight motion artifacts appearing in two cases. General anesthesia was induced at the time of the MSCT angiography examinations in 10 patients; short-acting sedation was required in 12. One patient experienced a minor complication related to the IADS angiography (groin hematoma).

**Results of the CT and CT Angiography Studies**

In 37 patients there was evidence of SAH (in 13 cases Fisher Grade 1; in three cases Fisher Grade 2; in 11 cases Fisher Grade 3; and in 22 cases Fisher Grade 4); in four of these patients a diagnosis was made of venous perimesencephalic SAH due to the absence of an aneurysm on the IADS angiogram. Postprocessing and reconstructions of the MSCT angiographic images were never altered by subarachnoid or intraparenchymal blood. Four aneurysms (8%) displayed thrombosis.

**Results of the IADS Angiography Sessions**

According to the results of gold-standard IADS angiography, 49 aneurysms were identified in 40 patients: 34 patients, with slight motion artifacts appearing in two cases.
tients (85%) harbored one aneurysm, four patients (10%) two aneurysms, one patient (2.5%) three aneurysms, and one patient (2.5%) an AVM and four aneurysms (Fig. 1).

Aneurysms revealed by IADS angiography were anatomically distributed as follows: two (4%) in the paraclinoid region, two (4%) at the ICA–OphA junction, one (2%) at the intracranial bifurcation of the ICA, two (4%) on the A1 segment of the anterior cerebral artery, 19 (39%) on the ACoA, one (2%) at the pericallosal and callosomarginal bifurcation, two (4%) at the origin of an internal frontal artery, one (2%) on the M1 segment of the MCA, 10 (20%) at the sylvian bifurcation, six (12%) on the PCoA, one (2%) at the tip of the basilar artery, and two (4%) at the origin of a superior cerebellar artery.

Forty-seven aneurysms were saccular (96%) and two were fusiform (4%). Thirty-six aneurysms were monolobular (73%), 10 bilobular (20%), and one trilobular (2%).

Intraarterial DS angiography detected 33 ruptured aneurysms (67%).

Comparison of MSCT and IADS Angiography in the Depiction of Intracranial Aneurysms

The overall results of sensitivity, specificity, and accuracy of MSCT compared with IADS angiography, with respect to aneurysm detection, were 94.8% (range 93–96.1%), 95.2% (range 94.1–96.4%), and 94.9% (range 93.2–96.1%), respectively, on a per-aneurysm basis. The positive and negative predictive values were 98.9% (range 98.2–99.5%) and 80% (range 78–83.1%), respectively. When considering a per-patient rather than a per-aneurysm approach, the sensitivity, specificity, and accuracy values of MSCT angiography were 99% (range 98.3–99.6%), 95.2% (range 94–96.1%), and 98.3% (range 97.3–99%), respectively. The positive and negative predictive values on a per-patient basis were 99 and 95.2%, respectively.

The sizes of the aneurysms in our series ranged from 1.5 to 25 mm, with a mean of 5.8 mm and a standard deviation of 2.5 mm. There was a significant correlation (slope = 0.916, r = 0.877, p < 0.001) between the sizes of aneurysms determined by MSCT and IADS angiography (electronic calipers used for IADS angiography) (Fig. 2). The interobserver agreement was excellent (slope = 0.909, r = 0.858, p < 0.001). The accuracy of MSCT angiography in the depiction of aneurysm orientation was 88% and in that of shape was 92%.

Despite these results, MSCT angiography failed to detect three of the 49 aneurysms. In the first case (Fig. 1), the feeding vessels and the nidus of an AVM obscured a 3.5-mm aneurysm located in the left sylvian bifurcation, which was identified only retrospectively by MSCT angiography. Conversely, the three other aneurysms harbored by the same patient, including one that had ruptured, were depicted prospectively by MSCT angiography.

The second missed aneurysm (Fig. 3) was an unruptured 1.5-mm lesion lying on the superior aspect of the left M1 segment. This aneurysm was visible on the admission MSCT angiogram as a tiny outpouching but was considered by the two reviewers to be an arterial wall irregularity rather than a true aneurysm. The other two aneurysms in the same patient were identified and neither was ruptured. This patient had been admitted to the hospital for unusual headaches without evidence of SAH.
The third undetected aneurysm (Fig. 4) was a 3-mm lesion located at the origin of the left OphA in a patient without SAH. This aneurysm was found in close contact with the underlying bone and was obscured on the MSCT angiogram by the left deep middle vein. This aneurysm was identified in its correct location by only one of the reviewers; the other reviewer confused it with the left deep middle vein and described it as paraclinoid. This case constituted the only false-negative result on a per-patient basis and led to a 98% interobserver agreement.

The sizes of the three missed aneurysms were 1.5, 3, and 3.5 mm. On the other hand, MSCT angiography identified a 2-mm aneurysm and a 2.5-mm aneurysm. Statistical analysis, although of limited significance due to the small number of aneurysms under consideration, demonstrated 2 mm to be the cutoff size below which the sensitivity of MSCT angiography was significantly lower (in aneurysms < 2 mm the sensitivity was 50%; in aneurysms ≥ 2 mm it was 95.8%, p < 0.001; in aneurysms 2.1–3 mm it was 88.9%; in aneurysms 3.1–4 mm it was 93.8%; and in aneurysms > 4 mm the sensitivity was 100%).

No statistical difference could be identified regarding the sensitivity of MSCT angiography, depending on the location of aneurysms in the anterior (Fig. 5) or posterior circulation. The sensitivity of this method was 92.5% for anterior aneurysms (that is, those arising from the ICAs or their branches, including the PCoAs) and 100% for posterior aneurysms (that is, those arising from intracranial vertebral arteries and the basilar artery and its branches, including the posterior cerebral arteries), leading to a nonsignificant probability value of 0.079.

Comparison of MSCT and IADS Angiography in the Characterization of Intracranial Aneurysms

Intraarterial DS angiography detected an apical teat for 33 aneurysms (67%). For MSCT angiography, the sensitivity, specificity, and accuracy were 76.9% (range 74.9–79.9%), 100%, and 87% (range 85.1–88.9%), respectively; and the positive and negative predictive values were 100% and 76.9% (range 74.3–79.5%), respectively. The most interesting cases were those of six patients with multiple aneurysms. In those patients, MSCT angiography was accurate in detecting the apical teat and correctly identified the ruptured aneurysm in all cases but one. In many cases, the distribution of subarachnoid blood and its epicenter could be used to identify the ruptured aneurysm successfully.

Sac/neck ratios were distributed as follows: four aneurysms in Category 1 (< 1), 26 in Category 2 (1–1.4), 16 in Category 3 (1.5–1.9), and three in Category 4 (≥ 2). The α
values extracted from the Pearson chi-square tests were 0.208 and 0.677, respectively, for the accuracy and interobserver agreement regarding use of MSCT angiography for assessment of the sac/neck ratio. This corresponded to a fair accuracy and good interobserver agreement, respectively. The use of MSCT angiography tended to cause underestimation of the sac/neck ratio systematically, as defined by IADS angiography (slope = 0.335), even if this observation did not reach statistical significance (p = 0.345).

The origin of arterial branches was found to be included in the aneurysm mass in six cases (12%); four of these cases were detected by MSCT angiography, whereas two others, which could not be characterized by conventional but only by 3D IADS angiography, were missed. With some caution regarding interpretation because of the limited number of aneurysms under consideration, this leads to a sensitivity, specificity, and accuracy of 66.7% (range 63.5–69.5%), 100%, and 95.7% (range 94.2–96.8%), respectively, and positive and negative predictive values of 100% and 95.2% (range 94–96.2%), respectively.

Comparison of MSCT and IADS Angiography in the Assessment of Elements of the Circle of Willis

The overall sensitivity, specificity, and accuracy of MSCT angiography in the assessment of elements of the circle of Willis amounted to 84.6% (range 81.9–86.7%), 84.3% (range 82.2–87.5%), and 84.5% (range 81.4–86.3%). Details are given in Table 2.

Discussion

The overall performance of the spiral CT scanning technique were dramatically improved by the technological development of multidetector-row CT scanners, particularly in CT angiography. In this study, the sensitivity, specificity, and accuracy of MSCT angiography for detection of intracranial aneurysms were 94.8, 95.2, and 94.9%, respectively, on a per-aneurysm basis and 99, 95.2, and 99%, respectively, on a per-patient basis. The interobserver agreement was 98%. The diagnostic value of MSCT angiography falls within the upper range of what has been reported for SSCT angiography in the literature.\textsuperscript{15,16,22,27,36} Multislice CT angiography performed well in the characterization of elements of the circle of Willis, which is a major concern in the evaluation of risks associated with both neurosurgical and endovascular treatments.

The major advantages of MSCT angiography in the investigation of intracranial aneurysms lie in its ability to acquire thin overlapping images by using a pitch value inferior to unity, without increasing the data acquisition time of the imaging method, and allowing improved quality and spatial resolution of the 2D and 3D reconstructions. In this
study, a pitch value of 0.75 was used. In contrast, previous SSCT angiography studies were conducted with a pitch value of 1.5,15,16,33,35,36 1.5,37–39 or 2,2 and a higher dose of contrast material (range 100–140 ml) was used to increase the sensitivity in detecting small aneurysms.16 In the present study, the volume of iodinated contrast material was tailored to each patient, according to the results of the test bolus; it ranged between 80 and 90 ml. Indeed, the very short acquisition time afforded by MSCT angiography allowed a significant reduction in the administered dose of contrast material, despite an increased overlap. This feature, in combination with a craniocaudal scanning direction, led to a significant reduction in the enhancement of overlapping intracranial venous structures, which potentially could obscure the arterial vessels. In this way, aneurysms situated at the origin of the PCoA were not obscured by the vein of Rosenthal and those located at the level of the cavernous segment of the ICA were not masked by the cavernous sinuses. Finally, in comparison with the SSCT angiographic method, MSCT angiography allows for the visualization of a much larger volume of analysis than previously possible, extending from the inferior loop of the posterior inferior cerebellar arteries up to the bifurcation between callosomarginal and pericallosal arteries.

In this study, MSCT angiography allowed a precise analysis of the shape and orientation of aneurysms. A significant correlation (slope = 0.916, r = 0.877, p < 0.001) was identified between the sizes of aneurysms described by MSCT angiography and those described by IADS angiography. Moreover, the MSCT method was shown to be very accurate in depicting possible intraaneurysm thrombosis, and these findings are in agreement with previous reports.16,34

Multislice CT angiography failed to detect three aneurysms, one because of its size and two others because of their locations. Regarding the size of the lesion, statistical analysis demonstrated that 2 mm was the practical size cutoff point, beneath which the sensitivity of MSCT angiography for aneurysm detection decreases sharply from 95.8 to 50%. On the other hand, two aneurysms were missed in

Fig. 5. Imaging studies obtained in a 71-year-old woman in whom an unenhanced cerebral CT scan (a) demonstrated a right frontoparietal parenchymal hematoma, associated with SAH. There is excellent correlation between MSCT angiograms (2D STS-MIP [b and c] and 3D SSD [d and e] views) and IADS angiograms (f), which demonstrate a giant dysplastic aneurysm of the right sylvian bifurcation (arrows) in exactly the same way. This aneurysm measures 25 × 10 mm. Its sac/neck ratio is in the range of 1 to 1.4. The aneurysm is oriented laterally as well as somewhat anteriorly and inferiorly. No arterial branch originates from the lesion.
Multislice CT angiography to assess intracranial aneurysms

this study because of their location, one because an adjacent vein obscured the view and the other because multiple branching vessels were close to the aneurysm. Conversely, paraclinoid, terminal ICA, and PCoA aneurysms were correctly identified and characterized. Similar to what was reported for SSCT angiography, there was no significant difference regarding the sensitivity of MSCT angiography for carotid arterial tree (92.5%) and vertebrobasilar artery (100%) aneurysms.

Finally, the sac/neck ratio and the absence or presence of arterial branches originating from the aneurysm were evaluated. Both parameters are very important when endovascular treatment is considered because they directly influence the selection of the embolization method and the materials that are used. In this series, conventional IADS angiography displayed a trend to classify aneurysm sac/neck ratios in a superior category compared with MSCT angiography. Conversely, in the six patients in whom 3D DS angiograms were obtained, the aneurysms were attributed the same sac/neck ratio in all but one case. During conventional IADS angiography, identification of the projection that allows adequate visualization of the aneurysm neck can be time consuming because of the superimposition of several arterial structures. Three-dimensional IADS and MSCT angiography overcome this limitation by offering the opportunity to create any desired projection from the original data set and, thus, to obtain the best orientation to view the aneurysm neck. Similarly, MSCT angiography proved to be as accurate as the conventional IADS method with respect to the characterization of arterial branches originating from the aneurysm, but less accurate than the 3D IADS method.

We acknowledge that there are several limitations to our study. Because of the inclusion criteria, the population that we studied had a high prevalence of aneurysms (80%), which may have induced some bias. Indeed, such an increased disease prevalence could have led to an apparent improvement in the sensitivity and specificity of MSCT angiography.

In addition, the series included patients with SAH (80% of the patients) and patients with symptoms that could have had an aneurysmal origin, although there was no evidence of SAH (20% of the patients). There were no asymptomatic patients. This could have influenced the sensitivity and specificity that were determined for MSCT angiography.

At our institution, CT scanning is used as a diagnostic tool for the numerous patients admitted to the emergency department for headaches mimicking SAH. Conventional cerebral CT scanning and MSCT angiography are the first investigations performed in the emergency setting in every patient for whom the clinician has a suspicion of SAH. Multislice CT angiography has the major advantage of being easily performed in emergency settings. At our institution, 2D and 3D reconstructions are performed by the resident in general radiology who is on duty. The learning process for manipulating data on the workstation is very rapid, even for junior radiologists. In every case, the data are reviewed by an on-call neuroradiologist, who can perform an endovascular procedure immediately if required.

Early depiction and precise 3D characterization of an intracranial aneurysm are thus available after a postprocessing time averaging 10 to 15 minutes, aiding the medical staff in decision making and in the coordination and timing of treatment options. If an emergency surgical decompression of a life-threatening cerebral hematoma is required and IADS angiography has to be postponed or canceled, MSCT angiography represents a precise and comprehensive alternative for the neurosurgeon and allows a decision to be made concerning the most appropriate surgical approach, as previously reported. On the other hand, MSCT angiography allows the interventional neuroradiologist to evaluate the indication of an endovascular procedure before performing IADS angiography, and thus decide about the need and/or timing of inducing general anesthesia in the patient. With respect to unruptured aneurysms, MSCT angiography could be useful in follow-up examinations in patients with known intracranial berry aneurysms identified using the IADS method. Changes in the size of a known aneurysm could be monitored over time, enabling a significant time lapse between IADS angiography sessions. It is noteworthy, however, that additional studies focusing on the evolution of unruptured aneurysms are needed.

Conclusions

Multislice CT angiography is an excellent noninvasive screening test in the assessment of intracranial aneurysms, both on a per-aneurysm and per-patient basis. It provides a precise characterization of intracranial aneurysms, including size, structure, and orientation and can also depict the presence of thrombosis and rupture. The results of MSCT angiography are better than those reported for the SSCT method. A much faster scanning time, a wider coverage of the intracranial arteries, and a significantly lower amount of contrast material to be administered make MSCT angiography much more efficient than the previously used SSCT method. The introduction of eight- and especially 16-detector row MSCT angiography will allow further progression through thinner slices, a lower pitch, and a purely arterial phase.

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**Address reprint requests to:** Max Wintermark, M.D., Department of Diagnostic and Interventional Radiology, University Hospital (CHUV) BH07, CH-1011 Lausanne, Switzerland. email: Max.Wintermark@chuv.hospvd.ch.