Neurologic Complications of Cerebral Angiography: A Prospective Analysis of 2,900 Procedures

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Purpose
To prospectively evaluate patient and procedural risk factors associated with neurologic complications from cerebral angiography.

Materials & Methods
Two thousand and nine hundred consecutive digital subtraction cerebral angiograms using nonionic contrast were evaluated prospectively. Neurologic complications were categorized as transient (< 24 hours), reversible (24 hours to 7 days) and permanent (lasting beyond 7 days). The following data were correlated to the neurologic complication rate: patient age, indication, medical history, fluoroscopic time, contrast volume, number and size of catheters, vessels injected, operator experience, and the time period the study was done. The correlations were analyzed statistically using chi-squared tests.

Results
Transient neurologic complications occurred in 0.7%, reversible in 0.2%, and permanent in 0.5%. The overall neurologic complication rate was 1.3%. There was a significantly higher neurologic complication rate in patients 60 years of age or greater (1.9%, p = 0.0193), in patients with cardiovascular disease (2.4%, p = 0.0086), and when fluoroscopy was greater than 10 min (2.0%, p = 0.0166). The neurologic complication rate was higher in procedures investigating carotid stenosis or ischemic stroke (1.8%) but this was not statistically significant. Over the 5 1/2 years of the study there was a lower neurologic complication rate in the fourth quartile (6 of 671, 0.9%) compared to the first quartile (16 of 771, 2.1%). This related to the reduction in the percentage of procedures done to investigate carotid stenosis or stroke and the reduction of the percentage of patients with cerebrovascular disease (Table).

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Number of Procedures</th>
<th>DSA</th>
<th>Mean Age</th>
<th>Number for Carotid Stenosis/Ischemic Stroke</th>
<th>Number with Cerebrovascular Diseases</th>
<th>Mean Contrast Volume</th>
<th>Neurologic Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>777</td>
<td>single-plane</td>
<td>54.0</td>
<td>321 (41.3%)</td>
<td>258 (33.2%)</td>
<td>125.8</td>
<td>16 (2.1%)</td>
</tr>
<tr>
<td>2nd</td>
<td>779</td>
<td>single-plane</td>
<td>52.2</td>
<td>298</td>
<td>213 (27.3%)</td>
<td>118.6</td>
<td>9 (1.2%)</td>
</tr>
</tbody>
</table>
### Conclusion

Despite the use of digital subtraction angiography, biplane angiography, nonionic contrast, smaller catheters, femoral sheaths, and hydrophilic guidewires we have been unable to reduce the neurologic complication rate of cerebral angiography compared to the other large prospective studies (1-4). The neurologic complication rate of cerebral angiography remains an important consideration in patient management. The shift to noninvasive imaging of the craniocervical vessels is justified diminishing the indications for catheter angiography.

### References