The impact of age and sex on stroke and death rates after CEA or CAS

Secondary data analysis of the nationwide German statutory quality assurance database


Department of Vascular and Endovascular Surgery, Klinikum rechts der Isar, Technical University of Munich
Disclosure

Speaker name: Andreas Kuehnl

I have the following potential conflicts of interest to report:

☐ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☒ I do not have any potential conflict of interest
Background:

Short-term outcome after stenting versus endarterectomy for symptomatic carotid stenosis: a preplanned meta-analysis of individual patient data

Summary
Background Results from randomised controlled trials have shown a higher short-term risk of stroke associated with carotid stenting than with carotid endarterectomy for the treatment of symptomatic carotid stenosis. However, these trials were underpowered for investigation of whether carotid artery stenting might be as safe as endarterectomy in specific patient subgroups. We therefore did a meta-analysis of data from three randomised controlled trials.

Methods Data from all 3433 patients with symptomatic carotid stenosis included in the Endarterectomy versus Angioplasty in Patients with Symptomatic Severe Stenosis (EVA-3S) and StentProtected Angioplasty versus Carotid Endarterectomy (SPARQ) trials were pooled and analysed with fixed-effect binomial models. The primary outcome event was any stroke or death. The intention-to-treat principle was used to pool the results of events occurring between randomisation and 120 days thereafter. The preplanned meta-analysis included data for patients receiving the allocated treatment and events occurring within 120 days of randomisation.

Interpretation:
Stenting for symptomatic carotid stenosis should be avoided in older patients (age ≥70 years), but might be as safe as endarterectomy in younger patients.
Research question:

Patient characteristics:
- Sex
- Age

In-hospital outcome:
- Stroke or death
- death (alone)
- stroke (alone)

for asymptomatic or symptomatic carotid stenosis under routine conditions in Germany
Methods:

Database: Statutory quality assurance registry on carotid procedures operated by the AQUA-Institute

Coverage: 2009 – 2014, 99.1% of all CEA/CAS procedures in Germany

Type of study: Observational (secondary data analysis)

Statistics: Multilevel multivariable regression analysis (GLMM)

Outcome: any stroke or death until discharge

Included: 142,074 elective CEA
13,086 elective CAS

Excluded: 27,873 emergency procedures (cTIA, SIE), unclear or unspecified conditions.
# Results: Characteristics

<table>
<thead>
<tr>
<th></th>
<th>CEA</th>
<th>CAS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Patients</td>
<td>96,396</td>
<td>45,678</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>39%</td>
<td>40%</td>
</tr>
<tr>
<td>Age (mean, SD)</td>
<td>70±9</td>
<td>72±9</td>
</tr>
<tr>
<td>ASA category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASA I+II</td>
<td>28%</td>
<td>32%</td>
</tr>
<tr>
<td>ASA III</td>
<td>69%</td>
<td>66%</td>
</tr>
<tr>
<td>ASA IV+V</td>
<td>3%</td>
<td>2%</td>
</tr>
</tbody>
</table>
Results: raw outcome rates

CEA

Risk of any in-hospital stroke or death (CEA)

- All (A)
- All (S)

CAS

Risk of any in-hospital stroke or death (CAS)

- All (A)
- All (S)
Results: multivariable regression (age categorical)

**CEA:** Risk of any in-hospital stroke or death (n=138,479)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Adj. RR [95% CI]</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;65 years</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>65-69 years</td>
<td>1.22 [1.06 - 1.41]</td>
<td>0.005</td>
</tr>
<tr>
<td>70-74 years</td>
<td>1.34 [1.19 - 1.52]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>75-79 years</td>
<td>1.33 [1.17 - 1.51]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>80 and more years</td>
<td>1.66 [1.46 - 1.88]</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Adj. RR [95% CI]</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1.01 [0.93 - 1.10]</td>
<td>0.823</td>
</tr>
</tbody>
</table>

**CAS:** Risk of any in-hospital stroke or death (n=13,086)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Adj. RR [95% CI]</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;65 years</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>65-69 years</td>
<td>1.74 [1.16 - 2.61]</td>
<td>0.008</td>
</tr>
<tr>
<td>70-74 years</td>
<td>1.87 [1.28 - 2.72]</td>
<td>0.001</td>
</tr>
<tr>
<td>75-79 years</td>
<td>2.53 [1.76 - 3.65]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>80 and more years</td>
<td>3.23 [2.24 - 4.65]</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Adj. RR [95% CI]</th>
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<tr>
<td>Female</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.99 [0.76 - 1.26]</td>
<td>0.951</td>
</tr>
</tbody>
</table>

Adjusted for neurological status on admission, ASA category, degree of ipsi- and contralateral stenosis, periprocedural antiplatelet therapy, pre- and postprocedural assessment by a neurologist, and intraprocedural neurophysiological monitoring. In addition, type of anesthesia, surgical technique, shunt use, clamping time, and intraoperative completion studies for CEA or use of a protection device for CAS, respectively.
Results: multivariable regression (age continuous)

**CEA – stroke or death**

\[
RR_{\text{linear}} = 1.19 \ [95\% \ CI \ 1.14-1.24]
\]

**CAS – stroke or death**

\[
RR_{\text{linear}} = 1.54 \ [95\% \ CI \ 1.35-1.75]
\]
Results: multivariable regression (age continuous)

**CEA – stroke (alone)**

RR of any stroke as a function of age (CEA)

Relative risk (95% confidence interval) vs. Age (years)

\[ \text{RR}_{\text{linear}} = 1.05 \ [95\% \ CI 1.00\text{--}1.11] \]

**CAS – stroke (alone)**

RR of any stroke as a function of age (CAS)

Relative risk (95% confidence interval) vs. Age (years)

\[ \text{RR}_{\text{linear}} = 1.47 \ [95\% \ CI 1.26\text{--}1.72] \]
Conclusion:

In Germany, under everyday conditions,

- higher age was significantly associated with higher in-hospital risk of stroke or death following CAS (RR=1.54) and CEA (RR=1.19)
- regarding in-hospital stroke alone, the age effect was stronger in CAS (RR=1.47) compared with CEA (RR=1.05)
- sex was not associated with stroke or death after CEA or CAS
Department of Vascular and Endovascular Surgery, Klinikum rechts der Isar, Technical University of Munich