dosimetry for radiodiagnosis (2). It has been used for personal dosimetry (as a replacement for film badges) and medical dosimetry for both radiotherapy and radiodiagnostics (2,3). The dosimeters (nanoDot, Landauer, Glenwood, Illinois) used in our study are OSL based, small (1 × 1 × 0.2 cm³), environmentally stable, and highly accurate and precise within the exposures measured in the study (3). Additionally, placing them under the XPF attenuating cap (BLOXR Corp., Salt Lake City, Utah) made them imperceptible to the research subjects and enabled comparative data assessment between cranial locations.

Although not a focus of this paper, the biological effects of long-term, low-dose radiation exposure including the stochastic and dose-dependent deterministic effects on health care workers are well established. In fact, Andreassi et al. (4) recently reported that workers exposed to high medical radiation in the cardiac catheterization laboratory had increased left-sided carotid intima-media thickness (CIMT) and reduced leukocyte telomere length. The presence of a specific polymorphism of the DNA repair gene XRCC3 Thr241Met, associated with increased chromosomal DNA damage in workers occupationally exposed to long-term ionizing radiation, was also found to be more prevalent in high-exposure workers and associated with increased CIMT (4). Although the risk of occupational radiation-induced brain malignancies has not been determined, this study (complete lifetime dosimetry reconstruction: occupational exposure, 12.6 ± 8.6 years; dose, 21.1 ± 26.3 mSv) suggests that adverse vascular and subcellular effects exist for the left side of the head and neck region of operators at case volumes that are within routine practice and not 2.5 million.

The secondary objective of our study was to determine whether a lightweight cap (nonlead based) could help attenuate the cranial radiation exposure to near ambient levels. The studied cap met those objectives, and its use would be consistent with the fundamental radiation safety principle of keeping medical radiation “as low as reasonably achievable.”

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**REFERENCES**


**Does Direct Transcatheter Aortic Valve Replacement Increase the Risk of Cerebral Embolization?**

We read with great interest the paper by Bijuklic et al. (1) that reported an increased risk of cerebral embolization with direct transcatheter aortic valve replacement (TAVR) without preceding balloon aortic valvuloplasty (BAV) using a balloon-expandable TAVR system.

Although this is a thought-provoking study, we feel that there are several issues. This is a small, retrospective series, and the 2 groups are not well-matched. The direct TAVR group consists entirely of S3 valves, whereas the BAV group were mostly Sapien XT valves. These 2 valves have different characteristics: for instance, the S3 valve has a smaller sheath and delivery system, which increases the proportion of patients who can be treated by the transfemoral approach and means that the cohort of patients treated may be different. To support this theory, there were higher rates of atrial fibrillation, diabetes mellitus, and hypertension in the direct group, which are important risk factors for stroke. The 13 S3 patients in the BAV group had small valve areas or valve calcium, which will introduce selection bias. The authors do not report differences in valvular calcification.

We also feel that Figure 1 requires further clarification. These data represent the most important results of the paper, but it is only represented in chart form, and the data are not included in the Results section. It is also not clear whether the error bars represent standard deviation or standard error of the mean. Furthermore, the error bars are missing from chart A.
Finally, the authors have only shown an association between direct TAVR and an increased volume of cerebral ischemic lesions. Because the overall number of lesions is not increased, and given the aforementioned issues, we feel that a title stating that there is an increased risk of cerebral embolization without prior balloon valvuloplasty in TAVR is potentially misleading.

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Please note: Dr. Palmer and colleagues for their interest in our work (1) and appreciate their comments. We thank Dr. Palmer and colleagues for their interest and appreciate their comments. We thank Dr. Palmer and colleagues for their interest in our work (1) and appreciate their comments.

We thank Dr. Palmer and colleagues for their interest in our work (1) and appreciate their comments. As mentioned in the discussion section of our paper, one major limitation of the study is the retrospective design with a small number of patients. The Edwards SAPIEN 3 (Edwards Lifesciences, Irvine, California) with its smaller profile (16- and 18-F) may allow the treatment of patients with smaller, more calcified peripheral arteries compared with the Edwards SAPIEN XT (18- and 21-F). Peripheral artery disease, however, which is the main limitation for the transfemoral approach, was well balanced between the 2 groups (21.8% in transcatheter aortic valve replacement [TAVR] with balloon aortic valvuloplasty [BAV], 20.0% in TAVR without BAV; p = 0.75).

In Table 1, the baseline characteristics of patients undergoing TAVR with BAV were compared with TAVR without BAV. There was a numerical but not statistically significant difference in atrial fibrillation (28.1% vs. 34.5%; p = 0.7), diabetes (15.6% vs. 27.3%; p = 0.7), and arterial hypertension (73.3% vs. 81.8%; p = 0.3) between the 2 groups. These are known risk factors for stroke but not necessarily for cerebral ischemic lesions post-TAVR. In a recent study, Samim et al. (2) analyzed risk factors for post-TAVR cerebral diffusion weighted-magnetic resonance imaging lesions in a cohort of 276 patients. Independent predictors for the number or volume of cerebral lesions were age, hyperlipidemia, post-dilation and peak transaortic gradient. In our study, age in the TAVR without BAV group was numerically even lower (82.9 ± 6.8 years vs. 83.8 ± 5.2 years; p = 0.81) and hyperlipidemia was comparable (50% vs. 50.9%; p = 0.8). When patients with post-dilation were excluded (5 of 87) from the analysis, the difference in mean volume of ischemic lesions between the 2 groups remained statistically significant (243.4 ± 334.9 mm³ for TAVR without BAV and 79.7 ± 117.4 mm³ for TAVR with BAV; p = 0.006). Thus, differences in baseline characteristic do not seem to explain our findings.

Aortic and aortic valve calcification might affect the cardiac magnetic resonance findings. Unfortunately, we do not have data on the degree of aortic/valve calcification. However, transthoracic echocardiography data, including transvalvular gradient, effective orifice area, and mean transvalvular gradient, were comparable in both groups. Detailed data of the incidence, number, and volume of ischemic lesions are found in Table 1. We disagree that it would be appropriate to change the title of our paper to “Increased Volume of Cerebral Ischemic Lesions After Implantation of a Balloon-Expandable Aortic Valve Without Prior Balloon Valvuloplasty.” Indeed, former studies have demonstrated that not lesion number but lesion volume on diffusion-weighted magnetic resonance imaging correlates significantly with clinical outcome ratings (3). This makes sense, because the volume includes single large as well as multiple smaller lesions.

**REFERENCE**


**REPLY: Does Direct Transcatheter Aortic Valve Replacement Increase the Risk of Cerebral Embolization?**

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**TABLE 1 Cerebral DW-MRI**

<table>
<thead>
<tr>
<th></th>
<th>TAVI With BAV (n = 32)</th>
<th>TAVI Without BAV (n = 55)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence, %</td>
<td>59.4</td>
<td>70.9</td>
<td>0.27</td>
</tr>
<tr>
<td>Number of ischemic lesions</td>
<td>1.8 ± 2.4</td>
<td>2.2 ± 2.7</td>
<td>0.39</td>
</tr>
<tr>
<td>Volume of ischemic lesions, mm³</td>
<td>89.5 ± 128.2</td>
<td>235.4 ± 331.4</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Values are mean ± SD. The incidence in % is defined as the number of patients with cerebral ischemic lesions divided by the total number of the patients multiplied by 100.

BAV = balloon aortic valvuloplasty; DW-MRI = diffusion-weighted magnetic resonance imaging; TAVR = transcatheter aortic valve replacement.