Incidence of Cataract Surgery in Patients After Percutaneous Cardiac Intervention in Taiwan

More than 1 million percutaneous cardiac intervention (PCI) procedures are performed annually in the United States, resulting in some reduction of cardiovascular mortality. Because the correlation between occupational radiation exposure and excess risk of cataract formation in medical staff is well documented, ocular protection from radiation (ie, routine use of lead eyeglasses) is recommended for interventionists. However, the risk of radiation cataract for patients undergoing PCI procedures has not drawn much attention, and there are no current guidelines for patient eye protection. Hence, we conducted this study to evaluate the risk of cataract in the population undergoing PCI procedures.

Methods | A retrospective, matched-cohort study was conducted using population-based representative claims data from Taiwan’s National Health Insurance (NHI) research database, which includes 1 million individuals. We used discharge procedure codes (International Classification of Diseases, Ninth Revision, Clinical Modification procedure codes 35.96, 36.0x, 37.21-37.23, 37.26, 37.27, 37.29, 37.34, and 88.5x) to identify patients who had recently undergone a PCI procedure (5-year washout period from 1996 to 2000) from January 1, 2001, through December 31, 2012. The date of the first PCI procedure was considered the index date for each patient. Patients were excluded if they were younger than 40 years, had a prevalent cancer (confounding by radiotherapy), or underwent cataract surgery before the index date. Controls were randomly selected from the NHI’s beneficiaries and matched 1:2 according to birth year, sex, and diabetes mellitus status (a major confounder in cataract). Index data for controls were assigned according to their matched patient. The end point of each study participant was determined by the date of cataract surgery, date of withdrawal from the NHI, or the end of 2012.

Cox proportional hazards regression model adjustment for potential confounders was used to assess the cataract risk. This study was approved by the institutional review board of Kaohsiung Medical University Hospital. The NHI research data were claims-based administration data set (secondary data). All the identifying markers were encrypted so the patients were deidentified.

Results | A total of 41,421 participants (13,807 exposed to PCI and 27,614 not exposed to PCI) were included. Patients who...

Table. Incidence of Cataract Surgery in Patients With and Without PCI Exposure

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>Group</td>
<td>Control</td>
</tr>
<tr>
<td>Male</td>
<td>1.33 (1.25-1.42)</td>
</tr>
<tr>
<td>Female</td>
<td>1.33 (1.25-1.42)</td>
</tr>
<tr>
<td>Age group, y</td>
<td>1.32 (1.24-1.40)</td>
</tr>
<tr>
<td>40-54</td>
<td>1.32 (1.24-1.40)</td>
</tr>
<tr>
<td>55-64</td>
<td>3.78 (3.30-4.33)</td>
</tr>
<tr>
<td>65-74</td>
<td>7.59 (6.66-8.66)</td>
</tr>
<tr>
<td>≥75</td>
<td>7.64 (6.64-8.80)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.32 (1.24-1.40)</td>
</tr>
<tr>
<td>Without</td>
<td>1.32 (1.24-1.40)</td>
</tr>
<tr>
<td>With</td>
<td>1.32 (1.24-1.40)</td>
</tr>
</tbody>
</table>

Abbreviations: NA, not applicable; PCI, percutaneous cardiac intervention.

* Model 1 compared PCI (without number counting) and controls. Model 2 compared different PCI times and controls. Data were adjusted for chronic pulmonary disease, rheumatoid arthritis, peptic ulcer, renal disease, and hypertension.

b P < .05.

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underwent a PCI procedure had a higher incidence of cataract surgery, and a dose-response effect was observed (Table). The overall adjusted hazard ratio for those exposed to PCI vs not exposed to PCI was 1.25 (95% CI, 1.17-1.34) and increased with the number of PCI exposures (Figure).

Discussion | We found that patients who underwent PCI procedures had a 25% increase in the incidence of cataract surgery with a dose-response relationship seen. The reasons for this association are many fold. First, the radiation dose of PCI was traditionally too low to cause immediately noticeable damage, and there is no reliable diagnostic method for detection of radiation cataract. Second, the common risk factors for coronary artery disease, such as diabetes mellitus, hypertension, smoking, and steroid use, also increase the incidence of cataract. Third, data on the safe radiation threshold for the lens are uncertain, and it is difficult to set regulations to limit lens exposure for PCI. Because this was an observational study, we cannot establish causation, and there may be unmeasured confounders. In Taiwan, more than 99% of residents are covered by the NHI system, so access to care is unlikely to be an issue.

In the past decade, procedures for complex cardiac conditions have become lengthier, and the need for additional procedures has become more common, which introduces higher accumulative radiation doses and increased risks for radiation damage. Therefore, PCI-associated radiation cataract may be an increasing concern.

In conclusion, this study found an association of PCI exposure with the need for cataract surgery. Thus, providing lead eye glasses to protect patients eyes, as is already done during cosmetic laser procedures, during the PCI procedures is recommended.

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Author Contributions: Drs Huang and Lu had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: All authors.

Acquisition, analysis, or interpretation of data: Wei, Bee, Wang, Huang.

Drafting of the manuscript: Wei, Bee, Wang, Lu.

Critical revision of the manuscript for important intellectual content: Wei, Bee, Wang, Huang.

Statistical analysis: All authors.

Administrative, technical, or material support: Wei, Lu.

Study supervision: Huang, Lu.

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