Increased Rate of Poor Laryngoscopic Views in Patients Scheduled for Cardiac Surgery Versus Patients Scheduled for General Surgery: A Propensity Score-Based Analysis of 21,561 Cases

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Objectives: **Former analyses reported an increased rate of poor direct laryngoscopy view in cardiac surgery patients; however, these findings frequently could be attributed to confounding patient characteristics. In most of the reported cardiac surgery cohorts, the rate of well-known risk factors for poor direct laryngoscopy view such as male sex, obesity, or older age, were increased compared with the control groups. Especially in the ongoing debate on anesthesia staff qualification for cardiac interventions outside the operating room a detailed and stratified risk analysis seems necessary.**

Design: **Retrospective, anonymous, propensity score-based, matched-pair analysis.**

Setting: **Single-center study in a university hospital.**

Participants: **No active participants. Retrospective, anonymous chart analysis.**

Interventions: **The anesthesia records of patients undergoing cardiac surgery in a period of 6 consecutive years were analyzed retrospectively. The results were compared with those of a control group of patients who underwent general surgery. Poor laryngoscopic view was defined as Cormack and Lehane classification grade 3 or 4.**

Measurements and Main Results: **The records of 21,561 general anesthesia procedures were reviewed for the study. The incidence of poor direct laryngoscopic views in patients scheduled for cardiac surgery was significantly increased compared with those of the general surgery cohort (7% *v* 4.2%). Using propensity score-based matched-pair analysis, equal subgroups were generated of each surgical department, with 2,946 patients showing identical demographic characteristics. After stratifying for demographic characteristics, the rate of poor direct laryngoscopy view remained statistically significantly higher in the cardiac surgery group (7.5% *v* 5.7%).**

Conclusions: **Even with stratification for demographic risk factors, cardiac surgery patients showed a significantly higher rate of poor direct laryngoscopic view compared with general surgery patients. These results should be taken into account for human resource management and distribution of difficult airway equipment, especially when cardiac interventional programs are implemented in remote hospital locations.**

KEY WORDS: difficult airway, difficult laryngoscopy view, anesthesia for cardiac surgery, risk factor for difficult intubation

IN THE CONTEXT of a rising caseload of nonoperative cardiac interventions in remote hospital locations, such as catheterization suites, electrophysiology laboratories, and magnetic resonance imaging centers, the need for professional anesthesia care for sedation and general anesthesia for those patients is controversial.[1–4] The rate of airway interventions and unplanned shifts to general anesthesia for cardiac patients in remote locations was reported to be more than 10% (20 of 186); moreover, 40% (74 of 186) of the nongeneral anesthesia patients required an airway intervention.[5] Failure to ventilate and to secure the airway with resultant hypoxemia accounted for most cases of death and brain damage in the malpractice closed-claims analysis. Airway-related problems accounted for 17% of the American Society of Anesthesiologists (ASA) closed claims-cases.[6] Injuries related to endotracheal intubation, including laryngeal, oropharynx, esophageal, and tracheal injuries, constitute up to 6% of the closed-claims database and are related to poor laryngoscopic view.[6] An earlier analysis from the authors' institution showed that cardiac surgery patients had a higher rate of difficult laryngoscopy, which was in line with the findings of other groups, who reported up to 10% of difficult airway situations in a cardiac surgery cohort.[7,8] However, these results frequently could be attributed to nonstratified demographic risk factors of the cohorts. Taking into account that the number of cardiac diagnostic tests and interventions requiring general anesthesia outside the core operating room has risen throughout recent years,[4,5,9] a solid knowledge of the patient characteristics seems critically important to allocate anesthesia staff and airway equipment sufficiently. To assess and understand the factors leading to a potentially higher rate of poor laryngoscopic view in patients undergoing cardiac surgery, a risk-stratified analysis of a high-volume cohort might be helpful.

METHODS

Prior to the analysis, the local ethics committee disclaimed the need for obtaining consent and the need for approval of the study with respect to the retrospective, descriptive, and anonymous study design.

All data records from adult patients undergoing general anesthesia for cardiac surgery at a university hospital for 6 consecutive years (November 2005 to December 2011) were analyzed. General surgery patients were selected as the control group since electronic anesthesia documentation was recorded simultaneously in both departments, the observation span was identical in both groups. Furthermore, the operating rooms of the cardiac and general departments are side by side and share the same pool of airway equipment so that

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the available equipment was identical. In addition, the cohort of the general surgery department consisted of many more patients than the cardiac surgery cohort, which enabled a better propensity score-based matching of the 2 groups.

The filed anesthesia records were retrieved from the electronic patient data management system (NarkoData IMESO, Hüttenberg, Germany). The data for age, height, weight, Mallampati score, dental status, Cormack and Lehane (CML) classification, priority of surgery, anesthesia drugs, and type of airway device were anonymized and transferred into an Access database (Microsoft, Redmond, WA).

Cardiac and general surgeries added up to 26,959 anesthesia procedures within the observation period. Figure 1 shows the flowchart of the patient selection. Patients without direct laryngoscopy were excluded from further statistical analysis:

- Patients who arrived already intubated in the operating room (eg, patients from intensive care units) (n = 1,994)
- Patients receiving exclusively regional anesthesia (n = 320)
- Patients receiving exclusively sedation or anesthesia standby (n = 1,526)
- Patients receiving laryngeal mask airway or other supraglottic airway devices (n = 1,532)
- Patients with unclear or missing documentation of direct laryngoscopy (n = 26)

Patients who underwent video laryngoscopic or fiberoptic endotracheal intubation were included in the analysis if a direct laryngoscopy finding was documented before or after endotracheal intubation.

After dropouts, a total of 21,561 cases were included in the statistical analysis. In a propensity score-based matched pair analysis, the demographic data for age, body mass index (BMI), and sex were stratified between the cardiac surgery and the general surgery group. This analysis revealed demographic twin pairs, with 2,946 patients in each of the 2 surgery groups.

The institution at which this study was performed provides a full spectrum of cardiac and general surgery for patients of every age; however, only charts of adult patients were included. Anesthesia for patients undergoing general surgery is provided by anesthesiologists of varied levels of training under close supervision of senior physicians. In the cardiac surgery department, anesthesiologists have at least 3 years of experience and are under close supervision of senior physicians.

Preoperative evaluation, induction, and maintenance of anesthesia, as well as difficult airway algorithms, are provided according to preexisting standard operating procedures (SOP). The SOP for preoperative evaluation demands documentation of the dental status and the 4-scale Mallampati test result.[10] When a Mallampati test result was not obtainable, the preoperative documentation protocol could have been completed without a valid test result. Documentation of physical health status according to the ASA score was mandatory.

SOPs for anesthesia induction and maintenance demanded a consistent approach, including intravenous injection of an opioid, a hypnotic drug, and a neuromuscular blocking agent.

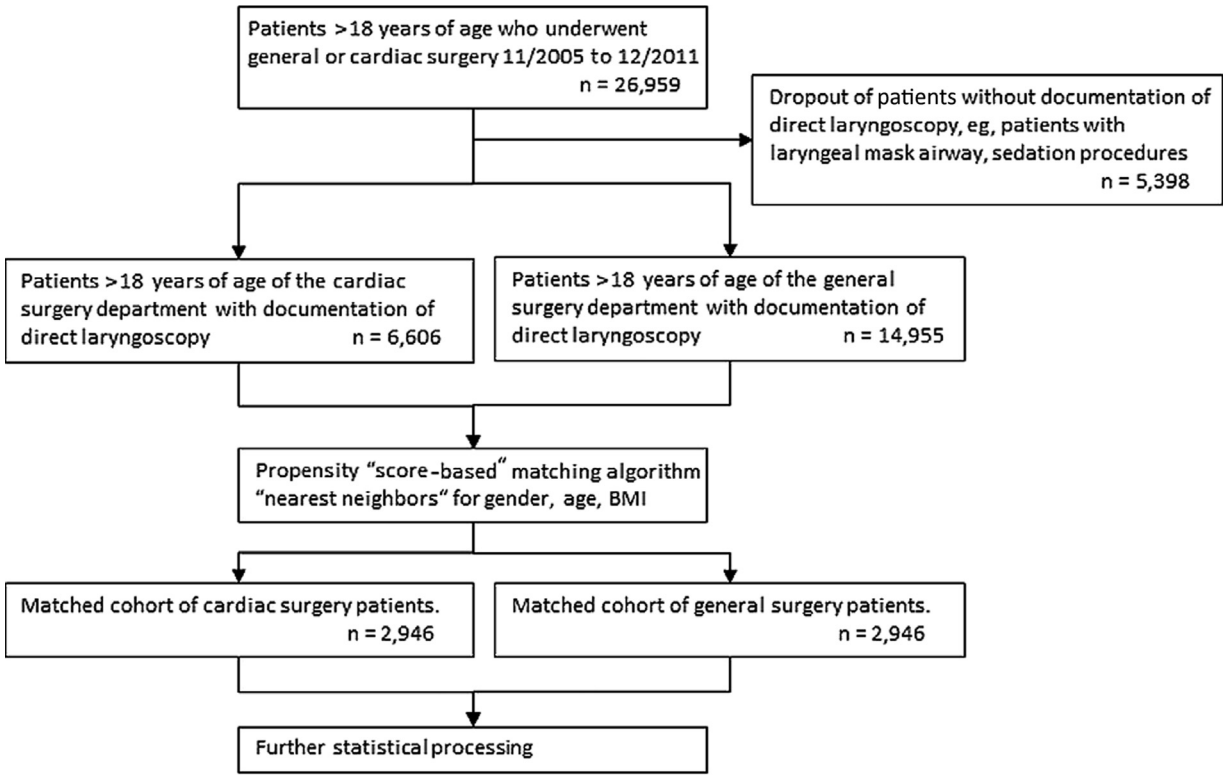

Fig 1. Flowchart of the patient selection for further statistical processing.