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Prevalence of Cancer in Female Plastic Surgeons in the United States

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Abstract

Objective: Several female sub-populations of the healthcare industry, including radiologists, radiology technicians, and orthopedic surgeons, display an increased prevalence of breast cancer. Female plastic surgeons have a similar exposure to possible risk factors such as radiation exposure, late parturition, and overnight shifts. Therefore, this study aimed to evaluate the risk of breast cancer and overall cancer in female plastic surgeons.

Methods: A two-page survey designed to collect data on respondent demographics, cancer incidence and exposure to social and occupational risk factors as identified in the current literature was mailed to 612 currently practicing female plastic surgeons identified by the American Society of Plastic Surgeons (ASPS). Prevalence rates for breast cancer and cancer in general were calculated. Only melanoma and internal cancers that were diagnosed within 15 years of the survey date were included, enabling us to compare the results with data from the National Institute's Surveillance Epidemiology and End Results (SEER 11) Program. Standardized prevalence ratios (SPR), confidence intervals, and exact p-values were calculated.

Results: Fourteen of the 352 respondents had been diagnosed with cancer, including three breast cancer cases, within 15 years preceeding the survey. These numbers are not signficantly lower than the expected prediction of 16 cancer and six breast cancer cases, based on the sex- and race-specific prevalences in the general U.S. population. SPRs were 0.89 [95%CI: 0.49 to 1.5] for all cancers and 0.54 [95%CI: 0.11, 1.57] for breast cancer.

Conclusion: Despite similarities to subpopulations with increased breast and overall cancer prevalence, the subpopulation of female plastic surgeons had no evdience of excess cancers compared to age and race-adjusted women in the general US population.

Keywords: Female plastic surgeons; Cancer prevalence; Breast cancer prevalence

Introduction

Recent studies have demonstrated an increased prevalence of breast cancer among female subpopulations of the healthcare industry, including radiologists [1], radiology technicians [2-4], and orthopaedic surgeons [5,6]. The association between cancer and radiation exposure is well established, and the female breast is highly susceptible to the cancer-causing effects of radiation [7].

Some studies have found that occupational doses to radiologists, radiology technicians, and interventional cardiologists have declined due to improvements in radiation protection standards as well as in radiation technology itself [4,8,9]. However, nonregulated specialties such as orthopaedic surgery [5] and plastic surgery do not require prevention education. Like orthopaedic surgeons, plastic surgeons have a similar exposure to ionizing radiation during fluroscopy and polymethylmethacrylate (PMMA) intraoperatively. Several previous studies have investigated radiation exposure among surgeons [10-13] and, in particular, among hand surgeons [14-18]. In addition, the high socioeconomic status of female orthopaedic surgeons and plastic surgeons is correlated with other risk factors for breast cancer, including older age at first birth, low parity, and nulliparity [19-21]. Finally, positive associations have been identified between women working night shifts and the risk of breast cancer, suggesting that disruption of circadian rhythms is another risk factor [22,23]. Therefore, with a vast presence of risk factors, plastic surgeons may be at increased risk for breast cancer or other cancers. The purpose of this study was to determine the overall prevalence of cancer and the specific prevalence of breast cancer in female plastic surgeons compared to the general population in the U.S.

Methodology

Survey methods

Using the registry provided by the American Society of Plastic Surgeons (ASPS),612 currently practicing female plastic surgeons were identified.Cover letters explaining the purpose of the study were mailed to the identified surgeons in February 2012 along with randomly assigned, individually numbered surveys, and stamped return-addressed envelopes. A follow-up letter and identical survey were sent to non-respondents, who were identified by their individual survey number. The surveys were collected from March to July 2012. In total, 352 surgeons (57%) responded and were included in the study.

The participants were asked questions regarding their age, ethnicity, family history, years in practice, social history, and fluoroscopy use. In addition, they were asked to specify any history of cancer, including the date of diagnosis and the type of cancer. All study activities were approved by the Stanford University Institutional Review Board.

Statistical analysis

The study was designed to be comparable with the National

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Institute's Surveillance Epidemiology and End Results (SEER 11) Program's 15-year limited-duration prevalence statistics. In accordance, the study was limited to melanoma and internal cancers that were diagnosed in female plastic surgeons within 15 years of the survey date. Using this criteria, 14 separate cancer cases were excluded because they were diagnosed prior to the 15-year time frame: four melanoma, three breast, two endometrial (one of which was associated with colon cancer), one lymphoma, one MALToma, one cervical, one bladder, and one cancer of the fallopian tube (Table 1).

To calculate standardized prevalence ratios (SPRs), the observed number of cancers among female plastic surgeons was divided by the expected number based on sex-, age- (divided into ten-year groups), and race-specific prevalences in the U.S. population. Confidence intervals and exact p-values were calculated, assuming a Poisson distribution for the observed number of cases and using an approximation of the exact Poisson test [24]. This method, typically applied to standardized mortality ratios, provides an accurate test of whether the SPR departs from unity when more than ten cases are observed [25]. Confidence intervals were calculated for SPRsfor overall cancer as well as breast cancer.

Results

Subject characteristics

The 352 practicing female plastic surgeons who responded to the survey were primarily Caucasian (79% of respondents), with the second most common self-identified ethnic group being Asian (15% of respondents). The majority of the surgeons were between forty and sixty years of age (60% of respondents). Respondents were in practice an average of 20.9 years, with a range of 7-46. Of the 243 respondents who completed the questions regarding fluoroscopy use, only four percent used fluoroscopy more than once in the average week. Ninety-one percent of responders used fluoroscopy less than six times per year (Table 1).

Standardized prevalence ratio

In total, 14 of the surgeons had been diagnosed with cancer within 15 years preceeding the survey, 1.6 less than the predicted 15.6 cancers based on SEER prevalence estimates, with a SPR of 0.89 (95% confidence interval: 0.49-1.50), indicating no significant difference from expected. The most common cancer in the cohort was melanoma, followed by breast cancer (Table 2). Six breast cancer cases were expected using the SEER prevalence estimates; however, only three breast cancers were observed and a SPR of 0.54 (95% confidence interval: 0.11-1.57) , indicating no significant difference from expected.

	Mean	SD	Range
Age	50.5	9	35-113
BMI	23	3.8	16-49
Number of Children	1.7	1.3	0-3
	Percent		
History of Smoking	6.9		
Current Smoker	1.4		
Age at Menarche			
Don't Remember	6.1		
<12	14		
12	25		
13	29.7		
>13	25		
Menstruated in past year	53.4		
Hormone Replace in past year	27.8		
Working Full Time	93		
Type of Practice			
Academic	12.1		
Private	78.6		
HMO	3.1		
Hospital	5.1		

Table 1: Characteristics of Survey Respondents.

Included Cancer Cases	Excluded Cancer Cases (Did not meet SEER 11 guidelines)
4 Melanoma	*2 Melanoma-in-situ
3 Breast Cancer	*1 DCIS breast Cancer
2 Endometrial (one with colon)	*1 LCIS breast cancer
1 Lymphoma	**3 Breast Cancer
1 Maltoma	**1 Hodgkin's Lymphoma
1 Cervical	**1 Papillary Thyroid Cancer
1 Fallopian tube	**1 Carcinoma of the Appendix
1 Bladder	**1 Carcinoma of the Vulva
	**1 Cervical Cancer
Total: 14	Total: 12

* Non-SEER cancer type
** Diagnosis was outside of the 15-year time frame

Table 2: The number of self-reported cancers among the 352 female plastic surgeon participants in this study.

Discussion

This is the first study to analyze the risk of breast cancer among female plastic surgeons. The results revealed no significant difference inprevalence of cancer overall, or breast cancer compared to American women of similar age and race. This result is in contrast to a previous study in female orthopaedic surgeons that demonstrated a 1.9-fold increased prevalence of overall cancer and a 2.9-fold increased prevalence of breast cancer [5]. These findings are surprising, as presumed risk factors in female orthopedic surgeons should parallel the female plastic surgeon population. Multiple studies on other female subpopulations within the healthcare field have reported an increased prevalence of breast cancer and other cancers; in addition, studies of female radiology technologists and both genders of interventional radiologists have demonstrated an increased rate of cancer of the brain, thyroid, prostate, uterus, ovaries, and breast [2-4,26-29]. As expected, the study confirmed presumptions about female plastic surgeons. This highly educated population was predicted to have decreased reproductive frequency and later partuition than the general population. The average American female has her first child at 25 [30], and only 20% of American women aged 40 to 44 are childless [31]. Among the responders of this study, 35% had their first child after age 35, 24% had their first child between ages 30 and 34, and 27% had no children.

Unlike female orthopaedic surgeons in previous studies, the practicing female plastic surgeon responders in this study had much less fluoroscopic radiation exposure. Only 2.6% of orthopaedic responders used fluoroscopy less than six times a year [6], compared to 91% of the female plastic surgeon responders in this study. Whereas 37% of female orthopaedists used fluoroscopy weekly, 4% of female plastic surgeons reported this usage.

The normative cancer prevalence among female plastic surgeons revealed in this study compared to the excess cancers found in other health care labor force samples may be due to the presence of protective

factors in this population. For instance, physicians often have a deeper understanding of the impact of diet and recreational habits. Accordingly, the average female plastic surgeon has a BMI of 23 (76% BMI <25, 15% BMI 25-29.9, 8% BMI>30), which is substantially lower than the average American female's BMI of 28.1 [32] and similar to the average BMI for female orthopaedists (55% BMI <25, 23% BMI 25-29.9, 7.5% BMI>30) [6]. This is notable, as obesity has been linked to several cancers, including breast and colorectal cancers [33,34]. In addition to having a healthier BMI, practicing female plastic surgeons have been reported to exhibit healthy lifestyle choices such as decreased smoking [35] and alcohol consumption. Consistently, only one of 352 respondents in this study currently smokes, and less than 7% have any history of smoking, compared to the 18.3% of American females who currently smoke 35. In one study, 36% of the surgeons polled did not drink in the week prior to completing the survey, and 13% drank daily compared to 20% of the general population 36. In contrast, female orthopaedic surgeons have been reported to be less likely to abstain from alcohol consumption [5].

The major limitation of this study was the relatively poor response rate of the surgeons contacted for participation. Only 57% of the 617 female plastic surgeons identified in the ASPS registry responded to the survey. Therefore, it was not possible to obtain statistically significant results. Another limitation that is commonly documented in occupational studies is the healthy worker bias [37]. According to this bias, sub-groups of the population may tend to be healthier than the general population because of the physical demands of their occupation. Additionally, given that female plastic surgeons are likely to discontinue their ASPS memberships once they stop working, the prevalence of cancer may be underestimated in this study.

Nevertheless, this study is an instrumental step toward a better understanding of the epidemiologic prevalence of cancer in the medical community. Despite the trend toward a decreased prevalence of breast cancer among the female plastic surgeon population, it is recommended that all female plastic surgeons regularly perform breast self-examinations and adhere to mammography screening guidelines [38].

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