Mortality and Suicide Among Danish Women With Cosmetic Breast Implants

Poul Harboe Jacobsen, MD; Lisbet R. Holmich, MD; Joseph K. McLaughlin, PhD; Christoffer Johansen, MD, DMSc; Jørgen H. Olsen, MD, DMSc; Kim Kjøller, MD; Søren Friis, MD

Background: Epidemiologic studies indicate that women with cosmetic breast implants have a significantly increased risk of suicide. Our objectives were to examine mortality among Danish women who underwent cosmetic breast implant surgery and to evaluate the baseline prevalence of psychopathological disorders as measured by admission to a psychiatric hospital among women seeking cosmetic surgery.

Methods: Cohort study of 2761 women who underwent cosmetic breast implant surgery at private clinics of plastic surgery or public hospitals, 7071 women who underwent breast reduction surgery at public hospitals, and 1736 women who attended private clinics for cosmetic surgery other than breast implantation, between 1973 and 1995. Causes of death through 1999 were identified through the Danish Mortality Files. Information on admission to psychiatric hospitals prior to cosmetic surgery was obtained from the Danish Psychiatric Central Register.

Results: Women with cosmetic breast implants had significantly elevated standardized mortality ratios (SMRs) for death overall (SMR, 1.4; 95% confidence interval [CI], 1.1-1.7), nonmalignant lung disease (3.4; 95% CI, 1.4-6.9), and suicide (SMR, 3.1; 95% CI, 1.7-5.2). Women who underwent breast reduction exhibited low SMRs for death overall (0.7; 95% CI, 0.7-0.8) and several specific causes, including breast cancer (0.4; 95% CI, 0.2-0.6), whereas death from suicide was moderately above expectation (SMR, 1.6; 95% CI, 1.0-2.5). The prevalence of psychiatric admission prior to cosmetic surgery was higher among women who underwent cosmetic breast implant surgery (8.0%; 95% CI, 7.0%-9.0%) than among women who underwent breast reduction (4.7%; 95% CI, 4.2%-5.2%) or other cosmetic procedures (5.5%; 95% CI, 4.5%-6.7%). When compared with all control groups, women with cosmetic implants had an odds ratio for psychiatric admission of 1.7 (95% CI, 1.4-2.0).

Conclusions: Danish women with cosmetic breast implants experienced higher overall mortality compared with women in the general population owing in part to a 3-fold increase in suicide. Women with breast reduction had a low total and cause-specific mortality but a moderate excess risk of suicide. For the first time, to our knowledge, we found evidence of an increased prevalence of mental illness as measured by admission to a psychiatric hospital prior to implant surgery among women receiving cosmetic breast implants. Studies are needed to clarify the underlying reasons for the consistently reported 2- to 3-fold excess of suicide among women with cosmetic breast implants.

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THE EPIDEMIOLOGIC EVIDENCE to date does not support an association between silicone breast implants and specific diseases, including cancer, connective tissue disease, or neurologic disorders. However, recent studies suggest that women who have undergone cosmetic breast augmentation may have a different mortality pattern than women in the general population. In particular, a 2- to 3-fold excess risk of suicide has consistently been reported among women with cosmetic breast implants compared with the general population.

Women with cosmetic breast implants differ from women in the general population with respect to several characteristics that may influence their mortality risks, but specific reasons for the higher risk of suicide among these women have not been elucidated. It has been suggested that women with breast implants may have a more frequent history of mental illness than women in general, however, published data on underlying psychopathological disorders among women seeking cosmetic breast implantation has been largely absent. In the present study, we report on cause-specific mortality among Danish women who underwent cosmetic breast implant surgery at private clinics of plastic surgery or public hospitals. For com-

Author Affiliations are listed at the end of this article.
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comparison, we also examined the mortality of women who underwent breast reduction surgery at public hospitals and among women who attended private clinics for reasons other than breast implantation. In an attempt to ascertain any underlying psychopathological disorders among women undergoing cosmetic surgery, we examined their preoperative history of hospitalization for psychiatric disorders using the unique Danish nationwide psychiatric register.

**METHODS**

We previously identified 3 groups of women who underwent cosmetic breast surgery: 1653 women who received cosmetic breast implants at 8 private clinics of plastic surgery between 1973 and 1993, 1135 women who underwent cosmetic breast implant surgery at public hospitals between 1977 and 1992, and 7071 women who underwent breast reduction surgery at public hospitals between 1977 and 1992. From the files of the private clinics, we also identified a fourth study group consisting of 1736 women who attended the private clinics for cosmetic surgery other than breast implantation, matched on age (±3 years) and calendar year (±18 months) at procedure or consultation to the women who underwent breast implant surgery. The procedures in the latter group included breast reduction and mastopexy (23%), facial surgery (21%), skin excisions (21%), and liposuction (15%), while 19% had a consultation but no surgical procedure at the clinics. Details on the identification of the 4 study cohorts, including specific information on types of surgery and breast implants, have been described previously.

Information on mortality among the 4 study cohorts was obtained by linkage to the Danish National Mortality Files, which contains computerized records of all causes of death in Denmark since 1943. The linkage was performed by use of the personal identification number, a unique number assigned to all Danish residents since 1968 that encodes date of birth and sex. Follow-up for death began on the date of implantation, breast reduction or other treatment or consultation, and continued until date of emigration, date of death or December 31, 1999, whichever occurred first. The number of deaths in the standard cause of death categories observed among the cohort members was compared with the number of deaths expected among the general female population of Denmark. To obtain the expected number of deaths, female-specific death rates, calculated according to 5-year age groups and 1-year calendar periods, were multiplied with the corresponding person-years of the cohort members. The standardized mortality ratio (SMR), calculated as the ratio of the observed to the expected number of deaths, served as an estimate of relative risk, and 95% confidence intervals (CIs) were calculated based on the assumption that the observed number of deaths followed a Poisson distribution. We also calculated odds ratios (ORs) and 95% CI comparing the prevalence of prior psychiatric hospitalization among women with implants with that among the controls groups.

To identify preexisting psychopathological disorders among women seeking cosmetic breast surgery, we linked the 4 study cohorts to the files of the nationwide Danish Psychiatric Central Register. This register holds records on all admissions to psychiatric hospitals since April 1969. The admission record includes the hospital, hospital department, date of admission, date of discharge, 1 primary psychiatric diagnosis, and up to 3 auxiliary diagnoses (classified according to the *International Classification of Diseases, Eighth Revision* [ICD-8] until 1993 and the 10th revision [ICD-10] from 1994 onwards). All registered psychiatric diagnoses are based on an evaluation by a psychiatrist. For the purpose of this study, we obtained information on psychiatric admissions prior to cosmetic surgery among women in the 4 study cohorts. The psychiatric diagnoses were grouped according to a previously used categorization based on ICD-8.

The 2 breast implant cohorts were analyzed separately and combined. For 27 women who appeared in both breast implant cohorts, the earliest date of implantation was used in the combined analysis.

**RESULTS**

The age distribution at time of breast surgery was similar for the 2 implant cohorts and the reduction cohort (median age, 31 years), whereas women in the private clinic control cohort were slightly older at treatment (median age, 33 years) (Table 1). On average, women in the public hospital implant cohort had received their implants earlier in the study period compared with women in the private clinic implant cohort, so follow-up of the public hospital implant cohort (mean, 14.1 years; range, 7-22 years) was longer than that of the private clinic implant cohort (mean, 9.7 years; range, 4-26 years).

Overall, 88 deaths were observed among women with breast implants as opposed to 63.6 expected deaths based on mortality rates in the general female population (SMR, 1.4; 95% CI, 1.1-1.7) (Table 2). Women who underwent breast implant surgery at private clinics experienced somewhat higher mortality (SMR, 1.7; 95% CI, 1.2-2.3) compared with women who received their implants at public hospitals (SMR, 1.2; 95% CI, 0.9-1.6). Increased SMRs were observed in both implant cohorts for suicide and nonmalignant lung diseases (ie, bronchitis, emphysema, asthma, and unspecified chronic obstructive pulmonary disease [COPD]), yielding overall SMRs of 3.1 (95% CI, 1.7-5.2) and 3.4 (95% CI, 1.4-6.9), respectively, for these causes of death. In the combined implant cohort, we found slightly elevated SMRs for ischemic heart disease (SMR, 1.6; 95% CI, 0.6-3.5) and cancer of the respiratory organs (SMR, 1.5; 95% CI, 0.6-3.0), whereas there was no excess death from other cancers, including breast cancer (SMR, 1.0; 95% CI, 0.4-2.0), hematopoietic malignancies (SMR, 1.1; 95% CI, 0.1-4.1), and brain cancer (no observed cases vs 1.1 expected; 95% CI, 0.3-4.3).

Decreased SMRs for all-cause mortality were observed in both the breast reduction (SMR, 0.7; 95% CI, 0.7-0.8) and private clinic control (SMR, 0.8; 95% CI, 0.5-1.1) cohorts (Table 3). Among women who underwent breast reduction, decreased SMRs were seen for cancer (SMR, 0.6; 95% CI, 0.5-0.8), in particular cancer of the breast (SMR, 0.4; 95% CI, 0.2-0.6) and respiratory organs (SMR, 0.5; 95% CI, 0.3-0.8), ischemic heart disease (SMR, 0.7; 95% CI, 0.5-1.0), cerebrovascular disease (SMR, 0.4; 95% CI, 0.2-0.8), and smoking-related nonmalignant lung disease (SMR, 0.5; 95% CI, 0.3-0.9). The SMR for suicide was increased (SMR, 1.6; 95% CI, 1.0-2.5). No significant decreases or increases in cause-specific mortality, including suicide, were found in the private clinic comparison cohort; however, the statistical power was limited for this group.

Table 4 presents SMRs for overall mortality and for suicide among women with breast implant or reduction.
surgery, stratified by time since surgery. Among women with breast implants, there was a tendency toward decreasing SMRs with increasing length of follow-up for total death. No clear trend was observed for suicide, except for the highest SMR (4.0; 95% CI, 1.5-8.8) occurring in the combined breast implant cohort within the first 4 years of follow-up. Among women with breast reduction, there were no specific patterns with length of follow-up, except for an elevated SMR (2.3; 95% CI, 1.1-4.3) for suicide in the 1- to 4-year follow-up period.

Women who underwent breast implant surgery had a significantly higher prevalence of psychiatric admission prior to cosmetic surgery compared with women who underwent breast reduction or other cosmetic proce-
dures (OR, 1.7; 95% CI, 1.4-2.0); when compared with women who underwent breast reduction surgery only, the OR for prior psychiatric admission was 1.8 (95% CI, 1.5-2.1). Nearly 10% (9.4%; 95% CI, 7.8%-11.3%) of women who underwent breast implant surgery at public hospitals had previously been admitted to a psychiatric hospital, while 6.8% (95% CI, 5.7%-8.2%) of women who received implants at private clinics had a history of psychiatric admission (Table 5). Lower and about equal prevalences of prior psychiatric admission were seen among women with breast reduction (4.7%; 95% CI, 4.2%-5.2%) and women who attended private clinics for reasons other than breast implantation (5.5%; 95% CI, 4.5%-6.7%). In the combined breast implant cohort, 7 (50%) of the 14 women who committed suicide had been hospitalized for psychiatric disorders prior to implant surgery, compared with 6 (27%) of 22 women with breast reduction who committed suicide. The most frequent psychiatric diagnoses among women with cosmetic breast implants were neurosis and personality disorders (27%), transient maladaptation (20%), substance or alcohol abuse (11%), and affective disorders (7%).

**COMMENT**

We found that Danish women who underwent cosmetic breast implant surgery had a higher overall mortality compared with women in the general population. This increased mortality was due primarily to an increased risk of death from suicide and smoking-related diseases. Women who underwent breast reduction surgery had lower total and cause-specific mortality compared with women in the general population; however, these women also exhibited an increased risk of death from suicide. No excess of suicide was observed among women with other types of cosmetic surgery.

The findings of an excess of suicide in this and the 3 previous epidemiologic studies of mortality among women with breast implants have been remarkably consistent.7-9 All 4 studies, conducted in different populations, have found significant 2- to 3-fold increased risks of suicide among women with breast implants compared with the general female population. A history of mental illness requiring hospital admission is regarded as the strongest risk factor for suicide,23-25 which is consistent with our finding of a relatively high prevalence of psychiatric admissions among Danish women prior to seeking breast implant surgery. In a nationwide Danish study of risk factors for suicide, Mortensen et al26 reported a population attributable risk of nearly 50% for prior hospitalization for mental illness.

To our knowledge, this is the first study to report an increased prevalence of prior hospitalization for psychiatric disorders among women who chose to undergo cosmetic breast implantation. Some studies have reported varying degrees of preoperative depression, anxiety, or low self-esteem among women seeking breast implantation,15,16,27-29 but most of these studies had methodological limitations, and a recent review of the literature found little reliable evidence of increased prevalence of psychopathological disorders among women with breast implants.30 However, the presence of previous serious mental illness among women electing breast implantation has not been adequately studied. Our finding of preoperative psychiatric admissions in a sizable proportion of Danish women who underwent cosmetic breast implant surgery supports the notion that the excess risk of suicide

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**Table 4. Total Mortality and Suicide Among Danish Women With Breast Implant or Reduction Surgery by Time Since Surgery**

<table>
<thead>
<tr>
<th>Cause of Death/Year of Follow-up</th>
<th>Private Clinic Implant</th>
<th>Public Hospital Implant</th>
<th>Combined Breast Implant</th>
<th>Breast Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed</td>
<td>SMR (95% CI)</td>
<td>Observed</td>
<td>SMR (95% CI)</td>
</tr>
<tr>
<td>All Causes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>1</td>
<td>0.6 (0.3-3.4)</td>
<td>2</td>
<td>1.6 (0.2-5.7)</td>
</tr>
<tr>
<td>1-4</td>
<td>17</td>
<td>2.2 (1.3-3.5)</td>
<td>8</td>
<td>1.3 (0.6-2.6)</td>
</tr>
<tr>
<td>5-9</td>
<td>16</td>
<td>1.7 (1.0-2.8)</td>
<td>12</td>
<td>1.2 (0.6-2.1)</td>
</tr>
<tr>
<td>≥10</td>
<td>11</td>
<td>1.4 (0.7-2.5)</td>
<td>22</td>
<td>1.1 (0.7-1.7)</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>1.7 (1.2-2.3)</td>
<td>44</td>
<td>1.2 (0.9-1.6)</td>
</tr>
</tbody>
</table>

**Table 5. Prevalence of Psychiatric Admission Prior to Cosmetic Surgery Among Danish Women**

<table>
<thead>
<tr>
<th>Study Cohort</th>
<th>No. of Patients*</th>
<th>Prevalence, % (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined breast implant group</td>
<td>220</td>
<td>8.0 (7.0-9.0)</td>
</tr>
<tr>
<td>Private clinic implantation</td>
<td>110</td>
<td>6.8 (5.7-8.2)</td>
</tr>
<tr>
<td>Public hospital implantation</td>
<td>107</td>
<td>9.4 (7.8-11.3)</td>
</tr>
<tr>
<td>Breast reduction</td>
<td>329</td>
<td>4.7 (4.2-5.2)</td>
</tr>
<tr>
<td>Private clinic controls</td>
<td>96</td>
<td>5.5 (4.5-6.7)</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval; SRM, standardized mortality ratio.

*Number of patients admitted to a psychiatric hospital prior to cosmetic surgery (or cosmetic surgery consultation for 19% of the women in the private clinic control cohort).
†Percentage of cohort members with admission(s) to a psychiatric hospital prior to surgery.
among women with breast implants reflects an increased prevalence of underlying psychopathological disorders rather than a causal association with breast implants.\(^\text{10}\)

Women with breast implants have also been shown to differ from women in general with respect to nonpsychiatric factors, including cigarette smoking, alcohol intake, reproductive factors, and marital status.\(^\text{11-14}\) which may influence their risk of suicide.\(^\text{25,26,31-34}\) The mortality pattern among women with breast implants in our study is compatible with our previous finding of a higher smoking frequency among Danish women with breast implants than among women in the general population.\(^\text{19}\) In contrast, the low mortality among women with breast reduction indicates that these women may smoke less and be more health conscious compared with women in general. Even so, their risk of suicide was significantly increased compared with the general female population. This may indicate that although women with breast reduction had a lower prevalence of psychiatric admissions prior to surgery compared with women with breast implants, some of these women may share psychological characteristics associated with risk of suicide.

Women with breast implants experienced no excess death from breast cancer, or other cancer sites, including hematopoietic malignancies and brain cancer. However, we had limited power to assess site-specific cancer mortality. Among women with breast reduction, the risk of death from breast cancer was significantly reduced. We observed a total of 11 deaths from breast cancer among these women as opposed to 30 expected deaths. Several studies have reported a reduced risk of breast cancer among women who have undergone breast reduction.\(^\text{55-58}\) Possible explanations include reductions in breast size and, in particular, glandular tissue after surgery; however, the underlying biological mechanisms remain unclear.\(^\text{37-39}\)

The main strengths of our study were the cohort design with complete register-based follow-up for death and the linkage to the unique nationwide Danish Psychiatric Central Register, which enabled us to examine the history of psychiatric admission among all study subjects. Another advantage was the inclusion of comparison cohorts of women from the same public hospitals and private clinics as the women with breast implants, although some of the women in the comparison cohorts underwent procedures that cannot be termed strictly cosmetic, such as excision of benign skin tumors and breast reduction mainly because of physical complaints.

Limitations of our study include the relatively small number of deaths in the implant and private control cohorts and the lack of information on nonpsychiatric factors possibly associated with risk of suicide, including demographic and lifestyle characteristics. Also, in our register-based approach we had no information on less severe psychiatric conditions treated outside the hospital setting with a possible relation to risk of suicide. Although women in the private and public breast implant cohorts both underwent surgery for cosmetic reasons, these women are likely to differ, which was also indicated by their somewhat different mortality pattern. Our finding of a more frequent preoperative history of psychiatric admission among women who underwent breast implant surgery in public hospitals than among women who received implants at private clinics is consistent with the fact that during the 1970s and 1980s some public hospital departments in Denmark required a psychological indication and evaluation for breast implant surgery before the government health service would pay for the procedure (oral communication, Vibeke Breiting, MD, Holte Clinic of Plastic Surgery, Holte, Denmark, 2004). Another explanation for the discrepancy in preoperative psychiatric history might be that women who had surgery at private clinics were more likely to be treated for serious mental illness by private psychiatrists; however, such practice is rare in Denmark.

In summary, Danish women with cosmetic breast implants experienced a higher overall mortality compared with women in the general population, which was owing mainly to increased mortality from suicide and smoking-related disease. Women who underwent breast reduction surgery had lower total and cause-specific mortality compared with women in the general population, but a moderate excess risk of suicide. Compared with the control groups, we found evidence of an increased prevalence of prior psychiatric hospital admission among women undergoing cosmetic breast implantation, which may relate to their subsequent higher risk of suicide. This finding, the first of its kind, to our knowledge, to provide empirical evidence of preimplant psychiatric status, emphasizes the need for careful preoperative psychological screening among women seeking cosmetic breast surgery.\(^\text{99}\) Additional studies are urgently needed to further our knowledge of the underlying reasons for the increased risk of suicide among women who undergo cosmetic breast surgery.

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Author Affiliations: Department of Plastic Surgery, Private Hospital Hamlet, Copenhagen, and Department of Plastic and Reconstructive Surgery, Odense University Hospital, Odense, Denmark (Dr Jacobsen); Institute of Cancer Epidemiology, Danish Cancer Society, Copenhagen (Drs Holmich, Johansen, Olsen, Kjoller, and Friis); Department of Plastic and Reconstructive Surgery, Herlev University Hospital, Herlev, Denmark (Dr Holmich); International Epidemiology Institute, Rockville, Md (Dr McLaughlin); and Department of Medicine, Vanderbilt University Medical Center, Vanderbilt-Ingram Comprehensive Cancer Center, Nashville, Tenn (Drs McLaughlin and Olsen).

Correspondence: Joseph K. McLaughlin, PhD, International Epidemiology Institute, 1455 Research Blvd, Suite 550, Rockville, MD 20850-3127 (jkmc@iei.ws).

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