

Factors associated with breast symmetry after breast conserving surgery for cancer

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ABSTRACT

Introduction. Breast-conserving surgery (BCS) is the standard of care for treatment of early breast cancer. Factors associated with poor cosmetic results are not well described. The aim of the present study was to evaluate factors associated with breast asymmetry after BCS for invasive breast cancer. **Material and methods.** Patients who underwent unilateral BCS for invasive breast cancer and completed at least six months after radiation therapy were included. After informed consent, patients answered a validated questionnaire for breast symmetry. Demographic, clinical-pathological and surgical variables were recorded. Bilateral breast volume was measured in office and volume difference $> 20\%$ was considered objective asymmetry. Variables were analyzed with χ^2 test and significance was considered at $p < 0.05$. **Results.** One-hundred and thirty-three patients were included. Mean patient age was 56 ± 9 years. Most patients were married (78%) with educational level of high school or greater (50.8%). Mean body mass index (BMI) was 25 ± 8 . Twelve percent of patients underwent ≥ 2 surgical procedures. Eighty-one percent of patients had tumors > 1 cm. Twenty-two percent of patients had objective breast asymmetry and 27% perceived themselves with asymmetry. There were no significant relationship between objective and subjective asymmetry. The only variable significantly associated with perception of breast asymmetry was educational level \geq high school. **Conclusions.** There was no relationship between subjective and objective breast asymmetry after BCS, suggesting that cosmetic results are mainly related to patient subjective perception. The only variable associated with subjective breast asymmetry was high educational level, possibly because higher cosmetic expectations in this group of patients.

Key words. Breast cancer. Breast conserving surgery. Breast symmetry.

Factores asociados con simetría después de cirugía conservadora de mama por cáncer

RESUMEN

Introducción. La cirugía conservadora (CC) es el tratamiento quirúrgico de elección para la mayoría de las pacientes con cáncer de mama en etapas iniciales. Los factores asociados con resultados cosméticos pobres no se encuentran bien estudiados. El objetivo del presente estudio fue evaluar los factores asociados con simetría mamaria después de CC para cáncer de mama invasor. **Materiales y métodos.** Se incluyeron pacientes sometidas a CC unilateral por cáncer de mama invasor y que completaron al menos seis meses de terminado su tratamiento con radioterapia. Después de firmar consentimiento informado, las pacientes contestaron un cuestionario validado sobre percepción de simetría mamaria. Se registraron variables demográficas, clínico-patológicas y quirúrgicas. Se midió objetivamente el volumen mamario bilateral en el consultorio y una diferencia $> 20\%$ fue considerada como asimetría objetiva. Se analizó la relación entre las variables con la prueba de χ^2 y fue significativa una $p < 0.05$. **Resultados.** Se incluyeron 133 pacientes en el periodo de estudio. La media de edad fue 56 ± 9 años. La mayoría de las pacientes era casada (78%), con un nivel escolar de secundaria completa o superior (50.8%). El promedio de índice de masa corporal fue 25 ± 8 . Doce por ciento de las pacientes requirieron dos o más procedimientos quirúrgicos. Ochenta y un por ciento de las pacientes tuvieron tumores > 1 cm. Veintidós por ciento de las pacientes tuvieron asimetría mamaria objetiva de acuerdo con la definición del estudio y 27% se percibieron a sí mismas con asimetría mamaria. No hubo relación significativa entre percepción de asimetría y asimetría objetiva. La única variable asociada a percepción de asimetría fue un nivel educativo de secundaria completa o superior. **Conclusiones.** No se encontró relación significativa entre asimetría mamaria objetiva y subjetiva después de CC de mama, lo que sugiere que los resultados cosméticos se relacionan fundamentalmente con una percepción subjetiva de la paciente. La única variable asociada a percepción subjetiva de asimetría fue un nivel educativo superior, posiblemente relacionado con una mayor expectativa cosmética en este grupo de pacientes.

Palabras clave. Cáncer de mama. Cirugía conservadora. Simetría mamaria.

INTRODUCTION

Breast conserving surgery (BCS) is the standard treatment for early breast cancer. Compared with mastectomy, BCS is associated with less morbidity and deformity. Nevertheless, many patients who underwent this procedure reported breast asymmetry. This may be due to specific patient factors as well as surgical technique and radiotherapy (RT), which is essential after surgery. Risk factors associated with poor cosmetic results have not been well determined, however, young patients with large or medium-sized breasts are usually considered ideal candidates for BCS.

There are few reports that evaluate the factors that influence aesthetic results. Factors such as age, body habitus, comorbidities, tumor location, postoperative complications and reoperation rates have been associated with poor cosmetic results. Up to 60% of BCS require multiple surgeries to achieve disease-free margins, but the final cosmetic effect is unknown.

In this study we tried to determine factors associated with breast asymmetry in patients treated with BCS for breast cancer in a tertiary referral center in Mexico City, in order to identify women at risk of suboptimal cosmetic results. The knowledge of these factors could allow the surgeon to offer patient other options such as oncoplastic techniques or reconstructive procedures which may provide superior aesthetic results and quality of life.

MATERIAL AND METHODS

We included all patients who underwent BCS in one breast for malignant lesions at our institution between 1990 and 2010, or in the private practice of the main author (HMF) from 2001 through 2010 with more than 6 months of the completion of radiation therapy that agreed to participate and firmed informed consent. Patients who underwent bilateral breast surgery or breast reconstruction techniques or oncoplastic procedures by plastic surgeon were excluded. This protocol was approved by institutional IRB.

Educational level was classified as less than high school (equivalent in Mexico to 9 years of school assistance) and complete high school or higher. Economic status was assigned by social workers at our institution in order to charge fees for hospital services. Patients are classified from 1 (under poverty level) to 6 (higher income percentile for general Mexican population). Level 7 patients have a private

health insurance and represent < 5% of patient population at our institution.

For evaluation of cosmetic results, the Breast Cancer Treatment and Outcomes Survey (BCTOS) was used. The BCTOS is a 7-item survey instrument validated in breast cancer patients, who underwent BCS and RT. This questionnaire covered the aesthetic aspects of breast symmetry evaluating both glands according to the patient and was applied during the medical interview in the office. The items evaluated by the patient were hardness, change in colour of the skin, skin retraction, change in breast shape, change in nipple appearance, change in bra-adjustment and change in appearance when clothed. For asymmetry perception patients scored the 7 items from 1 to 4, meaning 1 = none; 2 = mild; 3 = moderate and 4 = severe. An asymmetry - perception score was established according to the questionnaire applied: ≥ 15 was equal to asymmetry perceived by the patient, < 15 meant no asymmetry perception.

A routine physical examination was performed, with measurement of breast volume with devices used by plastic surgeons in order to determine breast volume. Evaluation was performed by independent physician who did not take part of surgical treatment. Asymmetry was defined as the difference in volume $\geq 20\%$ between two breasts.

The chi-square test was used to compare associations between dependent and independent variables. We analyzed the correlation between cosmetic results and each independent variables. Significance was considered at $p < 0.05$.

RESULTS

One-hundred and thirty-three patients were included in our study. Demographic characteristics are described in table 1. All patients were women with a mean age 56 ± 9 years. Most patients included were married (78%) with an educational level of complete high-school or higher (50.8%).

The clinical characteristics are showed in table 2. Forty-four percent of patients had a BMI < 25. The right breast was the most frequently affected (64.7%) as the upper-outer quadrant (52.9%) as commonly described. Other less affected quadrants were: upper inner (18.4%), lower outer (15.7%) and lower inner quadrant (13%). No patient had retroareolar tumor, and most patients (83.3%) had tumors > 1 cm. Three out four patients underwent only one surgical procedure in order to obtain negative margins; the remaining had 2 or more surgical procedures. Most patients (83.4%) completed radia-

tion therapy (50.4 Gy in five weeks with no boost to tumoral bed). Surgical morbidity was very low (5.5%) mainly represented by seroma formation.

According to the questionnaire, the only factor associated with patient perception of asymmetry was educational level of complete high-school or higher (Table 3). No other factors like type of breast biopsy,

number of excision needed in order to obtain negative margins or tumor size were associated with subjective assymetry of the breasts. The only factor significantly associated with objective breast volume difference was BMI < 25. There was a trend to relationship

Table 1. Demographic characteristics (n = 133).

| |
|--------------------------------------|
| Age |
| Mean 56 ± 9 years |
| Marital status |
| 78% married |
| 22% not married |
| Economic status |
| ≤ Level 3 (72.3%) |
| > Level 3 (27.7%) |
| Educational level |
| Elementary (49.2%) |
| High school (33.1%) |
| College graduates and beyond (17.7%) |

Table 2. Clinical characteristics.

| |
|------------------------------|
| Body mass index |
| < 25 (44.4%) |
| ≥ 25 (55.6%) |
| Breast side |
| Right (64.7%) |
| Left (35.3%) |
| Tumor size |
| ≤ 1 cm (16.7%) |
| > 1 cm (83.3%) |
| Number of breast excisions |
| 1 (77.8%) |
| ≥ 2 (22.2%) |
| Radiation treatment complete |
| Yes (83.4%) |
| No (16.6%) |
| Systemic chemotherapy |
| Yes (61.2%) |
| No (38.8%) |
| Post operative complications |
| Yes (5.5%) |
| No (94.5%) |

Table 3. Factors associated with asymmetry perception and objective volume difference.

| Variables | Asymmetry perception | Volume difference > 20% |
|-------------------|----------------------|-------------------------|
| Age | P = 0.314 | P = 0.162 |
| ≤ 50 years | | |
| > 50 years | | |
| BMI | P = 0.437 | P = 0.029 |
| ≤ 25 | | |
| > 25 | | |
| Marital status | P = 0.191 | P = 0.579 |
| Married | | |
| Not married | | |
| Educational level | P = 0.020 | P = 0.335 |
| < High school | | |
| ≥ High school | | |
| Economic level | P = 0.472 | P = 0.33 |
| ≤ 3rd level | | |
| > 3rd level | | |
| Side | P = 0.605 | P = 0.139 |
| Scar size | P = 0.563 | P = 0.241 |
| ≤ 5 cm | | |
| > 5 cm | | |
| Tumor size | P = 0.676 | P = 0.579 |
| ≤ 1 cm | | |
| > 1 cm | | |
| Biopsy type | P = 0.563 | P = 0.335 |
| Excisional | | |
| Percutaneous | | |
| Excisions (n) | P = 0.676 | P = 0.579 |
| 1 | | |
| > 1 | | |
| Complete RT | P = 0.324 | P = 0.421 |
| Yes | | |
| No | | |
| Chemotherapy | P = 0.686 | P = 0.559 |
| Yes | | |
| No | | |

Table 4. Relationship between patient perception and objective asymmetry.

| Patient perception | Volume difference | | Total |
|--------------------|-------------------|-------|-------|
| | < 20% | > 20% | |
| Symmetry | 78 | 16 | 94 |
| Asymmetry | 24 | 15 | 39 |
| Total | 102 | 31 | 133 |

P = 0.09.

between breast volumen difference and perception of asymmetry, however it did not reach statistical significance (Table 4).

DISCUSSION

Breast cancer is an important cause of death in women between 35 and 54 years old.¹ During last century, radical surgery for breast cancer was used as the mainstay of breast cancer treatment. However, surgery has evolved toward less invasive procedures.²

There has been a reduction in the mortality rate by 2% per year due to screening tests, early detection and effective systemic therapies. This improvement in tumor detection rate at early stages has increased a more aesthetic surgical treatment and an improvement in the quality of life of these patients. It is important to determine factors that influence in the cosmetic and functional result in order to offer a better quality of life.

Multiple randomized studies had demonstrated that breast conserving surgery (BCS) is a safe oncologic treatment for breast cancer.³⁻⁵ Because of its cosmetic benefits, BCS is preferred by many surgeons when compared with mastectomy.⁶ Breast simmetry, comfort and better aesthetic results are achieved when certain surgical techinques are followed in breast cancer surgery. Also, proper selection of patients is crucial. Women with relatively low volume breasts or with inner quadrant tumors may be candidates for mastectomy rather than BCS because of a higher incidence of deformity and assymetry following lumpectomy plus radiation therapy (RT).⁷

There are some characteristics related to the patient such as smoking, obesity and comorbidities that can increase surgical complications. These risk factors can adversely affect the immediate and late postoperative outcomes, becoming relative contraindications for BCS or immediate breast reconstruction.^{8,9}

In our study, subject and treatment characteristics were not significantly correlated with postopera-

tive breast asymmetry perception. It has been reported that subject risk factors include young age patients, high BMI, tumors larger than 1 cm and tumors with upper-inner and lower-outer location. Treatment risk factors take into account: > 1 surgical excision, postoperative seroma and radiotherapy. We recognize that breast cosmesis changes with time after surgery and radiation therapy. We use at least 6 months after completion of radiation therapy in order to include more patients and because is the time when inflammatory changes are expected to be declining. Waiting more time could change cosmetic results and more studies with longer follow-up are necessary to address this issue.

We acknowledge that other parameters like breast shape and position of the areola-nipple complex can be modified by radiation therapy, however, because the breast volume is the only hard measure we decided to use it as only parameter for objective asymmetry. Other aspects of breast symmetry were self-evaluated by patients according to validated questionnaire.

In this study BMI < 25 and ≥ high school education were the only variables that reached statistically significance. The first was related to an objective breast volume difference and the second to a patient perception of breast asymmetry. Those patients with a higher educational level showed perceived more asymmetry when compared to patients with lower educational level, probably associated to higher cosmetic expectations. There was not a significant relationship between volume difference and patient perception of asymmetry, probably because the low number of patients. However it is a very interesting finding that according to the patient is the educational level the most significant factor for perception of cosmetic outcome, at least related to breast symmetry. In a previous work of patients who underwent breast surgery for benign and malignant diseases, the only factors associated with poorer quality of life was cancer diagnosis and high educational level.¹⁰

The main strength of the study is that surgery was performed by a limited number of surgeons (two) in a single institution with no changes in surgical technique. On another hand radiation therapy was administered at the same institution during the entire study period. The main limitation of the study was the small number of patients, so we acknowledge that further studies with larger number of patients are necessary to confirm our results. A prospective evaluation of preoperative breast symmetry perception would be desirable.

Because the retrospective nature of our study this was not performed in our cohort of patients.

In summary, patient expectations should be taken into account when a surgical procedure for cancer is offered. Probably in patients with high educational level and higher cosmetic expectations oncoplastic or reconstructive surgical techniques could be a better option for breast cancer surgical treatment.

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