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A comparison of long-term cost and clinical outcomes between the two-stage sequence expander/prosthesis and autologous deep inferior epigastric flap methods for breast reconstruction in a public hospital

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Summary   *Background:* Postmastectomy breast reconstruction involves the use of large amounts of hospital resources. This study provides comparative data on the clinical results and long-term economic costs of two methods of breast reconstruction in a public hospital.
Methods: A prospective cohort study was performed to evaluate the costs incurred by delayed unilateral breast reconstruction performed using either the two-stage sequence expander/ prosthesis (E-P) or autologous deep inferior epigastric flap (DIEP) method during 2005—2013 in 134 patients. The major evaluated variables included previous clinical records, history of radiotherapy, and number of surgical procedures. Total costs accounted for both direct intra- and extra-hospital costs derived from the initial reconstruction and those resulting from associated reoperations due to aesthetic retouches and/or complications.
Results: Patients undergoing E-P reconstruction required a higher number of surgery sessions to complete the reconstruction (3.07 vs. 2.32, $p < 0.001$) and showed higher rates of surgery-related complications (40.29% vs. 32.82%). No statistically significant differences were found between the two surgical methods in terms of total costs (€18857.77 DIEP vs. €20502.08 E-P; $p = 0.89$). In the E-P cohort, active smoking and history of radiotherapy were statistically significant risk factors of complications. In the DIEP group, only active smoking was significantly associated with complications.

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Conclusions: Compared to the E-P method, breast reconstruction using the DIEP method is more cost-effective and involves fewer serious complications that result in reconstruction failure or undesirable aesthetic results. E-P reconstruction presents a higher number of complications that may cause surgical failure or poor outcomes.

Introduction

Breast cancer is the most frequent malignancy in women as well as the second major cause of death due to cancer.[1] The increasing survival of these patients has led to a rise in the demand for breast surgical reconstruction, not only as a direct result of the tumor treatment but also because of the demonstrated functional, psychological, and social benefits for women undergoing treatment.[2,3]

The two most frequently used methods for breast reconstruction are the autologous deep inferior epigastric flap (DIEP) and the two-stage sequence expander/prosthesis (E-P). Several factors favor the convenience of each particular method; while some of them are dependent on the patients (age, medical records, and body image) and/or individual preferences, other factors rely upon the surgical team experience.[4–6]

On the basis of an analysis of the cost-effectiveness and cost–utility criteria for DIEP and E-P, some European and North American centers have published data on the economic costs. These studies accounted for several parameters such as duration of reconstruction (immediate or delayed) and the type of surgical techniques employed (implants, local flaps, and free flaps), with diverse tracking periods and final outcomes.[5,7–13] However, only a few studies have compared the clinical outcomes and reconstruction costs between the DIEP and the E-P method in a public and free universal healthcare system setting such as the Spanish healthcare system (without fees for patients or charges to insurance companies). Therefore, the aim of this study was to compare the economic costs and long-term follow-up outcomes of the DIEP and the E-P method of breast reconstruction, including the costs and clinical outcomes related to the initial reconstruction and associated reoperations due to complications or aesthetic retouches.

Patients and methods

Study design

This prospective cohort clinical study included 134 patients who underwent delayed unilateral breast reconstruction using either the E-P ($n = 67$) or the DIEP ($n = 67$) method in the plastic surgery unit of the Virgen del Rocio University Hospital (Seville, Spain) between 2005 and 2013 (9 years). The minimal period of follow-up was 5 years for the patients who underwent reconstruction using the E-P method (E-P cohort) and 2 years for those who underwent reconstruction using the DIEP method (DIEP cohort).

Patients indicated for delayed unilateral breast reconstruction using either the E-P or DIEP methods following reconstruction for breast cancer were included in this study irrespective of age or underlying medical condition. The decision-making process for the selection of either method was dependant on the patient condition and their personal preferences and concerns. The following exclusion criteria were applied: segmental or partial mastectomy, incomplete medical records, or unfinished treatment because of negative monitoring or death. All study participants provided an informed consent, and the study protocol was approved by the ethics committee. This study was performed according to the STROBE guidelines for cohort studies.

Data collection

The demographic variables recorded included age, clinical records, body mass index (BMI), and radiotherapy before reconstruction and type of operation (primary or secondary). In addition, the number and types of previous surgical operations and the presence and types of complications were analyzed.

The economic data evaluated were exclusively those accounting for direct intra- and extra-hospital costs. The indicators employed were as follows: duration of surgery, length of hospital stay, materials and tests used (implants, imaging tests, or abdominal mesh), and the total number of consulting sessions. The financial department of the hospital established a cost per unit that was ascribed to each of these indicators. The main costs per unit for breast

Table 1 Cost of functional units, 2013.[a]	
Operation room/hour	€750.6
Breast expander	€560.16
Breast prosthesis	€550
Abdominal mesh	€66
Computerized axial tomography—angiographic computed axial tomography	€239.7
Ecography	€31.96
Hospital stay	€746.32
Intensive care unit stay	€4684.10
Outpatient care	€634.70
First consultation	€144.56
Successive consultations	€69.14

[a] 1€ = US $1.32.