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Cost minimisation analysis of using acellular dermal matrix (Strattice™) for breast reconstruction compared with standard techniques

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Abstract

Background: We performed a cost analysis (using UK 2011/12 NHS tariffs as a proxy for cost) comparing immediate breast reconstruction using the new one-stage technique of acellular dermal matrix (Strattice™) with implant *versus* the standard alternative techniques of tissue expander (TE)/implant as a two-stage procedure and latissimus dorsi (LD) flap reconstruction.
Methods: Clinical report data were collected for operative time, length of stay, outpatient procedures, and number of elective and emergency admissions in our first consecutive 24 patients undergoing one-stage Strattice reconstruction. Total cost to the NHS based on tariff, assuming top-up payments to cover Strattice acquisition costs, was assessed and compared to the two historical control groups matched on key variables.
Results: Eleven patients having unilateral Strattice reconstruction were compared to 10 having TE/implant reconstruction and 10 having LD flap and implant reconstruction. Thirteen patients having bilateral Strattice reconstruction were compared to 12 having bilateral TE/implant reconstruction. Total costs were: unilateral Strattice, £3685; unilateral TE, £4985; unilateral LD and implant, £6321; bilateral TE, £5478; and bilateral Strattice, £6771.
Conclusions: The cost analysis shows a financial advantage of using acellular dermal matrix (Strattice) in unilateral breast reconstruction *versus* alternative procedures. The reimbursement system in England (Payment by Results) is based on disease-related groups similar to that of many countries across Europe and tariffs are based on reported hospital costs, making this analysis of relevance in other countries.

Keywords: Mammaplasty; Mastectomy; Acellular dermal matrix; Costs and cost analysis; Insurance; Health; Reimbursement

Introduction

Where clinically appropriate, immediate breast reconstruction is recognised as being beneficial for women undergoing mastectomy. In 2002, the National Institute for Health and Clinical Excellence (NICE) in the UK recommended that breast reconstruction should be available to all women at the time of mastectomy.[1] The incidence of breast cancer has risen substantially in the last decade, and this has led to a corresponding increase in the demand for surgery.[2] Between 1997 and 2006, the number of breast cancer operations performed by the National Health Service (NHS) in England and Wales rose from 24,684 to 33,814, an increase of 37 per cent.[2] There was also an increase during this period in the number of NHS hospitals performing breast reconstruction surgery, with the proportion of mastectomy patients having immediate reconstruction rising from 7 per cent to 11 per cent.[2] The National Mastectomy and Breast Reconstruction (NMBR) audit in the UK in 2009 estimated the current rate of immediate reconstruction to be 20.6 per cent among patients undergoing mastectomy.[2]

Standard methods of reconstruction include staged implant reconstruction, pedicled myocutaneous flaps, and free flaps. Autologous flaps are not without complications. The fourth annual report of the NMBR audit has shown that up to 25 per cent of women who undergo autologous latissimus dorsi (LD) flap reconstruction have some difficulty

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lifting and carrying heavy objects.[2] The main advantages of implant-based reconstruction are the absence of donor-site morbidity, reduced operating time, and quicker recovery. However, the standard implant technique involves a second-stage procedure after tissue expansion to implant a permanent prosthesis. It also involves full muscle coverage of the expander, which has inherent aesthetic consequences (eg, the expander tends to sit higher and lacks projection). Releasing pectoralis fibres to allow lower pole expansion improves projection, but implant rippling can be an issue when the implant is subcutaneous. Acellular dermal matrices (ADMs) in the form of AlloDerm® Regenerative Tissue Matrix (human cadaveric ADM; LifeCell Corporation, Branchburg, New Jersey, USA) and more recently Strattice™ Reconstructive Tissue Matrix (non-crosslinked intact porcine-derived ADM; LifeCell Corporation) have been used to provide implant coverage and to stabilise the position of the implant in a "cover and hold" concept. One of the important features of biologic mesh is its ability to allow neovascularisation through incorporation into host tissues[3] unlike synthetic mesh, which often becomes encapsulated[4] and is not used in reconstruction of the breast.

We have been using Strattice for breast reconstruction in a "one-stage" technique since January 2009. The use of Strattice has allowed us to insert the final-size breast implant at the initial surgery, or to insert a one-stage, two-chamber expander implant without the need for a second operation. The purpose of this cost minimisation analysis was to compare the cost to the NHS of the index operation, consumables additional to those included in the tariff payment, hospital admissions and attendances, and complications in three groups of patients: immediate breast reconstruction using Strattice, traditional tissue expander (TE)/implant, and LD techniques. The analysis compared costs in unilateral and bilateral patients separately. The cost analysis is based on national tariffs as a proxy for hospital costs, with the addition of the acquisition cost of Strattice, which is not included in the historical average costs reported by all NHS hospitals in England on which tariffs are based. The reimbursement system in England is a diagnosis-related group (DRG)-variant and in this respect is similar to the reimbursement systems used in many other countries. Given the current focus on healthcare costs in Europe for governments and healthcare insurance companies alike, it seems timely and relevant to present a cost analysis of using Strattice in immediate breast reconstruction compared with traditional methods, taking into account the relatively high cost of biologic mesh.

Patients and methods

Design

This analysis involves the first 24 patients who underwent a one-stage Strattice and implant reconstruction (unilateral or bilateral) at our institution (The Nightingale Centre and Genesis Breast Cancer Prevention Centre, University Hospital South Manchester, Wythenshawe, Manchester, UK). Clinical data were collected from the clinical records, and data on operative time, length of stay (LOS), and number of elective and emergency admissions were collected from the hospital data systems. Costings were based on the tariffs governing reimbursement current in the NHS in England in the financial year 2011/12. Although hospitals are known to report different costs for what appear to be the same procedures,[5] tariffs are based on the average reported hospital costs and can be considered a reasonable proxy for true hospital costs. Whether costs in a given hospital are higher or lower than average, the costs we have analysed are real for the payer because – as in other healthcare systems across Europe in which reimbursement is based on DRGs – the sum reimbursed is payable regardless of the actual cost to the hospital providing the relevant care.

Control groups (comparable in number to the unilateral or bilateral Strattice group, as appropriate) comprised patients undergoing two alternative standard methods of reconstruction: a conventional two-stage TE/implant technique (bilateral and unilateral) or unilateral single-stage LD flap reconstruction with implant. Control groups constituted a retrospective consecutive series working back from the date when Strattice became available in our hospital. No change was made to the mastectomy technique, which was comparable in all three groups. No data were collected on cosmetic outcome, patient satisfaction, or surgeon satisfaction. Data were collected for the comparison groups for a period of 18 months from their index operation to equal the approximate duration of follow-up for the ADM group.

To ensure an uncomplicated analysis, some patients were excluded from operative duration and LOS analyses: for example, several patients had contralateral surgery at the time of the index or additional surgeries, which may have influenced length of operation and LOS; such patients were excluded from the relevant analyses but not from others.

Cancer treatments (such as chemotherapy and radiotherapy) subsequent to index surgery were not recorded, but chemotherapy or radiotherapy prior to index surgery was recorded as a comorbidity. Additional unplanned surgeries (defined as all surgeries except for exchange of implants and port removal from dual-type implants) were included in the analysis.

Statistical analysis

Statistical differences were calculated using the appropriate descriptive statistics (ie, chi-square [χ^2] test and one-way analysis of variance [ANOVA]). Where sample sizes were small, differences were calculated using Fisher's exact test. For all tests, $P < 0.05$ was considered statistically significant. Statistical analysis was performed with the IBM SPSS statistical program version 19.00 (Chicago, IL, USA).