The breast cancer conservative treatment. Cosmetic results – BCCT.core – Software for objective assessment of esthetic outcome in breast cancer conservative treatment: A narrative review

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ABSTRACT

Background and objective: Cosmetic outcome of breast cancer conservative treatment (BCCT) remains without a standard evaluation method. Subjective methods, in spite of their low reproducibility, continue to be the most frequently used. Objective methods, although more reproducible, seem unable to translate all the subtleties involved in cosmetic outcome. The breast cancer conservative treatment cosmetic results (BCCT.core) software was developed in 2007 to try to overcome these pitfalls. the software is a semi-automatic objective tool that evaluates asymmetry, color differences and scar visibility using patient's digital pictures. The purpose of this work is to review the use of the BCCT.core software since its availability in 2007 and to put forward future developments.

Methods: All the online requests for BCCT.core use were registered from June 2007 to December 2014. For each request the department, city and country as well as user intention (clinical use/research or both) were questioned. A literature search was performed in Medline, Google Scholar and ISI Web of Knowledge for all publications using and citing "BCCT.core".

Results: During this period 102 centers have requested the software essentially for clinical use. The BCCT.core software was used in 19 full published papers and in 29 conference abstracts.

Conclusions: The BCCT.core is a user friendly semi-automatic method for the objective evaluation of BCCT. The number of online requests and publications have been steadily increasing turning this computer program into the most frequently used tool for the objective cosmetic evaluation of BCCT.

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1. Introduction

Breast cancer conservative treatment (BCCT) has become the preferred treatment for early breast cancer with identical overall survival to mastectomy but with a predicted better cosmetic outcome [1,2]. However, 30% of the patients submitted to BCCT have fair to poor cosmetic outcomes [3]. To be able to improve these results, there is the need to fully understand the elements that have an impact in cosmetic outcome. The uprise in recent years of new surgical and radiation techniques turned matters even more difficult, since it is necessary to adequately inform patients of probable cosmetic outcomes that will certainly turn out to be more diverse and difficult to classify [4,5].

However, in spite of its recognized importance, cosmetic outcome of BCCT remains without a standard evaluation tool [6,7]. Innumerous attempts have been made to optimize/standardize cosmetic evaluation of BCCT, but a standard tool has never been recognized by the medical/scientific community. This is most probably due to the fact that cosmetic outcome is a highly subjective concept involving innumerous aspects and subtleties difficult to quantify with simple resources [8].

Subjective evaluation by medical experts of patients, photographs or patient self-assessment are the most frequent methods used to report cosmetic outcome in BCCT [9]. However, subjective evaluation when performed by a panel of observers, which is the most frequent approach, has very low reproducibility values and it is both a difficult and time consuming procedure [10]. Self-assessment on the contrary is easy but usually translates Quality of Life (QOL) issues more effectively than a reproducible value of cosmetic outcome [11,12].

Objective measurements performed manually, in patients or photographs, tried to overcome the low reproducibility values associated with subjective methods but, unfortunately, lacked practicality and were merely based in asymmetry [13,14]. More recently two software programs were developed for the esthetic evaluation of results in BCCT: the BCCT.core [15] and the Breast Analyzing Tool (BAT) [16]. Both make use of a face-only photographic view of the patient and were developed to overcome the lack of reproducibility observed with subjective visual evaluation. The BAT considers only asymmetry measurements while the BCCT.core analyzes several parameters related to asymmetry, color differences and scar appearance [17]. Only the BCCT.core software is actually available for request and use. After manually positioning the reference points on the patient face view image (semi-automatic), the program calculates automatically 14 asymmetry, 8 color and 8 scar features showed in the display (Fig. 1). Finally, machine learning techniques were used to find the best subset of measures and the best relation between them, classifying each case in one of four classes (excellent, good, fair or poor) [18]. The software can be used either to extract individual or multiple measurements or to make use of the created algorithm to calculate the final classification of cosmetic outcome.

In spite of the easiness of the objective evaluation and due to the absence of a recognized gold standard evaluation method, the majority of authors still use, as advised by the EORTC manual from 2004 [7], a combination of both subjective and objective evaluations with the intention of having a more robust appreciation and, as a consequence, higher reproducibility values [19,20]. Unfortunately, this approach is time consuming rendering the routine evaluation of cosmetic outcome in clinical practice difficult, especially in larger series.

In this work we intend to give the readers an overview of the current use of the BCCT.core software as well as the related published work trying to make proof of its utility as an easy and reproducible method to evaluate the most important quantifiable aspects of cosmetic outcome in BCCT.

2. Materials and methods

The BCCT.core software is available online for free download after the signature of a license agreement through the website of the Breast Research Group at INESC Porto (http://medicalresearch.inescporto.pt/breastresearch) since June 2007.

All individuals/groups/services/departments requesting the software have been asked for identity information (position, center, city) and reason for requesting the software (clinical, research or both).

A detailed search has been conducted in Medline, Google Scholar and ISI Web of Knowledge using "BCCT.core" as the search term and including references from June 2007 to October 2014.

3. Results

From June 2007 to October 2014, 102 centers from all five continents have requested and signed the license agreement for the BCCT.core software use. Europe has been the frontrunner continent in the BCCT.core request (Table 1).

Breast Surgery has been the request leader by specialty, but all other specialties involved in the treatment of breast cancer are also represented (Table 2). The data about the intended use of BCCT.core was often left empty.

Nineteen full papers have been published with the specific use of the BCCT.core as a method for cosmetic evaluation of outcome. Twelve of those 19 papers are from independent groups that developed and published their work without our cooperation [21–32]. Four papers are the reference papers from our group [15,17,33,34] and the remaining 3 are the result of a cooperation between our own and other groups using the software and having team members as co-authors [12,35,36]. These papers correspond to 184 Web of Science citations. Twenty nine abstracts were published in indexed journals also using the BCCT.core as method of cosmetic evaluation (Table 3).

4. Discussion

Cosmetic outcome is undoubtedly a very important but difficult topic. How can a sole method translate the complexity of all factors involved in the global cosmetic result? There will probably never be a tool that encompasses all that complexity.