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Breast-conserving surgery as a viable alternative to radical mastectomy

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ABSTRACT

Breast cancer represents a large proportion of cancers that affect women and it is a major public health concern. For many years radical mastectomy was considered to be the only surgical procedure with curative potential for breast cancer. Radical mastectomy has a major negative impact on the quality of life. In order to avoid the complete removal of the breast, breast-conserving surgical techniques have been developed. During breast-conserving surgical procedures only the tumor is removed along with the surrounding breast tissue within the oncologic safety margin. Based on specialty literature we will summarize the surgical technique and explain the indications and contraindications of breast-conserving surgery for breast cancer along with the risk factors for disease recurrence.

Keywords: breast cancer, lumpectomy, breast surgery, breast-conserving surgery, sentinel lymph node

INTRODUCTION

Breast cancer remains a public health concern, as it is the most common type of cancer that affects women according to GLOBOCAN 2020 data [1]. The incidence of breast cancer is 25% of the cancer types that women develop [2]. It has a powerful impact both on individual and socio-economic scale [3]. In Romania breast cancer is the third most frequently diagnosed cancer type (11.5% of newly diagnosed cancers in one year) and it has a mortality of 6.6 % [4].

For many years the standard treatment for breast cancer was the radical mastectomy, which has a major negative impact on the quality of life [5]. Breast conserving surgery is a surgical treatment with curative potential, with a low impact on the aspect of the breast. This proves to be helpful as it increases the psychological comfort of the patient [6].

Before the introduction of lumpectomy, the Halsted radical mastectomy was the gold standard in breast cancer surgery [7]. During Halsted radical mastectomy the diseased breast was completely removed alongside the skin, the areola, surrounding adipose tissue, pectoralis major and pectoralis minor muscles, pectoralis fascia and the contents of the axilla [8]. More complex mastectomies such as Urban mastectomy were abandoned due to the fact the amount of tissue removed, such as the thoracic wall did not justify the results, as it did not significantly improve the survival rate [9].

METHODS

In order to obtain a review of the specialty literature we searched medical databases such as Google Scholar and PubMed, using keywords such as: breast cancer, lumpectomy, breast surgery, breast-

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conserving surgery, sentinel lymph node. We found 28 articles of interest. We also used surgery textbooks and atlases in order to present the surgical procedure.

SURGICAL TECHNIQUE IN LIMITED BREAST RESECTION

During limited breast resections, or lumpectomies, only the tumor is removed alongside a small amount of surrounding healthy tissue while respecting the oncologic safety margin [6]. The cosmetic result of lumpectomy is most often a satisfactory one, especially when associated with oncoplastic surgery [10]. The procedure is followed by radiotherapy in order to decrease the possibility of disease recurrence [11]. During the surgical procedure it is highly recommended to inspect the axillary lymph nodes in order to identify possible metastasis in the lymph nodes [6]. The invasion of axillary lymph nodes does not influence the indication for performing lumpectomy [6]. The cosmetic result of lumpectomies can be improved by performing onco-plastic surgery depending on tumor location [12]. In order to perform limited resections of the breast it is imperative to perform a rigorous selection of patients [13]. This is necessary in order to ensure that there will be no tumor recurrences. In absence of breast radiotherapy, the rate of recurrence is as high as about 19% of cases [6].

It is generally accepted that lumpectomy can be performed if the size of the tumor is under 2.5 cm, with microscopic invasion of under 1 cm [9].

Finding the tumor during the surgical procedure can be done by using intraoperative ultrasound or by having a harpoon or guide-wire inserted before the operation under mammographic guidance [14].

The incision is made directly above the tumor in order to avoid the spread of tumoral cells in healthy tissue [6]. The orientation of the surgical specimen and the examination of surgical margins are important steps in order to avoid disease recurrence. Sutures are placed in the surgical specimen in order to know its orientation [15]. The safety margin is a controversial topic and it varies in literature between 1 and 10 mm [9].

It is currently accepted that the concept of „no ink on tumor" provides adequate safety [6]. The surgical specimen is coated with ink and if during the histopathologic exam the margins of the tumor are free of ink it is considered that the safety margins are adequate [15]. If there is ink on the tumor the resection continues [6].

The identification of sentinel nodes is an important step in evaluating lymphatic dissemination of tumor cells [16]. The sentinel lymph node can be identified by peritumoral or peri-areolar injection of izosulphane blue or Technetium 99, with Geiger counter monitorization [17]. If the sentinel lymph node is affected by the tumoral invasion axillary lymphadenectomy is done [18].

INDICATIONS

In order to perform the lumpectomy, the size and position of the tumor have to allow for a resection with both adequate safety margins and a satisfactory cosmetic result [13]. It is recommended that the tumor isn't larger than 2.5 cm [9]. Another important condition is the necessity of postoperative radiotherapy [13]. It is imperative that there are no conditions present that constitute a contraindication to radiotherapy and it is vital that the patients fully cooperate with the physician so a possible disease recurrence is identified [6].

CONTRAINDICATIONS

Multicentric disease, where there are multiple tumors in different quadrants of the breast, is an absolute contraindication to breast conserving surgery [13]. Microcalcifications, with malignant aspect on mammography exam are also considered an absolute contraindication, along with persistently positive margins after a reasonable number of attempts to obtain negative margins, while preserving the breast [19]. The necessity to perform radiotherapy during pregnancy or previous irradiation to the area, as it is the case for Hodgkin lymphoma, are considered absolute contraindications [6].

Relative contraindications are a positive history for: scleroderma or systemic lupus erythematosus [6]. Radiotherapy performed in this case leads to lupus flare up [20]. A tumour which is too large, and requires a large part of the breast to be removed is another relative contraindication to breast conserving surgery [13].

RATE OF RECURRENCE FOLLOWING BREAST CONSERVING SURGERY

The rate of local recurrence of breast cancer is similar for both mastectomy and lumpectomy according to Early Breast Cancer Trialists Collaborative Group (EBCTCG) [21]. The current target for local tumoral recurrence after breast sparing surgery is 4% in 5 years, but it does not depend solely on the surgical procedure but also on radiotherapy and chemotherapy protocols [6].

In the cases where mutations of BRCA1 and BRCA2 are encountered it is considered that the tumoral recurrence appears due to genetic predisposition rather than due to a flaw in surgical technique [22]. Also triple negative breast tumors have a poor prognosis due to the fact that they do not

have receptor targets for conventional chemotherapy drugs [23]. Due to the fact that some patients are aware of their predisposition to develop breast tumors this leads to them going to the doctor's office for regular check-ups. The size of tumors in this case often allows for limited breast resection. It is considered that in the case of individuals with genetic predisposition for developing breast cancer the new tumor is formed de novo and it is not a recurrence of a previously excised tumor [6].

The presence of Her-2/neu protein in large amounts is an individual risk factor for tumor recurrence [24].

In order to try to prevent disease recurrence following breast conserving surgery chemotherapy is started with anti Her-2/neu agents such as trastuzumab. Recurrence rates for Her-2/neu positive tumors vary between 5% and 30% according to recent studies [24]. In order to obtain the best final result, it is mandatory that the chemotherapy regimen be strictly followed [25].

Expression of Ki-67 marker in more than 30% of tumor cells, discovered during immunohistochemistry exam represents an important negative long-term prognosis factor and it is related to disease recurrence [26]. The Ki-67 protein is a cellular marker for proliferation that is present during all active phases of the cell cycle such as: G1, S, G2, and mitosis. Ki-67 is absent in resting cells, that are in G0 state. In healthy breast tissue Ki-67 is found in extremely low levels, in under 3% of cells and it is absent in normal cells that display estrogen receptors [27]. In breast cancer ki-67 is overexpressed and serves as a marker for the growth of tumoral cell population [26].

In order to obtain long term success, it is imperative that adequate safety margins are obtained, which lowers the risk for local tumoral recurrence. If it is not possible to obtain adequate safety margins, then radical mastectomy must be performed [28-30].

CONCLUSIONS

The following indications have to be respected in order to be possible to perform conserving breast surgery: the size and the position of the tumor have to allow a resection with adequate safety margins and a satisfactory cosmetic result; the radiotherapy treatment can be done in absolute safety conditions for the patient; any possible tumor recurrence should be easy to identify.

The patients have to be fully compliant with the proposed treatment since radiotherapy and chemotherapy regimens are vital for a favorable long-term prognosis. The patients have to fully comply with the follow-up appointments so any disease recurrence can be identified.

Conserving breast surgery offers a low rate of complications both on the long and short term. The frequency of local recurrence is similar to that of radical mastectomy provided all the mentioned indications and contraindications are respected.

The rate at which local recurrences appear is increased in cases that have an overexpression of Her-2/neu receptors or ki-67 marker of proliferation, as well as in the case of triple negative tumors.

The main advantage of the method is the preservation of breast anatomy and the reduction of psychological impact that the surgical procedure has.

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