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Use of oxidized and regenerated cellulose polymer in oncoplastic breast surgery

AIM: The aim of this paper is evaluate the use of oxidized regenerated cellulose in order to control breast symmetry, shape and volume reducing skin retraction after wide excision for the treatment of early breast cancer.

MATERIAL OF STUDY: The Authors describe a new procedure using oxidized regenerated cellulose polymer after 8 resections for breast cancer and 1 total galactophore ducts resection for nipple discharge.

DISCUSSION: Oncoplastic breast surgery allows a more radical local tumour excision achieving an acceptable cosmetic result. Breast reshaping absorbs the volume loss and decreases the risk of a localized defect although there are zones that are at high risk of deformity. Once reabsorption of the seroma occurs, the excision cavity becomes prominent due to fibrosis and retraction of the surrounding tissue creating a noticeable defect.

CONCLUSIONS: In oncoplastic breast surgery the oxidized regenerated cellulose by preventing the hematoma, can promote dermal fibroblasts proliferation and cell migration playing a role in adjustment of the shape, volume and symmetry of the breast and reducing skin retraction.

KEY WORDS: Breast Cancer, Breast conserving surgery, Oncoplastic breast surgery, Oxidized regenerated cellulose polymer

Introduction

Oncoplastic breast surgery allows a more radical local tumour excision which potentially reduces margin involvement and hence local recurrence achieving an acceptable cosmetic result. Usually breast reshaping absorbs the volume loss and decreases the risk of a localized defect although there are zones that are at high risk of deformity and cosmetic failure, in one-stage procedures, can achieves 18% ¹.

Patients and Methods

The Authors propose a new procedure using oxidized regenerated cellulose polymer in order to control breast symmetry, shape, volume and reduce skin retraction after wide excision for the treatment of early breast cancer. From January to November 2012 we performed 9 oncoplastic breast procedures using oxidized regenerated cellulose polymer: 8 resections for breast cancer and 1 total galactophore ducts resection for nipple discharge; the patient's mean age was 66 years (range 42–86), the average size of the nodes was 19 mm (range 8–34) with average weight of 72.6 gr (range 32–120). A preoperative study using mammography, ultrasonography, cytological and/or histological examination (fine needle aspiration cytology or core needle biopsy) and galactography was performed. In 8 cases the lesions found had invasive components while in a single case there was a benign papillary component. The procedures were performed by

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breast surgeon without the help of plastic surgeon. Informed consent was obtained from each patient prior to oncoplastic surgery. In oncoplastic breast surgery the oxidized regenerated cellulose can promote dermal fibroblasts proliferation and cell migration playing a role in adjustment of the shape, volume and symmetry and preventing skin retraction.

SURGICAL PROCEDURE

In non-palpable breast cancer a guide-wire is inserted under ultrasound guidance with the patient in supine position and the resection area, that secures a surgical margin of 2 cm from the tumor, is marked. The pre-operative drawing is performed in the upright position (Fig. 1). The skin incision follows Kraissl's lines of tension to limit visible scarring and should allow en bloc

excision of the cancer. Extensive subcutaneous undermining follows the plane of the superficial fascia and facilitates both tumor resection and glandular redistribution after removal of the tumor. The breast parenchyma is excised in a full-thickness fusiform pattern oriented towards the NAC from the subcutaneous fat down to the pectoralis fascia. Mobilization of the breast tissue from the pectoralis muscle allows reshaping by reapproximation of the medial and lateral glandular columns to fill in the defect (Fig. 2). The adjustment of the shape, volume and symmetry of the breast is guaranteed by entering oxidized regenerated cellulose polymer, layered in three-dimensional wafer, into the space between the gland and the pectoral muscle (Fig. 3). This hemostatic agent may be peeled off in the desired amount, facilitating placement of the customized pieces, both under the gland and under the skin to avoid scar retraction and formation of hematoma or seroma. Sometimes



Fig. 1: Preoperative drawing in the upright position.



Fig. 3: The oxidized regenerated cellulose polymer is placed between the gland and the pectoral muscle.



Fig. 2: Mobilization of the breast tissue from the pectoralis muscle.



Fig. 4: Cosmetic result six months later surgery and radiotherapy. In this case is clear a skin retraction in the outer lower pole. This patient is the same of the fig 2, 3.



Fig. 5: Cosmetic result after quadrantectomy of the outer upper pole and central pole (Q1 and Q5) with nipple reconstruction. This result has been stable six months later surgery and radiotherapy.



Fig. 7: Cosmetic result eight months later surgery and radiotherapy.



Fig. 6: Patient of the fig.1 - Cosmetic result six months later surgery and radiotherapy.



Fig. 8: The same case of the fig 7. Surgical incisions: inverted T on the anterior axillary line.

after resection is necessary repositioning the NAC to maintain an adequate symmetry. In our patients the cosmetic result has been stable after six and eight months later surgery and radiotherapy (Fig. 4, 5, 6, 7, 8).

Discussion

Oncoplastic techniques extend the scope for breast conserving surgery by combining an extensive local excision with a simultaneous reconstruction of the defect to avoid local deformity. Breast-conserving surgery and reconstruction should be considered in those patients where adequate local excision cannot be achieved without sig-

nificant risk of local deformity². If less than 20% of the breast volume is excised a level I procedure is adequate and can be performed by breast surgeon without specific training in plastic surgery. For excisions which exceed 20–50% of breast volume will require a level II procedure that are based upon mammoplasty techniques and require specific training³. Deformities in patients who have had poorly planned conservation treatment are often severe and difficult to manage. Breast-conserving reconstruction is contraindicated when clear margins cannot be assured without performing a mastectomy; in T4 tumors; in multicentric disease; in extensive malignant mammographic microcalcification and in patients with inflammatory carcinoma. The large resection may lead

to hematoma and seroma formation does not always result in predictable long-term cosmetic results. Once reabsorption of the seroma occurs, the excision cavity becomes prominent due to fibrosis and retraction of the surrounding tissue creating a noticeable defect. The oxidized regenerated cellulose is commonly used in many surgical fields as a hemostatic agent which can be topically applied and acts as a scaffold for clot formation to controlling surgical bleeding^{4,5}. The mechanism of action is not completely understood, but it appears to be a physical effect: after cellulose has been saturated with blood it swells into a brownish gelatinous mass which aids in the formation of a clot. When used in minimal amounts is absorbed from the sites of implantation with practically no tissue reaction. The exact mechanism of absorption is not well understood, but macrophage processing is presumed to play a role. While a tissue reaction may persist in the surgical wound for a month or more, the oxidized regenerated cellulose is cleared from the implantation site in less than one week, in fact the absorption begins as early as 18 hr after placement of the gauze into the surgical bed and depends on several factors, including the amount of gauze used, the degree of saturation with blood and the tissue bed⁶. The oxidized regenerated cellulose is supplied as a layered with a consistency that looks like the cotton. The fibrillar form of the product allows the surgeon to grasp with forceps any amount needed to achieve haemostasis. The layers are peeled off in the desired amount, allowing controlled placement of customized pieces. Fibrillar remains pliable and can be reshaped within the wound to match the contours of the bleeding surface more precisely. The oxidized regenerated cellulose does not incite an inflammatory or foreign body reaction and the fibrinolytic effects, by increasing tPA levels, has been shown to retards the formation of adhesions^{7,8,9}. Are also known other properties of oxidized regenerated cellulose like bactericidal effects in vitro against a wide variety of aerobic and anaerobic bacteria due to acidic pH¹⁰. In oncological breast surgery the oxidized regenerated cellulose by preventing the hematoma, can promote dermal fibroblasts proliferation and cell migration¹¹ playing a role in adjustment of the shape, volume and symmetry of the breast and reducing skin retraction¹².

Conclusions

Oncoplastic techniques extend the scope for breast conserving surgery by combining an extensive local excision with a simultaneous reconstruction of the defect to avoid local deformity. If less than 20% of the breast volume is excised a level I procedure is adequate and can be performed by breast surgeon without specific training in plastic surgery. The large resection may lead to hematoma and seroma formation does not always result in predictable long-term cosmetic results. The oxidized regen-

erated cellulose is an hemostatic agent which can be topically applied and acts as a scaffold for clot formation and to promote fibroblast migration and proliferation, to accelerate wound repair and to control breast symmetry, shape and volume reducing skin retraction after wide excision for the treatment of early breast cancer.

Riassunto

Il moderno trattamento del carcinoma mammario non può prescindere dall'impiego delle tecniche di chirurgia oncoplastica che permettono di trattare la malattia in modo radicale cercando di ottenere il migliore risultato estetico. Il senologo è un "chirurgo verticale" e deve gestire la malattia in modo completo, interfacciandosi con un team multidisciplinare, al fine di garantire un trattamento personalizzato per ogni singola paziente. In questa presentazione si vuole dimostrare come l'impiego della cellulosa ossidata e rigenerata, normalmente impiegata in tutti i campi della chirurgia come emostatico riassorbibile, possa svolgere anche un ruolo nel rimodellamento mammario.

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