Breast Cancer-Related Lymphedema

Subjects: Oncology

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Breast cancer-related lymphedema (BCRL) represents a global healthcare issue affecting the emotional and life quality of breast cancer survivors significantly. The clinical presentation is characterized by swelling of the affected upper limb, that may be accompanied by atrophic skin findings, pain and recurrent cellulitis. Cardinal principles of lymphedema management are the use of complex decongestive therapy and patient education. Recently, new microsurgery procedures have been reported with interesting results, bringing in a new opportunity to care postmastectomy lymphedema. However, many aspects of the disease are still debated in the medical community, including clinical examination, imaging techniques, patient selection and proper treatment.

Keywords: breast cancer ; lymphedema ; lymphaticovenous anastomosis ; vascularized lymph node transfer ; lymphatic microsurgery ; radiotherapy

1. Introduction

Breast cancer-related lymphoedema (BCRL) remains a significant clinical issue for breast cancer survivors in that it causes severe physical and psychological discomfort. With the ever-increasing incidence of breast cancer, more patients are undergoing breast surgery that may include sentinel lymph node biopsy (SLNB) and/or axillary lymph node dissection (ALND) [1][2]. Chest wall radiotherapy is also commonly performed in patients with previous ALND, whereas axillary radiotherapy is sometimes indicated as an alternative to ALND in selected patients [3][4]. Both axillary surgery or radiotherapy can cause lymphedema with significant impairment of the normal lymphatic drainage producing an abnormal collection of protein-rich fluid within the upper limb. Despite improved early detection and evolving approaches to minimize surgical intervention increasing conservative surgery procedures with fewer ALND [5]; BCRL remains however a significant healthcare burden [6].

According to reports the incidence of BCRL varies and is approximately 20% at one year and increases to 40% at ten years after breast cancer treatment with a cumulative incidence of 28% [4][7]. Indeed, lymphedema is significantly more likely to occur following ALND than after SLNB alone [8][9]. Lymphedema can to develop within days postoperatively and can continue to present until 11 years after breast cancer treatment [10].

The impact of a lower quality-of-life on patients with lymphedema is unquestionable and there is a higher likelihood of poorer general health [11]. Besides, complications of lymphedema including repeated episodes of cellulitis and ulceration, may require antibiotic therapy and hospitalization.

Cardinal principles of lymphedema treatment are patient education and control of concomitant diseases that may worsen swelling. Upper limb swelling is primarily controlled through the use of complex decongestive therapy (CDT) such as manual lymphatic drainage, bandages, compression garments and individualized exercises to reduce limb swelling [12]. Historical surgical treatments for lymphedema such as Homans' operation and Charles' procedure are palliative and nowadays largely abandoned [13]. Instead, a more recent volume reduction approach is circumferential liposuction [14][15]. In recent years, microsurgical and supermicrosurgical techniques, such as lymphaticovenous anastomosis (LVA) [16][17] and vascularized lymph node transfer (VLNT) [18] have gained popularity as they can potentially reconstitute lymphatic flow and, ideally, reduce the use of compression garments.

The recent introduction of severity staging using lymphoscintigraphy [19][20], and indocyanine green (ICG) [16][21] has helped the patient selection and improved the reported outcomes as it allows preoperatively to evaluate the lymphatic obstruction and the lymphatic flow patterns.

2. Treatments for BCRL

Current treatment options for BCRL include conservative and surgical treatments; however, determining the best treatment method for each patient remains challenging.

2.1. Conservative Treatments

CDT is widely accepted the universal first-line therapy for extremity lymphedema. It includes manual lymph drainage (MLD), skin care, specialized exercises, compression garments and self-education [6]. CDT is divided into Phase I Decongestion, and Phase II Maintenance and should be individualized to improve its effectiveness and contain costs.

Several advantages can be obtained by a CDT including: (1) reduction of lymphedema volume, pain and arm heaviness, (2) improvement of lymphatic drainage, (3) acceptable quality of life and (4) reduction of episodes of cellulitis [22][23]. Although conservative therapy alone may provide enough symptomatic relief, it depends essentially on patient compliance and their capacity to wear life-long compression garments.

2.1.1. Manual Lymphatic Drainage

Manual lymphatic drainage (MLD) is a massage method increasing the transport capacity of the lymph collectors and moving lymph fluid and protein absorption when the lymphatic ducts are still functioning. A meta-analysis showed that, compared with other CDT modalities, additional MLD is unlikely to produce a proper reduction in the lymphedematus limb circumference [24]. In the other hand, another systematic review found that when MLD was used in combination with compression garments, provide increased swelling reduction in BCRL patients compared to the compression bandages alone, especially for moderate lymphedema stages [25].

2.1.2. Compression Bandages and Compression Garments

Compression bandages are an important part of CDT maintaining the therapeutic effects of MLD. Compression bandages apply: (1) a resting pressure during the limb relaxed and (2) a working pressure when muscles contraction push the skin against resisting bandages. Low-stretch bandages produce the highest working pressure with multi-layered compression bandaging.

Compression garments are an essential part of CDT and with the aim to keep the volume reduction achieved with MLD and bandaging. Compression garments produce a two-way stretch in both longitudinal and transverse direction with the greatest pressure above the wrist and less pressure in the arm. The longitudinal pressure facilitates the joint movements. Generally, patients with BCRL wear a full arm sleeve and, frequently, a glove to prevent dermal backflow. There is no consensus regarding suitable compression values. Class 2 compression garments with 30–40 seamless are often recommended to be wear at least 12 h per day [19]. Of note, compression garments should be custom-made by a certified and experienced therapist in fitting garments for lymphedema patients.

2.1.3. Exercises and Life-Style

Exercises are an integral part of CDT with the aim (1) to promote lymph flow, (2) to mobilize the joints, and (3) to strengthen the muscles. It is widely known that participation in exercises during and after oncological treatment can improve the physical and psychosocial condition, ameliorating the quality-of-life [26]. Recent studies reported that gradual weight-lifting program does not worsen the risk of BCRL compared to patients without exercises [27][28].

2.2. Surgical Treatments

Many surgical procedures to treat BCRL have been propose as follow: (1) physiologic procedures (lymphaticovenous anastomosis, vascularized lymph node transfer) and (2) excisional procedures (reduction or liposuction) (Table 1).

Table 1. Available Treatments for Patients with Breast Cancer-Related Lymphedema.

Treatment	Indication	Advantages	Disadvantages
Complex Decongestive Therapy	• CLG 0-I	• Reduction lymphedema volume, pain and arm heaviness • Improvement lymphatic function • Acceptable quality of life • Reduction episodes of cellulitis	• It is a purely symptomatic treatment • Needs patient compliance • Life-long compression garments.
Lymphovenous anastomosis	• CLG I-early II	• Safe • Reduces of Circumference • Reduces callulitis	• Technically difficult • Needs supermicrosurgery instruments • Needs high resolution microscope • Needs ICG lymphography • Difficult to monitor the anastomoses patency
Vascularized Lymph Node Transfer	• CLG late II-III-IV	• Improvements in circumferential measurements, episodes of cellulitis, and quality of life	• Requires intraoperative techniques of greater complexity • Higher risk for postoperative re-exploration and the flap inset • Risk of donor-site lymphedema
Liposuction	• CLG III-IV	• Decrease limb size • Reduces episodes of cellulitis • Improve quality of life	• Risks of swelling recurrence • Life-long compression garments

CLG: Cheng's Lymphedema Grading.

3. Conclusions

BCRL is a debilitating and chronic and condition that can severely affect the patient's quality of life. An improvement in identification, prevention, and management of affected patients is imperative in reducing BCRL. A particular attention should be given to all stages of breast cancer treatment in order to reduce the incidence of BCRL. The use of new technologies for performing mastectomies and sentinel lymph node biopsy or axillary lymph node dissection could be useful [29][30][31][32]. Accurate physical examination and assessment of the lymphedema severity are essential to provide more predictable outcomes. A prompt management of the disease in a multidisciplinary team is the key to obtain good results [33][34][35][36][37][38][39][40][41]. Despite the fact lymphedema is still considered an incurable disease, in the last decade promising results with significant reduction of the limb swelling and improvement of psychosocial well-being have been shown.

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