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Effectiveness of pre and postoperative physiotherapy interventions in patients with osteosarcoma

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Abstract

Introduction: The lack of information on the effectiveness of physiotherapy interventions for the rehabilitation of patients with osteosarcoma in Ecuador has led to late evaluations of this disease, increasing its aggressiveness.

Materials and methods: This research aimed to analyze the effectiveness of physiotherapy intervention in the pre- and postoperative phases by compiling information from 35 scientific articles through a documentary and inductive approach. Methodological quality was evaluated with the PEDro scale, guaranteeing a score of ≥7 to validate the studies. Databases such as Redalyc, ProQuest, LILACS, Scopus, PubMed, SJR, Cochrane, Scielo, and PEDro were used, applying search strategies with Boolean operators.

Results: In the pre- and postoperative phases, physiotherapeutic interventions such as massage, nerve stimulation, acupuncture, cryotherapy, and exercise showed significant benefits in reducing pain, fatigue, anxiety, and depression, improving mobility, and strengthening muscles.

Conclusion: A multidisciplinary approach in patients with OS improved patient well-being and symptoms. This study supports the effectiveness of physiotherapy in comprehensive treatment, allowing patients to become independent after surgical and prosthetic treatment, highlighting the importance of implementing these interventions from the initial phases of diagnosis.

Keywords:

MeSH: Osteosarcoma, Medical Oncology, Physical Therapy Modalities.

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Introduction

Osteosarcoma is defined as a rare tumor that begins locally and metastasizes early; however, it has characteristics called tumor osteoid; this pathology accounts for 20% of all primary malignant bone tumors. John Abernathy, in 1804, introduced the word sarcoma with Greek influence, meaning fleshy excrescence; later, Alexis Boyer, in 1805, was the first to use the term osteosarcoma [1].

People who suffer from this pathology may also experience fatigue, muscle atrophy and trigger psychological problems. Osteosarcoma originates mainly at the metaphysis of the long bones, specifically at the distal extreme of the femur or other bones. Patients incidence under 20 years old is 56% of all bone cancers [2].

Early physical rehabilitation in osteosarcoma patients provides several benefits, such as maintaining the ability to perform basic activities of daily living, preventing patients from abandoning rehabilitation treatment during the diagnosis of the disease, and preventing postsurgical progress since, in this way, an attempt is made to reduce the recovery period and restore social, labor, and psychological reintegration. Early physical rehabilitation refers to oncological physiotherapy, through which techniques are used to restore and preserve individuals' physiological and functional functions [3].

Worldwide, 12 million people are diagnosed with cancer; 3% of them, equivalent to 360,000 people, are children. Cancer is considered the second cause of death in people under 20 years of age worldwide; therefore, there is a need to investigate the effectiveness of early multidisciplinary pre- and postoperative treatment protocols [1].

Osteosarcoma prevalence in Latin America encompasses 3-5% of childhood tumors, which is the opposite of what occurs in adults, representing only 1% of these. This type of cancer affects both female and male genders, being more common in the male gender (3:2). However, women tend to present osteosarcoma at an early age. Therefore, it explains why osteosarcoma presents in the age range of 15-19 years in the male gender, meanwhile it presents in the age range of 10-14 years in the female gender. There is a theory that states that women present this pathology due to the hormonal changes that occur during adolescence [4].

In Ecuador, it predominantly occurs in children and adolescents, annually presenting 1 to 3 cases per million individuals; this represents just 0.2% of malignant tumors and 15% of primary bone tumors. Osteosarcoma incidence peaks between 10 and 20 years, representing 60% of all cases. In adulthood, which ranges approximately 40 years, it represents the second incidence peak, accounting for 40% of the remaining cases. [5].

There is a lack of information in Ecuador about the effectiveness that is produced in the pre- and postoperative phases regarding the rehabilitation of patients with osteosarcoma. Also, there are negative factors associated with its diagnosis because professionals carry out a late evaluation; therefore, the aggressiveness of the disease increases. In many occasions, actions are taken when the affected extremity presents numerous metastases.

The research objective was to analyze the effectiveness of physiotherapeutic intervention on osteosarcoma, demonstrating its benefits in the pre and postoperative phases through the compilation of bibliographic information

Materials and methods

Study design

This research involved a documentary design with an inductive, retrospective method.

Study population

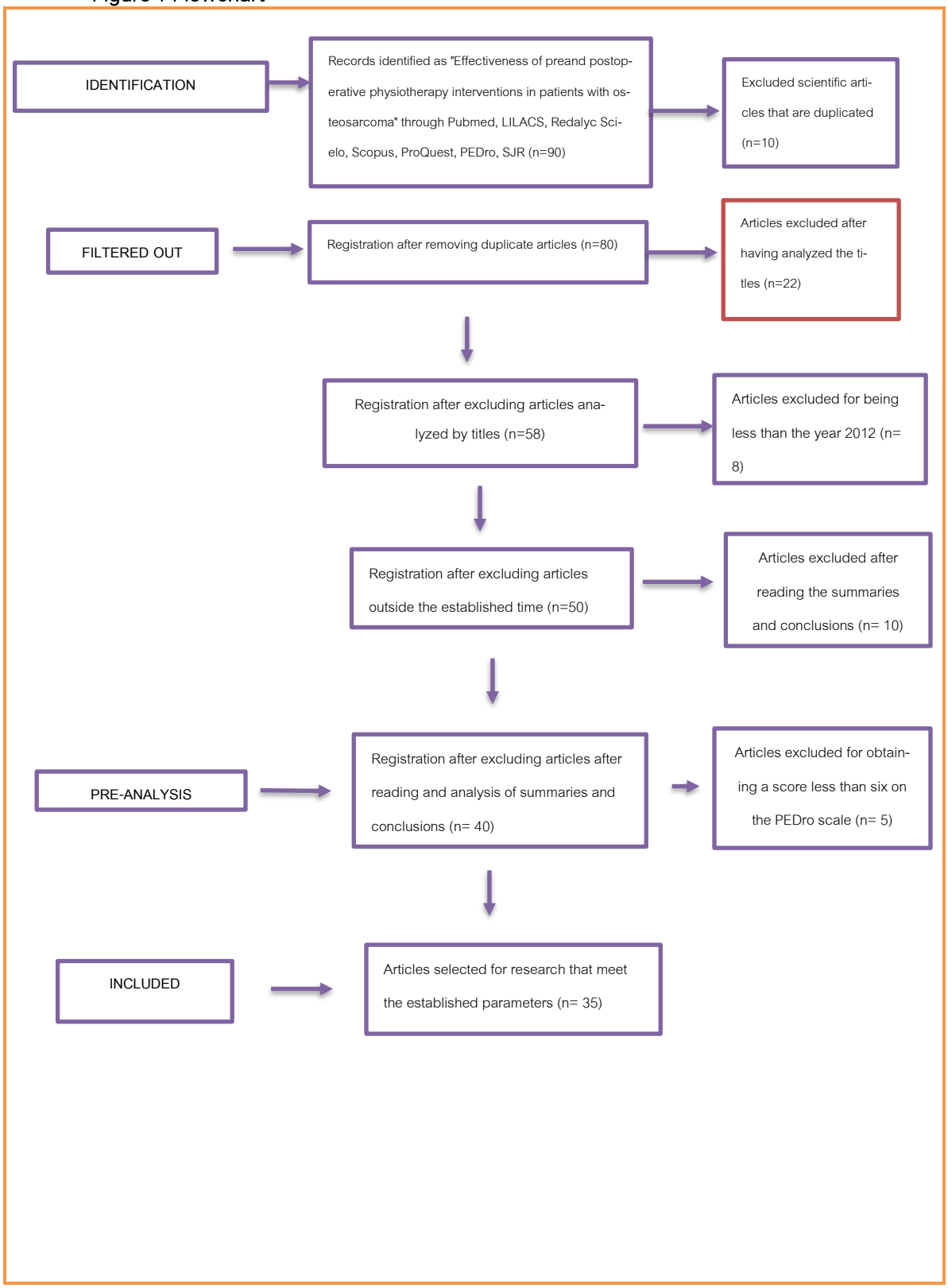
Scientific articles on the effectiveness of pre- and postoperative physiotherapy interventions in patients with osteosarcoma.

Search strategy

The databases used to collect scientific articles were Redalyc, ProQuest, LILACS, Scopus, PubMed, SJR, Cochrane, Scielo, and PEDro.

The search strategies used involve keywords such as"oncology and physiotherapy," "Osteosarcoma or bone cancer in physiotherapy," "Pre- or postoperative physical rehabilitation in osteosarcoma," "physiotherapy techniques in oncology," and "osteosarcoma and physical therapy." Moreover, Boolean operators such as "AND" and "OR" were used; this approach contributed to accessing academic and scientific databases and reducing the search time between research variables. All the chosen articles were evaluated through the PEDro scale, scoring greater than 7 in all the articles used.

Figure 1 Flowchart



Source: Adapted from Methodology in conducting a systematic review of biomedical research, [8]

Results

In the population, 35 articles were used, which reported that massage techniques and therapeutic exercise are able to reduce pain and restore the mood of cancer patients. The use of both complementary therapies, such as acupuncture and massage, combined with palliative care, reduces joint pain and stiffness.

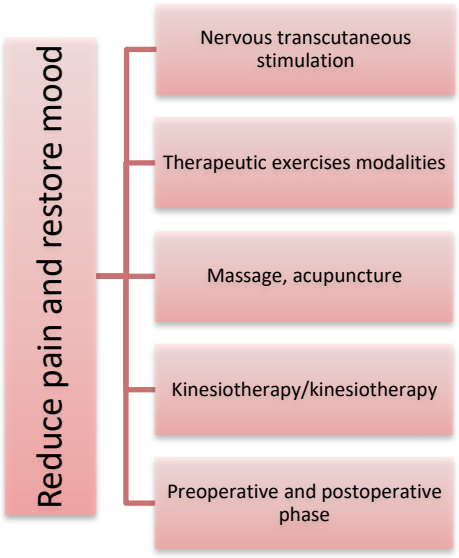
Neurophysiological studies have shown that a peripheral neuronal stimulus such as physiotherapeutic transcutaneous stimulation promotes changes in sensory, motor, visceral, hormonal, immune, and brain functions and must be found at the appropriate parameters for each patient.

When a preoperative phase protocol was performed, the patient experienced less recovery time, and physiotherapeutic techniques such as kinesiotherapy, exercise prescription, electrostimulation, an appropriate bandage, and prosthetic prescription were used to reintroduce the patient to all his activities.

In addition to the combination of aerobic and resistance exercises, physiotherapy significantly reduced fatigue levels, improved general well-being, relieved pain and drowsiness after 12 days of intervention, and was the most effective at reducing fatigue.

The result of the trial was the verification of the decrease in temperature that results in vasoconstriction followed by reactive vasodilation. This therapeutic modality has a positive effect on the level of the lymphatic vascular system. In addition, the operated patients experienced a decrease in the sensation of pressure on the extremity and the recovery of skin elasticity, which prevents the formation of fibrous tissue.

Figure 2. Techniques collected and their results.



Discussion

Physiotherapeutic interventions in patients with osteosarcoma suggest that physical rehabilitation contributes to preventing and restoring dysfunctions that may occur from the time of diagnosis to the time of surgery since, many times, these procedures bring with them sequelae that affect well-being. In general, the patient. Among the clinical manifestations treated are fatigue, decreased muscle mass, pain, swelling of the affected extremity, reduced range of motion, and joint stiffness.

Other studies [2] [25] [13] [16] [21] have suggested the importance of choosing an appropriate surgical technique to preserve joint function. They are, therefore, able to carry out the postoperative phase, which is responsible for recovering the functionality of the stump in the event of amputation or for relying on standard movement patterns when the patient uses a prosthesis. The range of motion, in many cases, improves since the tumor is removed when surgery is performed. Through the postoperative phase, there will be pain relief and, therefore, freedom of movement.

In osteosarcoma, patients experience much inflammation after the surgical phase, which is why the author [9] talks to us about cryotherapy as a positive effect, which prepares the swollen extremity to carry out a subsequent rehabilitation program because cryotherapy causes a decrease in temperature at the center of the injury, being effective in the lymphatic vascular system, in addition to preventing the formation of fibrous tissue and preventing adhesion in the scar that compromises functionality.

It should be noted that authors such as [15] and [12] [22] reported that massage is effective at reducing anxiety, fatigue, and insomnia, which are symptoms caused by the therapeutic processes that cancer patients undergo, in addition to relieving pain. Massage induces muscle relaxation, allowing patients to perform any movement. The techniques used in these tests were effleurage, petrissage, friction, and moderate compression.

According to the authors [6] [7] [23] [24] [10] [14] [19], they recommend transcutaneous nerve stimulation since it improves the main symptom, which is pain, in addition to tingling, numbness, and the presence of contractions. These effects are sustained involuntarily and clinically relevant. The majority of patients who underwent transcutaneous nerve electrostimulation managed to improve their mood and were also able to ambulate. These authors indicate the importance of following the appropriate parameters for placing this physical agent and using the VAS scale to establish reasonable indications.

Complex decongestive therapy is effective when the entire technique is correctly performed. According to previous studies [11], manual lymphatic drainage, compressive bandage, and stretching movements reduce the size of the lymphoedema, reduce edema, and improve mobility in the affected limb. It is essential to educate patients so they can do so at home and see greater effectiveness quickly.

Exercise can reintegrate the patient into activities of daily living in a shorter time; the kinesiotherapy technique improved the reduction in pain, prevented the functional deterioration typical of the disease, and reduced muscle fatigue in most patients. Patients were operated on under this modality of therapeutic exercise. The authors [22] [26] [18] mentioned that the types of exercises used in patients with osteosarcoma are aerobic and resistance exercises, and that combining them had a more significant positive effect on the patients. It should be emphasized that home physiotherapy work is necessary through the patient's instructions on the types of exercise to be performed and their dosage. It is essential to carry out an initial evaluation and follow-up to determine the patient's daily condition.

Conclusions

All the authors who support the research project mention that physiotherapy interventions significantly improve patients' general well-being since not only can the sequelae of the disease be treated, but also that each patient can benefit from rehabilitation along with chemotherapy or other medical treatments for osteosarcoma.

These studies reflect the benefits of performing an adequate tumor resection technique because the functionality of the extremity always remains a priority in entering a postoperative process that allows the patient to reintegrate all their activities. The effectiveness of these methods depends on the technique applied since the patients are treated for symptoms corresponding to osteosarcoma.

The techniques used in patients with osteosarcoma include therapeutic exercise through passive, active, and resistive kinesiotherapy according to each patient's situation, rubbing massage and superficial pressure, and cryotherapy with two modalities, which include cryomassage and direct cold placement. Three additional techniques, such as lymphatic drainage massage, compressive bandage, and extremity mobilization, are utilized: complex decongestive therapy, acupuncture in specific areas, and transcutaneous nerve electrostimulation.

Among the benefits of physiotherapy interventions in the pre- and postoperative periods are the reduction in pain and lymphedema, which are the main symptoms that afflict patients with osteosarcoma, and the reduction in fatigue, insomnia, and depression. Joint ranges and free movement were increased with gait reeducation, if applicable. It has been concluded that physiotherapy should be administered to multidisciplinary groups of oncological patients.

Abbreviations

There are no abbreviations.

Administrative information

Additional Files

None were declared by the authors.

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Author contributions

Cárdenas Julissa: Data curation, Formal analysis; Juan Pablo Masías Toapanta: Fund acquisition, Research, Methodology, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing.

Dávila Yasbek: Conceptualization, Data curation, Formal analysis; Juan Pablo Masías Toapanta: Fund acquisition, Research, Methodology, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing.

All the authors read and approved the final version of the manuscript.

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Availability of data and materials

The data are available upon request from the corresponding author. No other materials were reported.

Statements

Ethics committee approval

The study was exempted from the Faculty of Health Sciences Ethics Committee, National University of Chimborazo.

Consent for publication

Patient-specific images, MRIs, or CT studies were not available when they were not published.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References

1. Guarnizo Bustamante ND, Tobón Aristizábal JD, Gaviria Gaviria A, Joreda Aranzazu D, Mora Caceres JR. Osteosarcoma, desde una mirada actualizada por ortopedia y radiología. Scientific & Education Medical Journal. 2021; 3(1): p. 95-103.
2. Fornasin L, Betin Cabeza JR, Lores CA. Cirugía de Van Nes en osteosarcoma de fémur reporte de casos y revisión de literatura. Revista Venezolana de oncología. 2020; 32(3): p. 181-190.
3. Uclés V, Espinoza R. Prescripción del ejercicio en el paciente con cáncer. Revista clínica de la escuela de medicina UCR. 2017; 7(2): p. 11-17.
4. Armas L, Delgado D, Alvarado K, Cordero C. Osteosarcoma: Etiología, diágnostico y tratamiento. Revista clínica de la escuela de medicina. 2018;: p. 1-4.
5. Ortega A, Romero G, Medina C, Cervantes K. Osteosarcoma de rodilla en una paciente indígena. Revista científica multidisciplinar ciencia Ecuador. 2021;: p. 1-5.
6. Correa C, Criollo F. Osteosarcoma panhumeral; auto injerto peroné vascularizado con conservación de codo. Revista Ecuatoriana de ortopedia y traumatología. 2021; 10(2): p. 26-31.
7. Palomo , Golindano S, Corredor J. Limb salvage surgery for patient with malignant tumor of the shoulder girdle. A purpose of a case. Revista Venezolana de cirugia ortopedia y traumatología. 2014; 46(1).
8. Fábrica G, Peña I, Silva V, Ramos V. Use of energy, kinematics and stability in gait of a patient with trans-femoral amputation without rehabilitation approach. Revista de la Faultad de Medicina. 2017;: p. 59-68.
9. Olmos E. Crioterapia: Dos modalidades terapeúticas para la rehabilitación del linfedema. Revista Venezolana de oncología. 2020; 32(4): p. 216-223.

10. Rodriguez J, Gonzalez B, Torres , Guerrero J, Jimenes M, Nuñez M. Effects of the application of therapeutic massage in children with cancer. Revista Latinoamerica Américana de enfermeria. 2017; 25.

11. Loh J, Gulati A. El uso de la estimulación eléctrica transcutáneo en un importante centro oncológico para el tratamiento del dolor grave relacionado con el cáncer y la discapacidad asociada. Pain Medicine. 2015; 16: p. 1204-1210.

12. Méndez M, Larios B, Martinez M. Efectividad de la estimulación nerviosa electrica transcutánea asociado al paracetamol en disminución del dolor debido a neoplasia en mujeres. Revista Investigación en discapacidad. 2018;: p. 91-99.

13. Gewandter J, Chaudari , Ibegbu C, Kitt R, Serventi J, Burke , et al. Wireless transcutaneous electrical nerve stimulation device for chemotherapy-induced peripheral neuropathy: An open-label feasibility study. Support Care Cancer. 2019; 27(5): p. 1765–1774.

14. Siemens W, Boehlke , Bennett M, Offner , Becker , Gaertner J. Transcutaneous electrical nerve stimulation for advanced cancer pain inpatients in specialist palliative care—a blinded, randomized, sham-controlled pilot cross-over trial. Supportive Care in Cancer. 2020; 23: p. 5323–5333.

15. Villanova , Fornazari , Deon K. ESTIMULAÇÃO ELÉTRICA NERVOSA TRANSCUTÂNEACOMO COADJUVANTE NO MANEJO DA DOR. Revista inspirar movimento & Saúde. 2013; 6(5): p. 28-33.

16. Untura L, Ciacco M, Ferreira L. Use of the transcutaneous electrical nerve stimulation (tens) in control of nausea and vomiting. Revista da Universidade Vale do Rio Verde, Três Corações,. 2014; 12(1): p. 589-595.

17. Wong R, Major P, Sagar S. Phase 2 Study of Acupuncture-Like Transcutaneous Nerve Stimulation for Chemotherapy-Induced Peripheral Neuropathy. Integrative Cancer Therapies. 2016; 15(2): p. 153-164.

18. Cormie P, Zopf E, Zhang X, Schmitz K. El impacto del ejercicio en la mortalidad por cáncer, la recurrencia y los efectos adversos relacionados con el tratamiento. Revisiones epidemiológicas. 2017; 39(1): p. 71-92.

19. Pinto R, Souza B, Nascimento L. Cinesioterapia aplicada a la fatiga oncológica. Fisioterapia Brazil. 2021; 22(4): p. 29-60.

20. Meyer Corr A, Liu W, Bishop M, Pappo A, Kumar Srivastava D, Neel M, et al. Viabilidad y resultados funcionales de niños y adolescentes sometidos a quimioterapia preoperatoria antes de un procedimiento de conservación de extremidades y conservación. Oncología de rehabilitación (Asociación Americana de Terapia Física). 2017; 35(1): p. 38-45.

21. Dahan M, Anract A, Larousserie F, Biau D. Proximal femoral osteosarcoma: Diagnostic challenges translate into delayed and inappropriate management. 2017; 103(7): p. 719-724.

22. Hernandez S, Carrillo S, Gomez. Osteosarcoma: Generalidades, diagnóstico y tratamiento. Ciencia y Salud. 2021; 5(2): p. 24-31.

23. Nascimiento R, Dias L. A ATUAÇÃO DA FISIOTERAPIA NOS CUIDADOS PALIATIVOS DA CRIANÇA COM CÂNCER. Ensaios e Ciência Ciências Biológicas. 2013;: p. 153-169.

24. Moraes H, Dias J. ATUAÇÃO DA FISIOTERAPIA NO PÓS-OPERATÓRIO DE OSTEOSSARCOMA. Nova Fisio Científica. 2020;: p. 12-25.

25. López N, Alburqueque F, Cleland J, Fernandez C. Effects of Physical Therapy on Pain and Mood in Patients with Terminal Cancer: A Pilot Randomized Clinical Trial. THE JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE. 2012; 18(5): p. 480–486.

26. Trineo B, Maná B. Lymphedema: StatPearls Publishing, Treasure Island (FL); 2021.

Editor's Note