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About this Special Issue

This special issue is highly related to Microscopic examinations of the tissue of the medulla from the cortical-subcortical region on the injured side after a traumatic brain injury and various exercises were performed. Also it focuses on to identify possible ways to protect the rights of people who have lost their jobs due to the spread of COVID-19, analyse the effectiveness of international experience and propose promising changes to labour legislation in this area. In addition, Agrotechnical Methods of Increasing Drought Resistance of Spring Barley, The Role of Il4 in Contraction of Tracheal Muscle Among Rats, Stabilization of Mast Cell Membranes by Sodium Cromoglicate in Smooth Muscle Contraction of Trachea and Bronchi of The Rat, are been focused in this issues. This special issue focuses on those aspects with much implication for the health care. The articles published in this special issue will certainly bring as positive effect for the developing health care and to make use of available resources and to remove certain obsolete factors and process which may delay or harm the existing health care system. It enhances maximum utilization of scientific knowledge to potentiate therapy and diagnosis in the health care system. With the above discussion in mind, the papers are broadly divided into those describing applications of biotechnology and nanotechnology in biological sense. This Special Issue presents range of applications for biotechnology and nanobiotechnology for human health and environment. It is hoped that the reader will gain, from a reading of these papers a better appreciation and recent advances in the area

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CONTENTS

SP-01

Insight Into The Exercise Training Role In Preventing And Managing Non-Alcoholic Fatty Liver Disease

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Abstract: Non-alcoholic fatty liver disease (NAFLD) is a major public health issue worldwide, where the economy is rising and people's lifestyles are changing rapidly. Those with NAFLD have fat deposits accumulation in their hepatocytes that are caused by factors other than alcohol and liver injury, such as obesity, diabetes, and metabolic disorders. To demonstrate comprehensive and technical references for prescribing exercise programs for NAFLD treatment, we have proposed this review to clarify the role of exercise in the management and prevention of NAFLD using several previous studies investigating the clinical efficiency of various therapeutic exercise modalities in NAFLD patients. Endurance and strengthening training should be done twice a week at least and ideally three times a week, with at least eight exercises targeting the groups of major muscles with a repetition of 10–15 times each exercise at a moderate to high intensity, according to universal commendations of 150 minutes a week moderate-intensity aerobic exercises. In addition, patients who are unable to participate in formal exercise programs should aim to reduce or break up their sedentary time by a few minutes of walking. Patients' exercise compliance and achievement of exercise goals should be closely monitored to ensure therapeutic effects.

Keywords: exercise training, hepatic fat, high-intensity interval, moderate-intensity, NAFLD.

1. INTRODUCTION

Those with non-alcoholic fatty liver disease (NAFLD) have fat deposits accumulation in their hepatocytes that are caused by factors other than alcohol and liver injury, such as obesity, diabetes, and metabolic disorders. Insulin resistance and a predisposition to the condition run in the family. NAFLD became a major public health issue worldwide, where the economy is rising and people's lifestyles are changing rapidly. NAFLD was present in 32.9% of the Chinese population as of 2018. The number of NAFLD patients is expected to reach more than a hundred million by 2030, with the highest world's augmentation rate. Orderly, NAFLD may be the leading cause of chronic illness management and prevention [1]. NAFLD is currently an underappreciated health issue that puts people's lives in danger. If it causes liver illness, it may also cause or speed up the maturity of metabolic and cardiovascular problems. It is difficult to pinpoint the exact etiology of NAFLD, however genetic predisposition and metabolic abnormalities have been linked to it [2]. NAFLD has no specific treatment because of the disease's mystery and individual variability. For NAFLD, lifestyle modification and health education are indicated as the first-line treatment since they can reduce liver enzyme levels and improve fatty livers. NAFLD is a treatable condition with low costs and great cost-effectiveness thanks to an earlier study that showed that exercise can lower hepatic fats and alanine aminotransferases (ALTs) [3]. Abdelbasset et al. reported that a high-intensity interval aerobic exercise (HIIAE) might dramatically lower hepatic and serum fats, ALTs, ASTs levels in NAFLD patients [4,5]. Moderate-intensity aerobic exercise has also been proven to reduce low-density lipoprotein and triglyceride in the blood, two markers of NAFLD progression [6]. The fact that exercise regimens, detection indicators, and sample sizes varied so much across clinical studies to evaluate their efficacy in treating NAFLD [4-7] makes it impossible to draw any firm conclusions. As a result, it was necessary to conduct a comprehensive study to evaluate the influences of various exercise strategies for NAFLD treatment. To demonstrate comprehensive and technical references for prescribing exercise programs for NAFLD treatment, we have proposed this review to clarify the role of exercise in the management and prevention of NAFLD using several previous studies investigating the clinical efficiency of various therapeutic exercise modalities in NAFLD patients.

2. MATERIALS AND METHODS

The main aim of the study is to investigate the exercise training role in preventing and managing non-alcoholic fatty liver disease. To gratify that aim, an analytical approach is utilized. To clarify the role of exercise in the management and prevention of NAFLD, several previous studies investigating the clinical efficiency of various therapeutic exercise modalities in NAFLD patients are taken into consideration.

3. RESULTS AND DISCUSSION

3.1. Exercise Training and NAFLD Treatment

Regular exercise training can help lower cholesterol levels, reduce fatty deposits in the liver and improve one's quality of life. Physical exercises have been exhibited to be favorable to NAFLD patients in several trials. Despite this, creating optimal exercise regimens for NAFLD patients remains a difficulty because of individual heterogeneity. Patients with NAFLD were evaluated for their TGs, TCs, LDLs, and HDLs levels, in addition to hepatic enzyme functions involving ALTs, ASTs, and GGTs,

and body mass index. This is the first study of its kind, as far as we know. Cardiovascular exercise and resistance training have been shown to significantly improve TG and AST levels in NAFLD patients [8]. HIIAE is an effective treatment for NAFLD patients. People with NAFLD need to know these results since many exercise forms might cause a sports injury, and it's critical to pick an activity that's right for the patient. Regarding NAFLD obese individuals, some aerobic exercise forms could induce pressures or joint injuries, while resisted exercises are more suitable. A meta-analysis of research on exercise effects on NAFLD found that aerobic exercise had a substantial impact on TC, LDL, HDL, and BMI, whereas HIIE and resisted exercises did not have comparable outcomes; the benefits of other techniques of exercises should be considered with additional clinical studies. Physical exercises have been exhibited to be favorable to NAFLD patients in several trials [8] .Exercise is an effective treatment for NAFLD in numerous clinical trials [4,9]. There is also evidence in this meta-analysis showing that patients with NAFLD can benefit greatly from aerobic exercise. For example, a calorie-consumption mechanism could result in a reduction in hepatic fats and lipid storage and could decrease the function of hepatic enzymes, that provide good health for the liver. Additionally, prior clinical trials approved that aerobic exercise may lead to an improvement in NAFLD patients as a result of decreasing acetyl-CoA carboxylase and synthase of fatty acids, rising mitochondrial oxidation, and contents of the liver, raising the number of lipids oxidized, lowering the synthesis of fats, and stimulating AMP-dependents proteins kinase. It also gives patients with NAFLD a precise technical foundation for aerobics, which has been shown to improve several markers. In addition, more research is needed to confirm the therapeutic effects of weight training and HIIT on NAFLD [4-6].

3.2. Exercise Training and NAFLD Prevention

It has been linked to an elevated risk of all mortality reasons and a sedentary lifestyle ordinarily among people who are susceptible to NAFLD, Diabetes, and obesity (sedentary behavior was observed higher in these individuals) [10]. Sedentary behavior has been linked to higher hepatic triglyceride levels, and prospective cohort studies have found that it is a risk factor in and of itself for the onset and progression of NAFLD [11, 12]. According to a prior study that involved over 100,000 individuals of both genders with impaired glucose levels, exercise training resulted in a 46% reduction in risk of developing type 2 diabetes regardless of body mass index or glucose level baselines. This suggests that physical activity plays an important role in preventing the metabolic disorder related to insulin resistance [13-15]. Adolescents with a high waist circumference may benefit from increased cardiorespiratory fitness, according to the results of the HELENA trial. Exercise that focuses on decreasing abdominal fats and raising cardiorespiratory fitness and may be an effective intervention in preventing and treating adolescents suffering from NAFLD [16]. One of the first longitudinal studies to demonstrate the significance of exercise in NAFLD prevention and therapy was conducted by Sung and coworkers, who used ultrasound to track 169,347 men and women over five years. Twenty-three percent of the 126,811 adults who did not have NAFLD at baseline went on to develop the disease during the follow-up period. At baseline, of numerous NAFLD individuals (n=42,536), 34% of those individuals were determined. NAFLD can be prevented or reversed by any degree of moderate to severe exercise, regardless of potential confounding factors. Most substantial results were achieved when exercising five days a week and rising the exercise session frequencies gradually [17]. A recent cross-sectional study found that lower-risk individuals developing NAFLD, regardless of body mass index, were less likely to be physically active than those who stayed sedentary [18].

3.3. Physiological Mechanism of Exercise Training

Even in patients who did not lose weight, exercise was found to improve liver fat levels in several published trials, indicating that it has direct effects on the liver [19,20]. Exercise-induced hepatic fat loss is thought to be mediated by a variety of metabolic and molecular processes, while a clear link remains elusive. One of the most well-known and extensively researched pathways is insulin resistance. An inadequate inhibition of lipase in adipose tissues leads to accelerated lipolysis and free fatty acids' generation, which were consequently adopted by hepatocytes [21]. The liver's free fatty acids flux may be reduced if insulin resistance was improved. The liver needs glucose as free fatty acids fuel production, which is made possible by insulin resistance in skeletal muscle [22]. De novo lipogenesis can be reduced by either high-intensity aerobic exercise or strength training for 12 weeks through the activation of AMPK, which in turn reduces the transcription factor SREBP-1, which controls liver lipid metabolism in the NASH [23,24]. De novo lipogenesis may be aided by exercise-induced epigenetic mechanisms such as a decrease in DNA hypermethylation [25,26] .Additional evidence suggests that exercise may have an impact on the metabolism of fatty acids in the liver via raising the expression of the peroxisome proliferator-activated receptor-gamma [27]. Exercising the liver may also have a positive impact on mitochondrial function, as well as inflammation, according to animal models and small-scale research [28,29]. NAFLD patients can benefit from physical activity and certain exercise regimens that are not weight-loss-related. NAFLD-related cardiovascular disease risk can be reduced by both aerobic and resistance training [30]. The liver disease stage, level of fitness, and other comorbidities should be taken into consideration while designing an exercise program. For patients with NAFLD, HIIAE is an ideal type of exercise training since it lowers hepatic fats, visceral adipose tissues, and cirrhosis while improving cardiovascular health and lowering blood pressure [28-31]. Endurance and strengthening training should be done twice a week at least and ideally three times a week, with at least eight exercises targeting the groups of major muscles with a repetition of 10–15 times each exercise at a moderate to high intensity, according to universal commendations of 150 minutes a week moderate-intensity aerobic exercises. In addition, patients who are unable to participate in formal exercise programs should aim to reduce or break up their sedentary time by a few minutes of walking. Patients' exercise compliance and achievement of exercise goals should be closely monitored to ensure therapeutic effects [32,33]. NAFLD patients tend to be overweight, therefore finding an exercise regimen that is both achievable and effective in terms of weight loss (10 percent) and improved cardiorespiratory fitness is critical if those individuals are to benefit from the disease's potential health benefits [34]. Both moderate-intensity of aerobics and anaerobic for four to seven days a week for at least six months may result in an improvement in hepatic histology in patients with non-alcoholic steatohepatitis [35]. A recent document on obese and overweight

individuals reports the useful function of aerobics, regardless of exercise intensity, regardless of whether or not patients are restricted in their diet [4-6]. The latest recommendations highlight the necessity of exercise training but depart it up to each patient's preference and the possibility of long-term exercise training adherence to be taken into account [36]. In addition to these benefits, it was reported that exercise training is a preventive and interventional modality not only for NAFLD but also for viral infection, particularly COVID-19 [37,38].

4. CONCLUSION

Because of the increasing of NAFLD individuals worldwide, influential the proper type of exercise that affects hepatic lipids and liver functions is very imperative. Endurance and strengthening training should be done twice a week at least and ideally three times a week, with at least eight exercises targeting the groups of major muscles with a repetition of 10–15 times each exercise at a moderate to high intensity, according to universal commendations of 150 minutes a week moderate-intensity aerobic exercises. In addition, patients who are unable to participate in formal exercise programs should aim to reduce or break up their sedentary time by a few minutes of walking. Patients' exercise compliance and achievement of exercise goals should be closely monitored to ensure therapeutic effects. There are various limitations in this review. As a result, we were unable to conduct subgroup analyses by intensity, which could have influenced the results of the studies that were included in this review. Despite our careful search for recent publications, we could not exclude the potential of lost applicable unpublished trials, that could clarify the bias of HDL publications. Additionally, radio-diagnosis and hepatic lipids could be utilized as a prognostic marker for NAFLD assessment [39]. the usefulness of various types of exercises in NAFLD treatment should be thoroughly evaluated to give comprehensive and scientific references for prescribing certain exercise protocols in the future.

5. ACKNOWLEDGMENT

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6. DATA AVAILABILITY

This is a review, and no data sets were used in the manuscript.

7. CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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SP-02

The Lymphedema Following Breast Cancer Surgery: An Overview Of Its Diagnosis And Management

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Abstract: Breast cancer is one of the most common cancers among women, and it is a major cause of death for many of them. Numerous women with breast cancer suffer from lymphedema following a mastectomy due to cancer-related lymphedema. Several risk factors for severe lymphedema have been identified, including weight gain, infection, surgically dissected lymph nodes, lengthy duration of the condition, chemotherapy, radiotherapy, and other treatments. This study is analytical research. In order, we have proposed this review to clarify the appropriate assessment and interventional modalities for secondary lymphedema following breast cancer surgeries. Even though lymphedema is frequent among breast cancer survivors, it is often misdiagnosed by health care professionals. Edema in the upper limbs, breasts, or truncated limbs of breast cancer patients may have a significant impact on a patient's quality of life. There are several ways to treat and manage lymphedema, but the primary goal is to prevent the condition from progressing; decrease edema; sustain edema reduction; relieve symptoms, and avoid infection. Lymphedema is a condition that affects many people, and nurses need to be aware of it and how to treat it. Patient education and training in lymphedema assessment, as well as in the education of patients throughout their treatment, is essential for individualized management planning. The nurses in the perioperative phase may educate patients on risk-reduction measures and lymphedema symptoms. The relevance of recognizing lymphedema following breast cancer therapy must also be addressed via more learning and precise experimental studies. It is advised that a clinical setting be combined with a prospective monitoring program.

Keywords: Breast cancer, diagnosis, lymphedema, management.

1. INTRODUCTION

Breast cancer is one of the most common cancers among women, and it is a major cause of death for many of them. In Saudi Arabia, it has risen to 28.7 percent, and internationally, it has risen to 23 percent [1,2]. A mastectomy is still the most common surgical procedure for 20% to 30% of patients with breast cancer, despite advancements in treatment procedures. Breast cancer-related lymphedema is the most prevalent complication following breast cancer surgery [3,4]. Abnormally high levels of soft tissue fluid in the affected women's bodies are evidenced by localized discomfort and swelling that persists even after treatment, as well as atrophied skin and frequent infection [4]. Disturbing body image, reduced arm function, and increased cellulitis, and recurrences of infections are among symptoms of lymphedema that undermine the health-related quality of life [2]. A total of roughly 14.05 percent of Saudi women with breast cancer suffer from lymphedema following a mastectomy due to cancer-related lymphedema [2]. Several risk factors for severe lymphedema have been identified, including weight gain, infection, surgically dissected lymph nodes, a longer duration of the condition, chemotherapy, radiotherapy, and other treatments [5,6]. There are two types of lymphedema; main and secondary lymphedema. Primary lymphedema is the most common type. In the case of primary lymphedema, the etiology has not yet been identified, whereas secondary lymphedema is an acquired interruption of lymphatic compression induced by a tumor, or its interventional mode in the case of secondary lymphedema is not yet recognized [7]. A progressive sequence of lymphedema can be distinguished by the presence of three distinct clinical phases. There are two stages to this condition: the first is irreversible and is marked by pitting edema in the arms as well as slight discomfort and a sensation of fullness in the arms. The second stage is irreversible and is characterized by non-pitting edema, increased skin thickness, hair loss, and pain in the area of the affected skin. Also irreversible, the third stage is characterized by significant swelling of the extremities as well as the presence of sores that become infected, resulting in a widespread infection [8].Treatment approaches for lymphedema have been investigated in the past, including medication, customized education, exercise intervention, and therapeutic compression modalities [9]. Complete decongestive therapy, on the other hand, is the most often used treatment plan [10,11]. Women who have developed secondary lymphedema as a result of a mastectomy experience psychological problems such as depression and anxiety, as well as physical and functional limitations and a low quality of life [12,13]. Lymphedema following mastectomy has also been found to cause impaired functional performance, chronic impairments, and a decreased quality of life [14,15]. Furthermore, it has been shown that sleep disturbance can manifest itself early in the course of breast cancer diagnosis and last for a lengthy amount of time after the intervention [1,2].

2. MATERIAL AND METHODS

In the prevailing study, the main aim is to investigate and review the lymphedema following breast cancer surgery, its diagnosis, and management. To meet that aim, an analytical method is used and several related studies have been taken into consideration.

3. RESULTS AND DISCUSSION

3.1. Diagnosis of Lymphedema

It is not uniformly agreed upon by clinicians how to characterize lymphedema and what measurements and criteria are used. In most cases, lymphedema can be detected when there are arm circumference differences of 2 cm or more assessed at a particular anatomical point, or when there is a 200 mL or greater difference in extremity volumes measured between the healthy and affected extremities [16]. The severity of lymphedema may range from mild to severe depending on the condition severity. When pressure is applied, stage I lymphedema pits, but this is reversed when the limb is elevated. Because of excessive tissue fibrosis and fat deposition, the second stage of lymphedema (II) no longer depths when compression is applied, and it no longer reverses when the patient is elevated above the heart rate. Trophic skin alterations with gradual size enlargement, including tissue pulses, skin folding, warts, and frequently open strenuous sores, characterize stage III lymphedema [17]. This stage is marked by substantial disability in movement and a high risk of infection. A thorough medical history, as well as a physical examination, are required for the diagnosis of lymphedema. Patients with breast cancer with lymphedema may experience symptoms such as a sensation of arm fullness and minor discomfort, which are dependent on the patient's previous medical history. When the illness is in its early stages, these signs and symptoms will present themselves. During the later stages of lymphedema, joint immobility, discomfort, and skin changes are all common symptoms. Increased thickness of skin folds and pitting of tissues, and expansion of the diseased extremity are all examples of such changes [17,18]. To identify when symptoms first appeared, how long they lasted, whether or not there were any triggering events, and whether or not treatments were attempted [18,19], the history of the current condition should be reviewed. Furthermore, the history has to involve information on any previous operations, post-surgical problems, radiotherapy, the time break between surgery or radiation and the symptom onset, superseding measures in the existence or symptom severity, infection or trauma history, and existing pharmacotherapy [17,18]. Tissue bioelectrical impedance spectroscopy, infrared laser perimetry, sequential circumferential arm measurement, and water displacement volumetry are some of the physical examination procedures used in the field of dentistry. Volumetric measures using circumferential measurement or sequential circumferential arm measurement, on the other hand, are the most commonly used procedures in clinical practice [20]. The most common way is to measure the arm circumference 10 cm below and 10 cm above the olecranon or lateral epicondyle with a tape measure. While circumferences appear straightforward, controlling intra- and inter-reliability is complex. The “gold standard” for volumetric measures is water displacement, which includes foot or hand volumetry measurement [17]. While the water volumetry approach is correct, it has not supplied data on the extremity's profile, cannot be utilized on the opened wound, and is time overwhelming [17,18]. This study uses three less prevalent clinical measures. A perometer is an optoelectronic device that employs infrared light instead of X-rays to calculate volume [17,20]. Tonometry analyzes tissue resistance rather than volume and determines fibrosis [21]. Early lymphedema is assessed using bioelectrical impedance spectroscopy, which measures tissue confrontation to electrical currents to estimate the volume of extracellular fluids [17]. Other quantitative measures include radiological imaging examinations including CT, MRI, ultrasonography, lymphoscintigraphy, and lymphangiography [18,22]. This pattern distinguishes lymphedema from other putative cancer-associated edema reasons, for instance, deep vein thrombosis. It is associated with inflammation, scarring, and atrophy of lymph vessels, resulting in reduced lymph transport capacity. Lymphoscintigraphy involves injecting a radioactive tracer under the skin of the afflicted limb and monitoring it using a gamma camera. Lymphoscintigraphy can reveal lymphatic drainage paths, cutaneous backflow, collateral lymph channels, lymph node counts, and radiopharmaceutical clearance times [22]. Finally, lymphedema diagnosis procedures differ. Each approach has its clinical relevance. For edematous arms and legs, the water displacement approach is the gold standard, but not practicable for patients with wounds. However, the circumferential measurement may indirectly determine extremity volume and has intra- and inter-rater reliability problems. Perometry's expensive cost restricts its use, despite its accuracy in limb volume calculation. Finally, bioimpedance can identify subclinical edema but requires disposable electrodes; radiological imaging may not be viable due to expensive expenses unless causes and management necessitate additional inquiry. Thus, assessment methods must be carefully chosen based on medical and study settings in addition to the outcomes of the patients.

3.2. Management of Lymphedema

Compression therapy, therapeutic exercises, and medication can all be used to treat lymphedema caused by breast cancer [22]. The "gold standard" treatment for lymphedema is a complete decongestive therapy, a multi-modality technique. Compressive garment and manual lymphatic drainage, skincare, and bandages are only some of the treatments that are used in this therapy [22,23]. The complete decongestive therapy consists of two stages. In Phase I, acute intervention is carried out in medical settings outside of the hospital. It's the goal of this phase to minimize the extremity size, overturn any shape distortion, alleviate subcutaneous tissues, and overall enhance skin health. Manual lymphatic drainage, short-stretching compressive bandages, exercises, and good nail and skincare are typically included in this phase. A compressive glove and sleeve are worn within the day while at night, a compressive bandage is worn as part of Phase II, which is carried out by the patients and/or family members at home [22]. To preserve the progress made in the first phase, the patient must remain committed to the program throughout their entire lives [23]. Among the types of compression treatment available are compressive bandage and compressive garment, both of that aid the muscle pumping in the compressed area in mobilizing lymphatic fluids [22]. Using the pneumatic compressive treatment is a topic of heated discussion. It is possible that this sort of treatment may help to decrease edema and that it will be used as an additional therapy when self-manual lymphatic drainage is difficult for the patient. This approach, on the other hand, may result in the displacement of fluid to other parts of the body, raising the likelihood of future complications. To avoid infection, proper skin and nail care are required [23]. Cleaning and drying the extremities, using a pH-neutral moisturizer to avoid chapping, and putting sunscreen on exposed skin are all examples of skincare. Furthermore, patients should avoid any puncture wounds, such as injections and blood-drawing, on the at-risk/affected limbs to the greatest extent feasible, to prevent infection. Aside from that, patients should avoid using razors in the afflicted region since they may cause skin irritation [24]. Physical exercises for lymphedema care are widely accepted, and they include remedial exercises performed with the garment or

bandage in place to promote lymphatic flow by repetitive muscle relaxation and contraction [22]. Exercises that include the afflicted trunk, arm, and shoulder girdle may be effective in the management of lymphedema in the affected arm. Rowing, tennis, golf, skiing, squash, and racquetball are all activities that some clinicians advise against because they are vigorous and repetitive movements against resistance. Despite this, there is no published evidence from rigorously conducted studies that these exercises may worsen or promote lymphedema [2,25]. In manual lymphatic drainage, a sensitive massage method is used to increase the contraction of lymph vessels on an ongoing basis, as well as to guide lymph and edema fluids into nearby lymphatic vessels. To match with the naturally occurring sluggish, regular lymphatic rhythms [17], the pressure exerted is extremely light, and the motions are gradual. Following manual lymph draining, a multilayered low-stretch compression bandage is placed soon afterward. It is common practice to wrap bandages in layers from the fingers to the axilla to establish strong slope pressures at the distal area of the leg that progressively diminishes proximally [26,27]. Compressive garments may be utilized in preference to bandages in the case of minor edema in Stages I and II [28]. The appropriate healthy and functions of compressive garments are critical, and they must be personalized to the individual using the garment. At all, compression garments that do not fit properly are of poorer quality than no firmness. Results from research, clinical experience, and personal stories are used to help breast cancer survivors manage their lymphedema. Despite this, this information is still a bit of a mystery and requires additional investigation [28]. Because of this, further thorough investigation is required. There is now a lot of emphasis on risk reduction advice that isn't founded on scientific research. As a result, further study is required on breast cancer treatment-related risk reduction measures [26,28]. The role of patients' proper awareness of lymphedema and their treatment options should be examined in a future study to better understand the requirements of patients with lymphedema. Lymphedema patients' coping methods and how they might be enhanced should be a subject of future study, according to Johansson, Holmstrom, Nilsson... Albertsson... Ekdahl [31]. In addition, the association between exercise and lymphedema in women is not understood. It is thus necessary to do more investigation into this connection [32]. Breast cancer survivors have a lifelong risk of developing lymphedema, which necessitates more in-depth information and support for them. Lymphedema education and counseling have to be developed further to help patients better comprehend the disease. Women with lymphedema, on the other hand, travel to other locations to get care [33].

4. CONCLUSION

Breast cancer complications were difficult to deal with. Participants were unaware of the risk of lymphedema and felt betrayed by the medical specialists they visited. Without the help of a therapist, they were forced to deal with the physical, psychological, and practical implications. Another issue was managing their lymphedema since they couldn't afford the essential therapy and self-care materials for their condition. This led to people feeling exploited and turning to a wide variety of therapy methods. They relied on their families for support, and their religious beliefs allowed patients to exist in their illness. Even though lymphedema is frequent among breast cancer survivors, it is often misdiagnosed by health care professionals. Edema in the upper limbs, breasts, or truncated limbs of breast cancer patients may have a significant impact on a patient's quality of life. There are several ways to treat and manage lymphedema, but the primary goal is to prevent the condition from progressing; decrease edema; sustain edema reduction; relieve symptoms, and avoid infection. Lymphedema is a condition that affects many people, and nurses need to be aware of it and how to treat it. Patient education and training in lymphedema assessment, as well as in the education of patients throughout their treatment, is essential for individualized management planning. The nurses in the perioperative phase may educate patients on risk-reduction measures and lymphedema symptoms. The relevance of recognizing lymphedema following breast cancer therapy must also be addressed via more learning and precise experimental studies. It is advised that a clinical setting be combined with a prospective monitoring program.

5. ACKNOWLEDGMENT

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6. DATA AVAILABILITY

This is a review, and no data sets were used in the manuscript.

7. CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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SP-03

An Overview of the Role of Respiratory Physiotherapy in Cystic Fibrosis Disease

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Abstract: Cystic fibrosis (CF) is the most frequent autosomal recessive illness leading to different health issues. CF problems and patient death are mostly due to the progression of lung disease. There is a wide range in the time it takes for a disease to develop, and many people have minor or unusual symptoms. Patients with just a few of the classic symptoms of CF should not be excluded from the diagnosis of the disease. In order, we have proposed this review to demonstrate the role of respiratory physical therapy in the treatment of CF. This is an analytical study. In the context of respiratory physical therapy, physical exercise training and airway clearing procedures are both essential components of the process. Airway clearance regimens are useful for releasing mucus and look like an effective method for other purposes. Exercises increase aerobic capacity (which is typically compromised in CF patients as a result of multifactorial disease) and are thought to slow the pace of the decrease in respiratory function in CF patients. Though further research is needed to establish the most efficient management elements (type, frequency, duration, and intensity), preliminary findings suggest that a mix of anaerobic and aerobic training may be the most effective training method for CF patients. Individualized evaluation is required when developing training programs, but in the vast majority of instances, the advantages of exercise exceed the risks, and there is no reason to oppose exercise integration into the treatment of all CF patients.

Keywords: Chest physical therapy, cystic fibrosis, health issues, physical exercise.

1. INTRODUCTION

It is the most frequent autosomal recessive illness affecting persons of Northern European ancestry, with cystic fibrosis (CF) being the most common. In 1949, it was made public for the first time to the whole medical community. A patient registry maintained by the American CF Foundation lists more than thirty-thousands of CF individuals in the US and more than seventy-thousands of CF individuals worldwide[1-5]. Every year, around one-thousand new instances of CF, are discovered across the world. More than 75% of CF individuals are identified before the age of 2, and the average age at which a child is diagnosed is around 3 years old. Caucasian people with Northern European heritage have CF incidence rates as high as one in two to three thousand newborns. Based on the CF Foundation 2018 Registry Report, the median survival duration for CF patients in the United States is roughly 47.4 years. The prevalence of CF has not yet been globally recorded, other than the finding that the genotypic spectrum of CF individuals differs substantially across resident subpopulations depending on their geographic location [6-9].

2. METHODOLOGY

Throughout this study, it has been attempted to analyze and examine the role of respiratory physiotherapy in cystic fibrosis disease. An analytical approach is utilized to meet the aim of the study. Numerous related studies and surveys are considered and investigated to reach a comprehensive conclusion.

3. RESULTS AND DISCUSSION

3.1. Clinical Characteristics

When the body's chlorides and/or different ions including bicarbonate or sodium aren't properly transported, the result is a buildup of thick, sticky secretions (e.g. mucus) in the lungs and pancreas as well an increase in salt content in sweat gland secretions. CF problems and patient death are mostly due to the progression of lung disease. There is a wide range in the time it takes for a disease to develop, and many people have minor or unusual symptoms. Patients with just a few of the classic symptoms of CF should not be excluded from the diagnosis of the disease. Coughing, lung hyperinflation on respiratory functions, and lung radio-imaging results that indicate obstructive airway disorder are all common respiratory symptoms in people with cystic fibrosis. After recurrent infections and the discharge of cell contents, damage to bronchial walls results in loss of cartilage and muscle tone that ultimately leads to the disease's progression to bronchiectasis. As the disease progresses, symptoms such as coughing, dyspnea, increased sputum production, malaise and anorexia become more commonplace, as does weight loss. These acute occurrences are linked with an immediate, transitory decrease of lung function that recovers with therapy, but that commonly develops over time to chronic loss of lung functions [1]. Momentary airway infections with harmful microorganisms often take place in children with CF despite individual differences. It is common for CF sufferers to develop a persistent airway infection with either Pseudomonas aeruginosa (P. aureus) or Staphylococcus aureus (S. aureus). Stenotrophomonas maltophilia, Achromobacter xylosoxidans, and Burkholderia cepacitans are just a few of the additional microorganisms that may invade the airways of CF patients. Non-TB mycobacteria can also infect people with the disease [2]. P.aeruginosa-infected airways may prompt neutrophils to let loose significant quantities of matrix proteins and DNA into the bronchial airway, resulting in a more inflammatory response. The increased viscosity of mucus in the airways is due to a

combination of these compounds and the decreased airway clearance mechanisms and chronic inflammation caused by CF. Additional bacterial species found in the airways of CF patients are also being studied using next-generation sequencing techniques, including obligate anaerobes [3,4].

3.2. Diagnosis of Cystic Fibrosis

Traditionally, the clinical presentation of CF has been used to make the diagnosis. Nowadays, the majority of people with CF are identified as CF infants after positive results. These positive result in CF infants has been established in New Zealand, which has examined dehydrated spots of a blood sample for immune-reactive trypsinogen using a new technique [5]. A high immune-reactive trypsinogen suggests a considerable chance of developing CF. In 1980, the CF infant test was introduced in Europe, ten years after the start of this study. Nowadays, the majority of European nations have included CF into their national business strategies [6,7]. European median age of diagnosis is 4 months, according to the European CF Society Patient Registry Annual Data Report (2018) [8]. Nonetheless, it is critical to understand the illness's clinical manifestations to assist in the diagnosis of people whose infant test does not detect the condition. A broad range of symptoms (for example, persistent diarrhea, nasal polyps, mal-absorption, and steatorrhea) might point to the diagnosis. The most prevalent manifestation, however, is a combination of chronic or recurring mal-absorption and respiratory tract infections, which leads to the diagnosis of cystic fibrosis [9]. Meconium ileus is a clinical symptom that occurs in 20% of people with CF and is significant. Because of the substantial link between meconium ileus and cystic fibrosis, it is important to be attentive that the CF infant test might be mistakenly negative in children who have meconium ileus and other conditions. It is nevertheless suggested to undertake further testing (genetic or sweat test) in patients who are experiencing clinical symptoms even if the CF infant test is negative [10]. As soon as the diagnosis is assumed, whether, by a positive infant test or clinical signs, the patient must be referred to an appropriate specialist CF facility for further testing. The initial step in diagnosing CF channel dysfunction is to assess the channel's dysfunction, which is followed by genetic testing. The measurement of sweat chloride concentration is the most reliable and extensively used technique, and it is often combined with electrophysiological levels. In Europe, 3 separate diagnostic criteria are documented and defined by differing sweat chloride concentration levels: 1) CFTR-related disease, 2) non-classic CF, and 3) typical CF [9]. The first group is defined as the presence of CF-specific manifestations in conjunction with an SCC of more than 60 mmol/L on two separate occasions. In the United States, the second category is not recognized. For a group of patients with the level of sweat chloride concentration borderlines (30–60 mmol/L) in conjunction with CF-specific symptoms as well as CFTR malfunction as shown by two CFTR mutations or an abnormal function test, it is employed. Hereditary absence of the vas deferens, repeated pancreatitis, or dispersed bronchiectasis is all signs of CF-related disorder, which may be identified when a patient has just one kind of CF producing CFTR mutation or borderline sweat chloride concentration levels [11]. It is used to describe the situation where a newborn who has had an abnormal CF infant test but does not completely convene CF diagnostic criteria and does not exhibit any medical symptoms is referred to as having CF transmembrane conductance regulator associated with metabolic syndrome/CF screen optimistic, questionable identification. It is known that the cystic fibrosis transmembrane conductance regulator-related metabolic syndrome system originated in the United States, and that cystic fibrosis screen positive, the inconclusive diagnosis was used in other countries; the two terminologies were merged in 2016 to simplify data collecting and enhance patient care [12]. A revised clinical treatment guideline for these children was released in 2020, and it is now being reviewed. The vast majority of these children will never show any clinical signs and will stay healthy; but, an unknown number of them will ultimately be diagnosed with cystic fibrosis or cystic fibrosis-related respiratory disease. At this stage, it is impossible to determine who will get cystic fibrosis, although early identification is critical. It is thus advised that these neonates be extensively examined and that they are examined on an annual basis until they reach the age of at least six years. The annual physical examination has been improved with the recommendation to do a chest imaging and pulmonary function test [13].

3.3. Physical Therapy Intervention

An intervention that is interdisciplinary and tailored, including physical exercise training, clearing airways, and behavior modifications is referred to as pulmonary rehabilitation [14].

3.3.1. Physical Exercise

An outpatient, inpatient, or home program may be used as part of the rehabilitation process for patients with pulmonary disease. Training for lower and upper limbs as well as inspiratory muscle training and chest physical therapy are all part of rehabilitation regimens. It is common to prescribe a minimum of three or more weekly sessions for at least four weeks, but it is also possible to recommend as little as two sessions per week for up to six weeks (12 overseen sessions at least). A 30- to 60-minute workout might be continuous or intermittent, with an eye on either building strength or endurance as the primary goals of the workout sessions. Habitual physical exercise 5-session weekly for 30 minutes is suggested apart from therapy as well livelihood recommendation [15,16]. Notably, the American College of Sports Medicine recommends that individuals engage in a minimum of 30 minutes of moderate-intensity aerobic (endurance) exercise five days a week or 20 minutes of vigorous-intensity aerobic activity on three days a week [17]. For home-based programs, a variety of aerobic and muscle-strengthening regimens have been adopted. During each session, Happ and his colleagues alternated between two distinct workout regimens of varying intensities to create an at-home cycling training program. At a heart rate of roughly 150 beats per minute, it was also employed a 3-session a week of the aerobic training program. The lack of uniformity in self-regulated, home-based exercise necessitates more research since these treatments are very easy to implement and inexpensive [18-20] .Both aerobic and anaerobic training had equivalent benefits on FEV1, FVC, and exercise capacity after six months of training, according to Kriemler et al. Although anaerobic exercise reduces motionless hyperinflation, aerobic exercise doesn't. Strength training may have reduced

hyperinflation in this group, which may have increased FVC [21]. Aerobic and anaerobic training may be considered equally beneficial in light of these facts. Some individuals, such as those with significant pulmonary impairment, may not benefit from the same training methods as others. There were no significant differences in exercise capacity between patients with severe illness who received a personalized training program for six weeks and those who received standard training [22]. The findings of this research support the use of training that is tailored to the specific needs of each participant. In terms of training intensity, most trials that improved exercise capacity utilized intensities between 50 and 85 percent of maximal heart rate [21,23-25]. The prior document has examined the instantaneous impacts of exercise intensity on diffusing and respiratory capacity. Aerobic diffusing was enhanced with moderate activity, but it was restricted with strenuous exercise [26]. The ideal exercise training regimen for CF patients has not yet been established. Overall, physical exercises including different types of aerobic and resistance exercises exhibited useful influences in different age stages with different respiratory diseases [27-33].

3.3.2. Chest Physiotherapy and Airway Clearance

The implementation of airways clearing procedures, which are utilized to strengthen the clearance of the mucociliary system aiming at transferring secretion proximally through bronchial airways, is a vital aspect of pulmonary rehabilitation [34,35]. There are several types of chest physiotherapy, including conventional chest physiotherapy (percussion, vibration, positioning, and postural drainage) [36], active cycle of breathing technique [37], that comprise thoracic expansion training and breathing control, as well as positive expiratory pressures known as respiration in opposition to positive expiratory pressures using mouthpieces or masks, autogenic drainage (3 levels of respiratory sequences starting at low lung volume) and forced expiration. Notably, positive expiratory pressure may be oscillating or non-oscillating, depending on the patient's needs [38,39]. Oscillating positive expiratory pressure is a technique that includes airflow or oscillation with positive expiratory pressure aiming at releasing secretion. Aerobic exercises may be used as a method of chest clearance therapy since it decreases the sputum mechanical resistance and increase expiratory volumes [40], which are both beneficial to airway clearance. According to recent documents, inspiratory muscle training showed effective outcomes in patients who experienced respiratory disorders including children with congenital diaphragmatic hernia repair and recovered COVID-19 patients [41,42], which should be evaluated in CF patients in future studies.

4. CONCLUSION

CF is the most frequent autosomal recessive illness, leading to different health issues. CF problems and patient deaths are mostly due to the progression of lung disease. There is a wide range in the time it takes for a disease to develop, and many people have minor or unusual symptoms. Patients with just a few of the classic symptoms of CF should not be excluded from the diagnosis of the disease. Transient airway infection with harmful microorganisms often occurs in children with CF, despite individual differences. An intervention that is interdisciplinary and tailored, including physical exercise training, clearing airways, and behavior modification, is referred to as pulmonary rehabilitation. In the context of respiratory physical therapy, physical exercise training and airway clearing procedures are both essential components of the process. Airway clearance regimens are useful for releasing mucus and look like an effective method for other purposes. Exercises increase aerobic capacity (which is typically compromised in CF patients as a result of multifactorial disease) and are thought to slow the pace of the decrease in respiratory function in CF patients. Though further research is needed to establish the most efficient management elements (type, frequency, duration, and intensity), preliminary findings suggest that a mix of anaerobic and aerobic training may be the most effective training method for CF patients. Individualized evaluation is required when developing training programs, but in the vast majority of instances, the advantages of exercise exceed the risks, and there is no reason to oppose exercise integration into the treatment of all CF patients.

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6. DATA AVAILABILITY

This is a review, and no data sets were used in the manuscript.

7. CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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SP-04

AN OVERVIEW OF WOMEN WITH BREAST CANCER-RELATED LYMPHEDEMA'S QUALITY OF LIFE

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Abstract: In the prevailing era, one word of six letters (C-A-N-C-E-R) commonly provokes hopelessness, disability, life insufficiency, and death. Breast cancer is one of the most common cancers among women, and it is a major cause of death for many of them. With the development of interventional modalities for the management of breast cancer, mastectomy continues to be the most common surgery that ranges from 20-30% of women diagnosed with breast cancer. When cancer survivors are diagnosed with lymphedema, they will have it for the rest of their lives, reducing their quality of life. This review aims to provide an overview of the effects of breast cancer and lymphedema following treatment on the quality of life. To that aim, an analytical method is used and several studies are taken into consideration. According to this viewpoint, lymphedema commonly impairs the quality of life of affected women due to poor body image, functional impairment of the affected arm, and other disabilities such as frequent infection and cellulite. Therefore, all healthcare providers should deeply understand lymphedema following breast cancer treatment. As a result of the previous documents, new information and intuition were gained regarding the degree of awareness of breast cancer and breast early assessment among women.

Keywords: Breast cancer, cancer, lymphedema, quality of life, treatment.

1. INTRODUCTION

One word of six letters (C-A-N-C-E-R) commonly provokes hopelessness, disability, life insufficiency, and death. Cancer affects different age groups, all genders, and various classes of socioeconomic statuses. Based on cellular impact, cancer is classified into different types. Cells affected are growing hysterically and forming a mass of tissue lump known as a tumor. It affects different body parts, such as the lungs, liver, breast, and colon [1]. The main cancer type that affects women is breast cancer. It has increased significantly worldwide, causing critical health problems. It has the potential to affect all females worldwide, including those in developing and developed countries [1,2]. Based on a prior document approved by the Research Council of Cancer in the United Kingdom, the number of breast cancer patients reaches 6.3 million yearly throughout the world. It has been stated that 2,360 males and 232,670 females suffering from breast cancer in the United States resulted in breast cancer-associated deaths of approximately 430 males and 40,000 females [3]. In the Arabic world, it was documented that 36.7% of Jordanian cancer patients were diagnosed with breast cancer, which was most widespread in the last decade [4]. It was also reported that approximately 15.4% of 100,000 Egyptian cancer patients were diagnosed with breast cancer, in both males and females [5]. Moreover, it was reported that breast cancer is the most common cancer type that affects women in Gulf Cooperation Council countries. Qatar, Bahrain, and Kuwait were identified as more prevalent countries when compared with Oman, Saudi Arabia, and the United Emirates, which were classified as lower prevalent countries [6].

2. MATERIALS AND METHODS

Throughout this study, the issues of women with breast cancer-related Lymphedema's quality of life are analyzed. An analytical method is employed to reach an informed conclusion. Quite a several related specialized studies are analyzed and compared.

3. RESULTS AND DISCUSSION

3.1. Breast Cancer-Related Lymphedema

The most common health problem following mastectomy is lymphedema, which is termed breast cancer-related lymphedema [7,8]. It occurs due to impairment of the lymphatic system, which resists proper lymphatic drainage, leading to excessive accumulation of lymphatic fluids that contain extreme amounts of proteins in the interstitial spaces [10,11]. It is defined as excessive amassing of soft tissue fluid characterized by unrelenting swelling, aching, emaciated skin, tightness, heaviness, and repeated infectivity, which seriously leads to physical, psychological, and physiological impairments [7, 8]. Lymphedema frequently impairs the quality of life of affected women because of poor body image, functional impairment of the affected arm, and other disabilities such as frequent infection and cellulite [11]. Therefore, all health care providers should deeply understand lymphedema following breast cancer treatment [12].

3.2. Quality of Life and Breast Cancer

When it comes to quality of life, it is described as a personal feeling of well-being that encompasses a holistic viewpoint that incorporates physical, psychological, social, and spiritual aspects or domains, among others. In recent decades, practitioners and studies have focused on measuring the quality of life of breast cancer survivors, which has become more important in assessing treatment results [13,14]. Raising understanding of breast cancer, improvements in early diagnosis and the use of modern procedures and technology in treatment have all resulted in higher survival times for those suffering from the disease. This

problem of extended life has now emerged as a significant concern in breast cancer care, requiring more focus and inquiry into the long-term impact of therapeutic applications on breast cancer survivors on the overall quality of life of those affected by the disease [15,16]. Research on the quality of life of cancer patients is underrepresented when compared to studies in Western nations. According to the authors [17,18], there are just a few published studies that include quality of life among breast cancer survivors in the Arabic world region, based on the investigators' understanding and literature search. So it can be claimed that the present research will be an imperative review to determine the quality of life among breast cancer survivors. According to the findings of prior documents, breast cancer women in Saudi Arabia have a poor quality of life [12,18].

3.3. Quality of Life and Lymphedema Following Breast Cancer

When cancer survivors are diagnosed with lymphedema, they will have it for the rest of their lives, reducing their quality of life. Previous research has shown that the existence of lymphedema is connected with a worse quality of life, especially in physical functioning, such as the ability to operate in a home setting, over the long term [19,20]. It was found that patients with lymphedema had a worse quality of life when compared to cancer survivors who did not have lymphedema. In addition, breast cancer survivors who suffer from lymphedema incur extreme emotional, spiritual, social, psychological, and physical consequences as a result of this chronic illness [21]. Although swelling or edema inside the tissue is not uncomfortable in and of itself, the nerve fibers stretching under the skin, the existence of a regional illness, or the accumulation of fluid on top of a nerve bundle may all result in substantial discomfort and incapacity. Lymphangitis, cellulitis, infections, septicemia, are all possible complications after the onset of extremity swelling [22].

4. CONCLUSION

Quality of life is extremely affected, including all domains such as physical, psychological, social, and spiritual domains in breast cancer-related lymphedema. Managing the repercussions of breast cancer was a difficult task. Participants were unaware of the danger of acquiring lymphedema and believed they had been duped by the medical experts who attended the session with them. Their physical, psychological, and practical implications were left to them to deal with on their own without the support of a therapist or counselor. Another problem was managing their lymphedema, which they were unable to do since they lacked the requisite therapy and self-care resources. Because of this, many felt exploited and resorted to a variety of different sorts of therapy to have their needs met. They had the support of their families, and their religious convictions helped them endure despite their precarious state of health. From a psychological standpoint, lymphedema often impairs the quality of life of afflicted women owing to a negative body image, functional impairment of the affected arm, and additional limitations such as recurrent infection and cellulite formation, among others. As a result, all healthcare professionals should be well-versed in the symptoms of lymphedema after breast cancer therapy. Based on the preceding evidence, it was concluded that knowledge of breast early assessment was rather excellent, but awareness of breast cancer risk factors was quite poor. From this situation, it is clear that quick intervention is required to improve awareness of breast cancer and the need for early breast inspection among the female population. Collations of studies that are similar to those conducted in other countries demonstrate the need for increasing public awareness about breast cancer. Female learners must be better educated about breast cancer and encouraged to do breast early examinations regularly to detect anomalies in their breasts and identify breast cancer at an early stage. For female university students, appropriate training intermediaries, such as elective courses that offer essential viewpoints on women's health, might be very beneficial to their education. The provision of the free breast early detection educational courses may also be an effective means of increasing knowledge. As a result of the previous documents, new information and intuition were gained regarding the degree of awareness of breast cancer and breast early assessment among women.

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6. DATA AVAILABILITY

This is a review, and no data sets were used in the manuscript.

7. CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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SP-05

AN OVERVIEW OF LASER THERAPY ROLE IN THE MANAGEMENT OF CHRONIC LOW BACK PAIN

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Abstract: Many people suffer from chronic nonspecific low back pain worldwide, which may be debilitating daily. Pain that has persisted for more than three months without a clearly defined cause is referred to be chronic pain. As of now, it is estimated that a great percent of the population will suffer from chronic non-specific low back pain for the remainder of their lives. Orderly, many studies have been proposed to ascertain the effect of different physiotherapy modalities in the management of chronic low back pain such as laser therapy, magnetic field therapy, ultrasound therapy, electrical stimulation therapy, and varied other modalities. This analytical study, therefore, has been demonstrated to clarify the role of laser therapy whether low or high-intensities in the management of low back pain patients using several previous studies investigating the clinical efficiency of laser therapy in low back pain patients. Both low and high-intensity laser reduces functional disability, low back pain, improve circulation, enhance lumbar range of motion, improve the quality of life in individuals suffering from low back pain. Further investigation of the proposed therapeutic threshold as well as similarity of low- and high-intensity laser therapies should be carried out to produce more specific clinical practice recommendations. The rehabilitation and physiotherapy centers might consider incorporating low- and high-intensity laser treatments into their treatment plans for individuals with chronic low back pain.

Keywords: high-intensity, laser therapy, Low back pain, low-intensity; physiotherapy.

1. INTRODUCTION

Many people suffer from chronic nonspecific low back pain, which may be debilitating daily. Pain that has persisted for more than three months without a clearly defined cause is referred to be chronic pain [1]. As of now, it is estimated that 84.8 percent of the population will suffer from chronic non-specific low back pain for the remainder of their lives. In addition to being associated with psychological and functional difficulties, chronic low back pain has been shown to result in a decrease in overall quality of life. When it comes to treating persistent low back pain [1,2], a mix of medical and nonmedical therapy is utilized. There is a great deal of uncertainty about the etiology of low back pain [2]. According to the National Institutes of Health, back pain costs the United States $91.1 billion in medical operating cost each year, in addition to $50 billion in oblique expenses resulting from lost disability and productivity advantage expenses [3]. However, even though LBP is one of the most common causes of adult morbidity [4,5], it is also one of the most curable. Only one out of every three people have never suffered from a major mental disease at any time in their life, according to the National Institute of Mental Health. The quality of life of persons who suffer from musculoskeletal system disorders is generally lower [5,6]. Lower back pain treatment is intended to ease discomfort, enable patients to continue with their daily activities, and enhance their overall quality of life in the beginning [7].

2. METHODOLOGY

Throughout this study, it has been attempted to analyze and examine the laser therapy role in the management of chronic low back pain. An analytical approach is utilized to meet the aim of the study. Numerous related studies and surveys are considered and investigated to reach a comprehensive conclusion.

3. RESULTS AND DISCUSSION

3.1. Laser Therapy

Medical professionals across the globe use laser treatment regularly; nevertheless, it has not been given FDA approval to be used for any reason [7]. A very focused light radiation is produced by the laser, which is monochromatic and non-ionizing. For the treatment of numerous musculoskeletal dysfunctions, laser therapy is a helpful physiotherapy technique because of its anti-inflammatory effects, muscular relaxation, analgesia, ligament repair, fibroblast explosion, tissue revolutions, and biostimulant influences. A low-intensity laser is often used to treat both acute and chronic pain [8]. A high-intensity laser is a noninvasive, expedient, and effortless method that increases joints' range of motion, motivates effectively deeper tissue, and delivers analgesics, anti-inflammation, and other helpful impacts [9,10]. The use of pulsed high-intensity laser has been shown to decrease extreme pain [11]. For those who suffer from chronic pain or inflammation, it also has anti-inflammatory, anti edematous, and analgesic properties [12]. Even more importantly, it can stimulate places that low-intensity laser cannot, such as the joints that are difficult to access [13]. One study revealed that low-intensity laser is an effective technique for managing chronic low back pain, while another study found that high-intensity laser is safe and effective for individuals with chronic low back pain. In addition, the high-intensity laser may transport more energy into the tissues than the low-intensity laser [13].

3.2. Evidence and Physiological Mechanism

It has been demonstrated that a low-intensity laser has both analgesic and anti-inflammatory effects by increasing the pain threshold, inhibiting A-δ and C-fiber transmission, increasing hydroxy indole acetic acid, decreasing interleukin-1, interleukin-8, tumor necrosis factors, and prostaglandin levels, and decreasing prostaglandin levels [14]. The low-intensity laser can reduce pain by increasing the release of endogenous opioids in the peripheral nervous system [15]. An infrared laser with a wavelength of 808nm has been established by researchers to be a safe and effective method of treating low back pain, both in terms of lowering disability and decreasing pain intensity [16]. It has also been shown that a low-intensity laser may reduce the amount of C-reactive protein present in the bloodstream [17], which is beneficial. A high-intensity laser has the potential to penetrate deeper and provide a larger therapeutic coverage [18]. However, despite the widespread use of low-intensity and high-intensity laser therapies, the processes and therapeutic results of these treatments remain disputed, and the correlations between laser dose and therapeutic benefits remain equivocal [19-21]. As part of this research, high-intensity laser treatment equipment was employed, which had not been investigated in this region before. Although the treatment is comparable to that provided by a standard laser, the photo-energy effects are more concentrated and intense, and the concentration of endogenous chromophores is more appropriately distributed all through the management course, based on laser wavelengths. Furthermore, as laser irradiation spreads throughout the body, it penetrates deeper into the tissues and increases the mitochondria oxidative reactions; it also produces RNA, DNA, ATP. It enhances photo-biological impacts on the affected tissues; it excites collagen construction in the tendons of the skeletal muscles; and, as a result, it improves the status of chronic low back pain as well as their ability to carry out their daily lives [22]. When compared to patients in placebo groups, those in laser groups had a greater decrease in visual analog scales (VAS), disability, greater improvements in quality of life, and lumbar range of motion. Following treatment with high-intensity laser analgesia/detumescence, the patient's low back pain is lessened, circulation is improved, the patient can return to work more rapidly, and functional ability is restored. These results are congruent with those of previous research. When compared to low-level lasers, high-intensity lasers have a longer duration, are more sophisticated, penetrate deeper into the body's affected tissues, and have a larger dose behavior on those issues. Laser therapy, in addition to reducing discomfort and restoring function, has been shown to improve illness conditions [23].

4. CONCLUSION

Both low and high-intensity laser reduces functional disability, low back pain, improve circulation, enhance the range of motion of the lumbar motions, and improves life quality in individuals suffering from low back pain. In summary, this review shows an update on the usefulness of laser therapies in chronic non-specific low back pain that does not respond to other treatments. According to research looking at pain severity and functional ability, patients may benefit from low- and high-intensity laser therapy, depending on their situation. Moreover, no evidence could be found to support the existence of a favored low-intensity laser therapy prescribed that varied from that found in a previous analysis. Further investigation of the proposed therapeutic threshold, as well as a comparison of low-intensity and high-intensity laser therapies, should be carried out to produce more specific clinical practice recommendations. The rehabilitation and physiotherapy centers might consider incorporating low- and high-intensity laser treatments into their treatment plans for chronic low back pain individuals.

5. ACKNOWLEDGMENT

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6. DATA AVAILABILITY

This is a review, and no data sets were used in the manuscript.

7. CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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SP-06

Home-Based Exercise And Elderly Cancer Patients: An Overview

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Abstract: As time goes on, increasing numbers of individuals are being diagnosed with cancer. Approximately seventy-eight percent of all malignancies are diagnosed in people over the age of sixty. The rising survival rates of cancer patients have brought attention to the issues of health-related quality of life and way of life. Other chronic disease groups have long emphasized the need for regular exercise. Nevertheless, the benefits of exercise for cancer survivors are just now beginning to emerge. This study is analytical research. This review, therefore, has been demonstrated to clarify the role of home-based exercise in cancer among elderly individuals using several previous studies investigating the clinical efficiency of laser therapy in low back pain patients. According to this review, which also indicated that few studies have explored the matter from an aging standpoint, little attention has been paid to exercise among older cancer survivors. Research evidence is weak in the realm of home-based fitness therapies for cancer survivors. It is also important to note that all research was constrained in line with this study and reporting. According to this new research, home-based exercise therapies for cancer survivors may be practical and give physiological and psychological advantages throughout the rehabilitation phase, despite the methodological constraints of studies. Further clinical studies are necessary to make progress in this area of inquiry, particularly for elderly cancer individuals.

Keywords: Elderly, Cancer, home-based exercise, malignancies.

1. INTRODUCTION

As of 2020, the International Agency for Research on Cancer (IARC) predicts that over 20 million people will be diagnosed with cancer globally. In 2040, the worldwide cancer burden is predicted to be 50% larger than it was in 2020, as new cases continue to rise. Approximately seventy-eight percent of all malignancies are diagnosed in those over the age of sixty. Efforts to develop long-term cancer treatment and preventive strategies are essential [1,2] Cancer survivors' mortality and life expectancy have been improved as a result of better cancer therapy and supportive care. It's important to note that chemotherapy and radiation treatments may have long-term detrimental consequences on both the body and the mind for many cancer victims [3,4]. This means that evidence-based rehabilitation therapies specific to this group are essential since cancer is a chronic illness that needs long-term systematic care [5]. Patients and survivors of cancer are increasingly benefiting from exercise treatments as part of their therapy and supportive care [6]. There is strong scientific evidence that exercise therapies may help alleviate the physical and psychological impacts of cancer therapy. It has been proven to increase cardiorespiratory fitness, as well as health-related quality of life, and decrease tiredness and depression [7-9]. Intervention programs in cancer survivors face numerous barriers, including organizational and legal barriers such as a significant dearth in healthcare, low awareness, or a lack of referral from healthcare providers; barriers in the neighborhood of patient populations include an inconvenient location, time of day, or inadequate capacity to offer exercise programs rehabilitation programs [10]. For cancer survivors, a home-based fitness program has the opportunity to solve several hurdles that prevent them from engaging in standard center-based exercise programs under expert supervision. Home-based exercise seems to be a viable alternative to traditional center-based programs, according to recent investigations of Home-based exercise treatments [11,12]. An alternate remote access approach and its variants are highly advocated in chronic conditions amid the present COVID-19 epidemic [13,14]. Home-based exercise therapies for cancer survivors are presently lacking, thus we conducted an overview on the function of home-based exercise therapy during rehabilitation in elderly patients with cancer. For the planning of future researches, it is vital to determine the direction and obstacles learned from these investigations. The authors of this comprehensive review set out to find and assess the available research on the health benefits of home fitness programs for cancer survivors.

2. MATERIALS AND METHODS

Throughout this study, the correlation between home-based exercise and elderly cancer patients is analyzed. An analytical method is employed to reach an informed conclusion. Quite a several related specialized studies are analyzed and compared.

3. RESULTS AND DISCUSSION

3.1. Cancer and Aging

Despite the enormous number of elderly cancer survivors, however little is known about the disease in this group [15]. In part, this lack of knowledge is attributable to the fact that older persons are underrepresented in clinical cancer studies. Many cancer studies revealed that just 25% of respondents were over 65 years old, a figure that is far lower than the 63% expected in the overall US cancer survivor population [16]. Age restrictions in the eligibility criteria, patient misconceptions about their right to interact, logistical barriers, intermingling health conditions, and selective reporting due to physician misunderstandings that elderly individuals may not be as consistent or advantage as much from clinical trials may all play a role in this, according to the

authors of the study. As the number of older persons afflicted with cancer continues to rise, future research must be focused on the special issues of this demographic. With a little amount of data available, it is clear that elderly cancer survivors have a particular quality of life challenges. Older cancer survivors appear to suffer less overarching psychological distress than their younger individuals [17]. However, elderly individuals appear to have stress-related health quality of life issues with which to contend. A cancer diagnosis is often made in conjunction with another medical issue for many elderly patients. A person's already high-stress levels and the side effects of cancer treatment may lead to a marked decline in their quality of life, both in terms of their ability to function and their physical well-being [18,19]. There was a correlation between the number of co-morbidities and pain and exhaustion among breast, gastrointestinal, lung, and prostatic cancer victims over the age of 65 [18]. Age-related problems, such as decreased mobility, eyesight, and strength, are common among cancer survivors in their advanced years. Thus, adapting may not be as successful as for younger people. Psychosocial quality of life symptoms such as sadness, anxiety, and delirium may worsen if a person is unable to deal with several sources of stress [17]. Older cancer survivors are more likely to suffer from depression and anxiety. One research indicated that 25% of cancer survivors over the age of 65 had clinical depressive symptoms [20]. There seems to be little if any, the correlation between the incidence of psychological discomfort and seniority [21].Singleness, retiring, and a decline in support networks may also hurt elderly cancer survivors' ability to live with the disease. Researchers discovered that older cancer sufferers who reported mental health problems and lack of psychological support had the worst self-perceived health and psychosocial adjustment one year after surgery [22]. Toxicities from cancer therapies may also be increased by age-related changes in the cardiovascular, renal, pulmonary, and gastrointestinal systems. As a consequence, elderly cancer survivors may have a worse quality of life than younger cancer survivors. The gastrointestinal mucosal defensive systems weaken with age, making older women with breast cancer more vulnerable to mucositis, a painful illness that affects the physical and functional quality of life [23]. Rectal cancer survivors who are above the age of 70 had worse physical functioning and worldwide health scores and greater pain and tiredness levels, according to recent research [24].

3.2. Home-Based Exercise

In general, exercise intervention showed useful influences on life quality in cancer individuals [25,26]. Also, physical activity may improve mental well-being, depression, and life quality in healthy individuals during COVID-19 infection [27]. The current review assesses the quality of home-based fitness programs for cancer elderly survivors. To our view, this is the review article provides an overview of alternate methods to cancer rehabilitation. Previous studies imply that home-based exercise programs might assist cancer survivors throughout their recovery. Some of these gains are in cardiorespiratory fitness and body composition. Most authors accurately reported research outcomes, although most studies had methodological flaws. Frequently, techniques were detailed insufficiently, with specifics missing about participant recruitment, treatment duration, and exercise prescription. These flaws may affect the overall quality of the comprehensive study and the generality of the results, which might hinder future home-based exercise intervention research in cancer survivors.Home-based exercise was determined to be safe and practical in all investigations, which is in line with the outcomes of population cancer survivors receiving supervised exercise [28]. In rehab centers, adherence to exercise programs was shown to be high. Researchers believe that the participants in their studies are adequately motivated to work out of their own will, regardless of any exercise recommendations [29,30]. High levels of functional capacity may have an impact on adherence and exercise prescription, as well as tiredness. Because regular exercise is a highly recommended strategy to increase functional capacity, the efficacy of home-based exercise therapies may be essential. There is a strong clinical case for developing effective interventions to increase the aerobic capacity level of fitness in cancer survivors based on current research [31]. According to research, interval and vigorous exercise training have the potential to increase functional capacity efficiency. When compared with moderate-intensity continuous training, this prescription had a greater cardiorespiratory fitness impact and reduced the severity of side effects such as nausea, vomiting, pain, and physical exhaustion [32]. A group of individuals with heart failure has been shown to benefit from interval training over moderate-intensity continuous exercise [33,34]. This is in line with the deleterious effects of chemotherapy on oxidative stress in cancer survivors. It has been shown that heart failure individuals with lower ejection fraction may benefit from home-based exercise therapies [35]. The safety of home-based workout facilities is crucial. Safety concerns arise since patients are not under direct monitoring, as is the case in typical rehabilitation centers. The safety of workouts performed at home has yet to be shown [36,37]. The home-based exercise regimen did not result in any major complications or deaths. Although the findings support the use of home-based therapies in all cancer survivors, a more thorough study is required in this field to fully assess the safety risk .Previous studies examined the one-year effects of home-based exercise colorectal cancer individuals following the rehabilitative intervention period [38]. However, further studies will be required to substantiate the hypothesis that home exercise improves clinical outcomes over the long term. However, the optimistic findings from individual research show that home-based exercise helps sustain numerous long-term outcomes of the various interventions that have been implemented.Globally, rehabilitation is being curtailed or restricted, making the deployment of effective solutions depending on the reference standard more challenging at this time. So creative means of social interaction might be vital in keeping patients motivated. Alternatives like home-based exercise and/or telerehabilitation, which apply to all patients with chronic illness, face an even greater problem in light of this [39].

4. CONCLUSION

Research evidence is weak in the realm of home-based fitness therapies for cancer survivors. It is also important to note that all research was constrained in line with this study and reporting. According to this new research, home-based exercise therapies for cancer survivors may be practical and give physiological and psychological advantages throughout the rehabilitation phase, despite the methodological constraints of studies. Further clinical studies are necessary to make progress in this area of inquiry, particularly for elderly cancer individuals.

5. ACKNOWLEDGMENT

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6. DATA AVAILABILITY

This is a review, and no data sets were used in the manuscript.

7. CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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SP-07

The Role Of Stabilization Of Mast Cell Membranes By Sodium Cromoglicate In Smooth Muscle Contraction Of Trachea And Bronchi Of The Rat In The Conditions Of The Physiological Norm

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Abstract: The article discusses the role of stabilization of mast cell membranes with sodium cromoglycate in the contractile activity of smooth muscles of the trachea and bronchi. The studies were carried out on isolated preparations using electrical stimulation of postganglionic nerves (frequency - 30 stim/s, duration - 0.5 ms, amplitude - 20 V, duration of stimulation - 10 s). As a result of the study, it was found that the stabilization of mast cell membranes with sodium cromoglycate promotes an increase in the contractile activity of smooth muscle under physiological conditions. An increase in muscle contraction in response to sodium cromoglycate developed even after the atropine blockade of cholinergic receptors. When C-fibers were inactivated, the muscle contractile responses obtained after the administration of sodium cromoglycate decreased. Probably, the bronchoconstrictor effect of sodium cromoglycate is caused by the elimination of the dilating function of mast cells under normal physiological conditions.

Keywords: sodium cromoglycate, mast cells, acetylcholine receptor blockade.

INTRODUCTION

The qualitative and quantitative composition of pollutants in the surrounding air is constantly increasing, and therefore the epidemiological situation concerning the incidence of allergic bronchial asthma is deteriorating. For this reason, there is a growing interest in drugs that stabilize mast cell membranes. Several membrane stabilizers are fairly well understood. For example, the physiological effect of a drug such as nedocromil sodium on the human respiratory tract is described in the works of Joos G., Connor B.[1]. Recently, sodium cromolyn is often used for therapeutic purposes. However, the mechanism of action of this drug and its physiological effects remain unclear. Established membrane-stabilizing and anti-inflammatory function of sodium cromoglycate. A significant decrease in the number of mast cells, eosinophils, CD4-lymphocytes, and macrophages as a result of the use of sodium cromoglycate was found[2]. Stabilization of cell membranes is associated with an indirect blockade of the penetration of calcium ions through the membrane. This leads to the blocking of the formation of the connection of the membranes of the mast cell granules with the outer membrane. As a result, the release from granules of histamine, bradykinin, leukotrienes, prostaglandins, and other biologically active substances mediating inflammation and bronchospasm is inhibited[3-4]. Most of the current research on the use of this drug is aimed at assessing the overall therapeutic effects. A significant decrease in the number of attacks in patients with allergic bronchial asthma after prolonged use of pharmacological preparations based on sodium cromoglycate has been proven[1]. It was found that sodium cromoglycate prevents the development of allergic and inflammatory reactions, prevents bronchospasm during sensitization of the body, and severe allergic asthma[4]. In models of ovalbumin-sensitized guinea pigs with asthma, it was found that sodium cromoglycate significantly inhibits the late stage of the allergic reaction and, to a lesser extent, the early stage. In such animals, sodium cromoglycate suppresses the inflammatory effects of interleukin-5, prevents tissue damage by reactive oxygen species, and prevents further development of obstructive pathology[5]. It has been shown that a decrease or complete cessation of smooth muscle contraction in guinea pigs after the introduction of sodium cromoglycate, preceding the introduction of antigen and sensitization[6-7]. Hasan S. S. in his studies indicates the dose-dependent effect of sodium cromoglycate on the muscle of the bronchi. When treating guinea pig bronchial preparations previously sensitized with ovalbumin, sodium cromolynate reduced or completely stopped bronchoconstriction in direct proportion to the applied concentration: at a concentration of 10-8 g/ml, the drug practically did not eliminate bronchoconstriction, and at a concentration of 10-6 g/ml completely stopped pathological contraction muscles[2]. The effect of sodium cromoglycate was studied in a model of chronic obstructive pulmonary disease induced in rats by exposure to nitrogen dioxide. It has been shown that the suppression of mast cell degranulation and the release of endogenous histamine by stabilizing the cell membrane with sodium cromoglycate prevents the development of hyperreactivity of bronchial smooth muscles[8-10]. This study aimed to study the physiological role of stabilization of mast cell membranes with sodium cromoglycate in contractions of the muscles of the trachea and bronchi of rats under physiological conditions using electrical stimulation of postganglionic nerves against the background of blockade of C-fibers and cholinergic receptors. This article presents the results of experiments on the effect of sodium cromoglycate on the contraction of the muscles of the trachea and bronchi both against the background of saline and against the background of eliminating the effects of the intramural metasympathetic ganglion and C-fibers. In the modern scientific literature, there is rarely information about the role of mast cell membrane stabilizers in smooth muscle contractions, taking into account the effects of the metasympathetic nervous system.

MATERIALS AND METHODS

The object of the study was 20 Wistar rats of both sexes with a bodyweight of 180-250 g. Prepared preparations of the trachea and bronchi were placed in chambers with Krebs-Henseleit saline solution, where the required oxygen level and temperature regime were maintained. For research, we took the trachea and bronchi areas in the bifurcation area, since these zones of the

respiratory tract are characterized by a large accumulation of intramural metasympathetic ganglia. We studied the change in the responses of the smooth muscle of the trachea and bronchi, caused by electrical stimulation of postganglionic nerves to pharmacological drugs. The work analyzed the maximum and minimum amount of contraction. The minimum amount of contraction can be considered as a relaxation effect, and the maximum - as a constrictor one (taken into account as a percentage of the background level of activity, taken as 100%). In the experiments, a physiological complex was used that maintained the normal course of physiological processes in isolated preparations. The complex included special chambers for placing trachea and bronchial preparations in them, an ultrathermostat, an aerator, a peristaltic pump (ML0146/CV, Multi Chamber Organ Baths, Panlab, Germany), electromechanical sensors (Grass FT-03 force-displacement transducer, Astro Med, West Warwick, RI, USA), electro stimulator (direct-current stimulator, Grass S44, Quincy, MA, USA), personal computer, special software (Chart v4.2 software, Power Lab, AD Instruments, Colorado Springs, CO, USA).Statistical analysis was performed using the SPSS statistical package, version 10.0 (SPSS, USA). Comparison between groups of control and experimental results were performed using independent t-tests. A p-value <0.05 was considered statistically significant. Data were expressed as mean, standard deviation.The electrical stimulator made it possible to irritate the drugs with an electric field. Silver electrodes were placed on both sides of the specimen. When the postganglionic nerves were stimulated, the frequency was 30 stim/s, the duration was 0.5 ms, the amplitude was 20 V, and the stimulation duration was 10 s. The registration of contractile activity was carried out by an electromechanical sensor. The contraction (tension) of the smooth muscle was converted into an electrical signal, which was fed to a personal computer for further processing[8].During the experiments, the following substances were injected exogenously: adenosine (10 μg/ml to activate mast cells as a 0.2 ml application, Sigma-Aldrich, Germany), sodium cromoglicate (100 μg/ml as perfusion to stabilize mast cell membranes Sigma -Aldrich, Germany), atropine (5 μg/ml as perfusion to block neuromuscular transmission, Sigma-Aldrich, Germany), capsaicin (1 μg/ml as perfusion for 30 minutes to inactivate C-fibers, Sigma- Aldrich, Germany).This study was carried out under the principles of the Basel Declaration and the recommendations of the European Commission on the euthanasia of experimental animals[9].

RESULTS

Before the effect of stabilization of mast cell membranes on smooth muscle contraction was evaluated, experiments were carried out to determine the significance of membrane destabilization with mast cell degranulation in muscle contraction. Against the background of saline and upon stimulation of postganglionic nerves, the mast cell activator, adenosine, caused an increase in the contractile responses of tracheal smooth muscle to 114.81 ± 2.61%. On the bronchi, the responses were slightly lower than 108.22 ± 1.91% (Fig. 1).When cromoglycate sodium entered the baths with preparations of the respiratory tract, the contractile responses increased both relative to the Krebs-Henseleit saline solution and relative to the action of adenosine. The responses of the trachea reached 148.75 ± 2.41%, bronchi - 140.11 ± 2.14% (p <0.05).

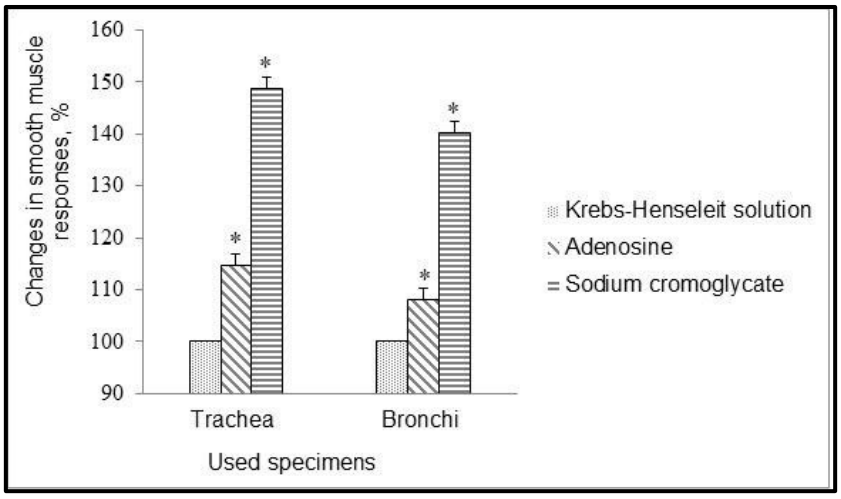

Fig I: The contractile responses of the smooth muscle of the trachea and bronchi against the background of the action of adenosine and sodium cromoglycate.

**** - significant (p <0.05) difference from control values***

Adenosine leads to partial degranulation of mast cells and increases the contractile responses of the tracheal and bronchi muscles within normal physiological values. Stabilization of mast cell membranes with sodium cromoglycate leads to a strong increase in contractile responses in the conditions of the physiological norm. Blockade of cholinergic receptors with atropine (Fig. 2) led to inhibition of smooth muscle contraction in response to electrical stimulation. The tracheal muscle responded to stimulation of postganglionic nerves equal to 18.32 ± 2.91%, bronchi - 15.25 ± 1.82%. When cromoglycate sodium was introduced into the bath with preparations, while maintaining the blocked state of cholinergic receptors, the contractile responses increased again. The responses of the trachea, in that case, increased to 82.11± 3.11%, bronchi - to 75.43 ± 2.03% (p <0.05).

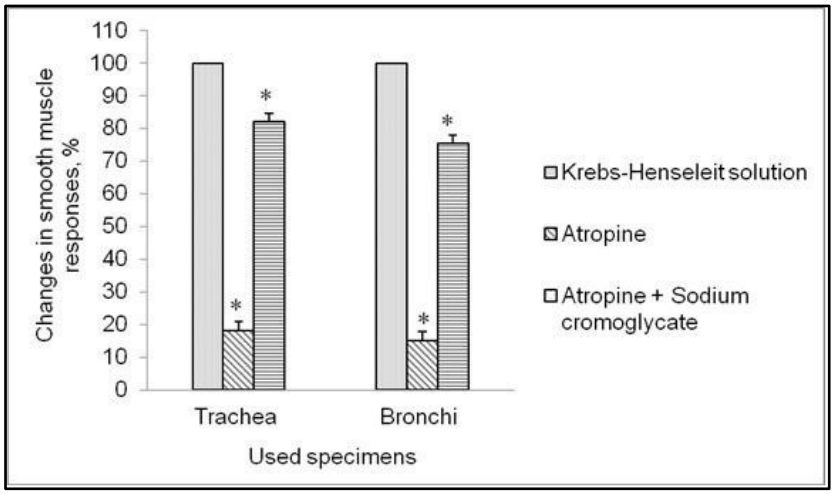

Fig II: Contractile responses of the smooth muscle of the trachea and bronchi against the background of the action of atropine and sodium cromoglycate.

**** - significant (p <0.05) difference from control values***

Atropine leads to a strong decrease in contractile responses of the tracheal and bronchi muscles. Stabilization of mast cell membranes with sodium cromoglycate against the background of atropine leads to an increase in contractile responses. With the depletion of sensitive C-fibers with high doses of capsaicin (Fig. 3), contractile responses decreased to 94.31 ±1.81% in tracheal preparations. The muscle of the bronchi showed less muscle contraction, which was 85.23 ± 1.54%. When cromoglycate sodium was introduced into baths with preparations, an increase in contractile responses occurred. Tracheal muscle responses increased up to 135.77 ± 3.22%. The bronchial responses were slightly lower and amounted to 130.21 ± 3.56% ($p < 0.05$).

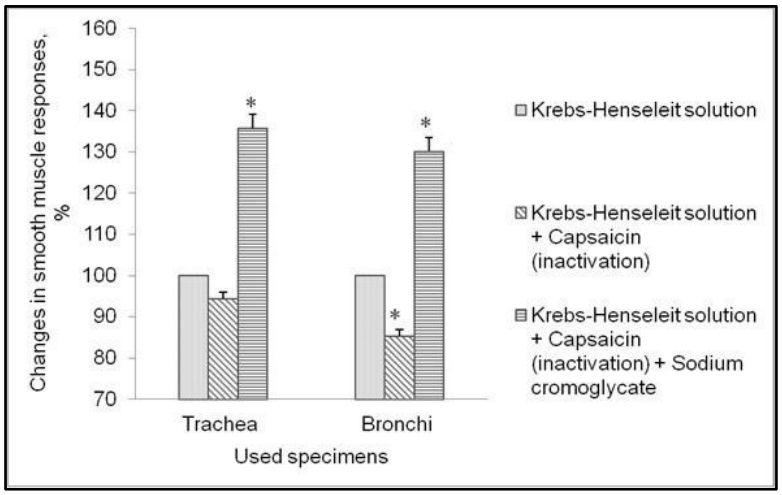

Fig III: The contractile responses of the smooth muscle of the trachea and bronchi against the background of the action of high doses of capsaicin and cromolyn sodium.

**** - significant (p <0.05) difference from control values***

Inactivation of C-fibers with capsaicin leads to a decrease in the contractile responses of the trachea and bronchi. Sodium cromoglycate on the background of inactivated C-fibers leads to an increase in contractile responses.

DISCUSSION

The injection of adenosine, a substance that causes IgE-independent activation of mast cells, into the baths with preparations of the respiratory tract, a small increase in the contractile responses of the smooth muscle of the trachea, and bronchi was recorded in the case when stimulation of the postganglionic nerves was used. This increase can be regarded as a variant of normal physiological contraction. After the preparation was completely washed out with saline, sodium cromoglycate was injected into the trachea and bronchial tract trays. Further, electrical stimulation was performed. The smooth muscle responses, in this case, were significantly increased. Stabilization of mast cell membranes, both in tracheal preparations and in bronchial preparations, leads to an increase in contractile responses. That is, in conditions of smooth muscle contractions fluctuating within the physiological norm, sodium cromoglycate causes a constrictor effect. Most likely, this is due to the elimination of

partial degranulation of mast cells, which is observed under physiological conditions. With partial degranulation, small doses of histamine are released, which leads to a relaxation effect due to the activation of H2 and H3 receptors. When comparing the contractile responses of the muscles of the trachea and bronchi, obtained as a result of the administration of adenosine, with the responses of the muscles, obtained as a result of the administration of sodium cromoglycate (Fig. 1), it can be seen that the responses to sodium cromoglycate exceed those to adenosine. These results may indicate the presence of any additional receptors to sodium cromoglycate, which mediate the constrictor effect under normal physiological conditions or indicate a normal range of contractions during partial degranulation of mast cells in response to their moderate destabilization by adenosine. To identify the physiological effect of sodium cromoglycate and the role of mast cells, experiments were carried out with the use of an anticholinergic drug - atropine. Atropine made it possible to block cholinergic receptors and thereby eliminate the influence of local intramural ganglia. After the application of atropine, the responses of the trachea and bronchi were greatly reduced, since the leading reflex pathways in the contraction of smooth muscles pass through the ganglion. However, the addition of sodium cromoglycate to atropine resulted in increased responses. The responses of the trachea and bronchi, in this case, were lower than the control values obtained against the background of saline, but significantly higher than the responses obtained against the background of atropine alone. Thus, sodium cromoglycate, even against the background of a blockade of neuromuscular transmission under conditions of a physiological norm, leads to an increase in the contractile activity of smooth muscle. This can be explained by the elimination of the dilating function of mast cells under normal physiological conditions. If we compare the magnitude of muscle contraction as a result of sodium cromoglycate administration against the background of saline (Fig. 1) and the background of atropine (Fig. 2), we can see the predominance of contractile responses against the background of saline. This may indicate that, under physiological conditions, the metasympathetic ganglion has a synergistic effect on the effects of mast cells mediated by sodium cromoglycate. In the effects associated with sodium cromoglycate, muscle contraction is sufficiently associated with mast cell blockage. Perhaps this effect is associated with the great significance of the dilating effect of mast cells under normal conditions or with the presence of any other structures that have receptors for sodium cromoglycate and lead to an increase in contraction.The results obtained in our studies concerning the physiological effect of sodium cromoglycate contradict the data of Hasan S.S., Salat M. Y. obtained in experiments on guinea pigs[2] and with the data of Lin Y.Y., Chou Y.L. obtained in experiments on rats[10]. Most likely, the discrepancy in the results is because these authors worked under conditions of a pathological organism (sensitized animals with allergic asthma). Under such conditions, the use of sodium cromoglycate led to a decrease in the contractile responses of the smooth muscle of the respiratory tract, due to the stabilization of mast cell membranes and the cessation of volumetric degranulation. Since mast cells under conditions of a physiological norm have a relaxation effect, and under conditions of allergy - a constrictor (due to the release of different concentrations of histamine), sodium cromoglycate leads to different physiological effects in different situations.C-fibers play an important role in the contraction of the muscles of the trachea and bronchi. Taking into account the mutual physiological influence of C-fibers and mast cells, and their joint significance in the contraction of smooth muscles, it is important to establish the role of blockade of mast cells with sodium cromoglycate under conditions of blocked C-fibers. In the modern scientific literature, there is no information on the role of sodium cromoglycate in muscle contraction against the background of the effects of C-fibers. In our studies, with blockade of C-fibers, contractile responses decreased, which is associated with the elimination of the excitatory effect of these structures. But when cromoglycate sodium was introduced into baths with preparations, there was a strong increase in muscle responses up to 135.77 $\pm$ 3.22% in tracheal preparations and up to 130.21 $\pm$ 3.56% in bronchi. However, if we compare the magnitude of muscle responses to sodium cromoglycate against the background of saline (Fig. 1) and the background of C-fiber blockade (Fig. 3), then the prevalence of contraction against the background of saline is obvious. Such results may indicate the role of C-fibers in the physiological effect of sodium cromoglycate. While maintaining the activity of C-fibers (muscle responses against the background of a saline solution), stabilization of membranes with sodium cromoglycate leads to greater contractile responses, in comparison with the responses obtained under conditions of inactivation of C-fibers. The obtained result may indicate a synergistic role of C-fibers in the contractile activity of smooth muscle together with mast cells and intramural ganglion. However, the role of C-fibers should be characterized as less significant than the effect of the ganglion in muscle contraction mediated by the stabilization of mast cell membranes. It is also possible that C-fibers have receptors for sodium cromoglycate, which has an exciting effect on them. In the literature, there was information about the presence of receptors for sodium cromoglycate on the membranes of cells involved in the immune response[2], but we could not find data on the presence of receptors for this compound on afferent C-fibers.

CONCLUSION

Thus, under physiological conditions in rats, stabilization of mast cell membranes with sodium cromoglycate promotes an increase in the contractile activity of smooth muscle of the trachea and bronchi, which is probably associated with the cessation of partial degranulation of mast cells and, to a sufficient extent, with the effect of the intramural ganglion. To a lesser extent, smooth muscle contractions mediated by the stabilization of mast cell membranes with sodium cromoglycate are associated with the effects of C-fibers.

AUTHORS CONTRIBUTIONS

All authors have contributed equally to this work.

ACKNOWLEDGMENTS

Not applied.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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SP-08

Study Of The Expression Of Receptors To Il4, Il4r Genes In Trachea And The Role Of Il4 In Contraction Of Tracheal Muscle Among Rats

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Abstract: This article examines the effect of IL-4 on the contraction of the muscles of the trachea and bronchi of rats, demonstrates the results of studies of the levels of expression of the IL4R gene and the levels of expression of molecular IL4R in the trachea of control and sensitized rats. The choice of this interleukin and its receptors is due to the great importance of these structures in the sensitization and pathogenesis of allergic bronchial asthma. The trachea of 20 Wistar rats were studied using real-time PCR, immunohistochemical method, and mechanography using electrical stimulation of nerve fibers. As a result of the studies, it was found that under sensitization conditions in the rat trachea tissues there is a pronounced expression of IL4R genes, a significant expression of the molecular receptor for interleukin-4, and an increase in the constrictor effect on smooth muscle due to the influence of the cytokine interleukin-4 on it. In tracheal regions containing intramural ganglia (bifurcation region), the level of expression of IL4R genes, the level of expression of the molecular receptor IL4R, and the magnitude of muscle contractile responses in response to interleukin-4 administration were significantly higher than in trachea samples without ganglia.

Keywords: proinflammatory cytokine, sensitization, intramural ganglion, smooth muscle.

INTRODUCTION

This article examines the effect of IL4 on the contraction of the muscles of the trachea and bronchi of rats, demonstrates the results of studies of the levels of expression of the IL4R gene and the levels of expression of molecular IL4R in the trachea of control and sensitized rats. The choice of this interleukin and its receptors is due to the great importance of these structures in the sensitization and pathogenesis of allergic bronchial asthma[1-5]. CheXiao-wen and ZhangYing point to a significant role of the prion flammatory cytokine, IL4, in the pathogenesis of asthma in the early stages. Scientists report that a beneficial effect in the treatment of bronchial asthma can be achieved by suppressing the synthesis of this interleukin. Also, IL4 increases airway hyper responsiveness in patients with asthma[1]. Liu XJ, Xin ZL. in their studies have shown that the level of IL4 in the blood and the bronchoalveolar fluid in patients with asthma significantly exceeds normal values and correlates with the level of IgE[2,6-8]. IL4 stimulates the production of IgE, which binds to the Fcε receptors of mast cells, leads to their activation with the release of pro-inflammatory mediators (histamine, leukotrienes, prostaglandins, and cytokines, which are known triggers of asthma exacerbation), which contribute to the development of pronounced contraction of smooth muscles of the trachea and bronchi[9-12].According to A.G. Chuchalin, IL4 is a therapeutic target for monoclonal antibodies in the treatment of bronchial asthma. Biological inhibition of IL4 by monoclonal antibodies leads to a decrease in the level of IgE in the blood serum and a decrease in the contractile activity of the tracheobronchial muscles[4]. In sensitized rats, exposure to ovalbumin caused a significant increase in the expression of IL-4[5,6,13,14]. IL4 signaling is via a specific receptor. The IL-4 receptor is a heterodimeric complex, in which the IL4Pα chain is necessarily present, which has a high affinity for IL4[8,15,16]. The receptor for human IL-4 is a trans membrane protein and exists in membrane-bound and soluble forms. Signal transduction occurs via STAT-6, which are critical molecules for IL4 signal transduction[9,17,18].In the absence of a cytokine, both subunits of the receptor are dissociated in the cell membrane, and their association occurs after IL4 binding[10, 8]. After assembly of the complex, signal transduction into the cell is carried out by activation of STAT6 (Signal transducer and activator transcription)[10,19]. The effect of IL4 on gene expression is mediated through the transcription factor STAT6, which is phosphorylated at the Tyr641 residue and dimerized in the cytoplasm, after which it is translocate into the nucleus[11,20]. In the nucleus, the STAT6 dimer binds to its specific site TTC-GAA, separated by 4 nucleotides[12,21,22]. IL4 initiates signal transduction into the cell through the membrane receptor complex, which can be of two types. The receptor for IL4 (IL4R) type I consists of an α-chain (IL4Rα) and a γ-chain. This type of receptor is located on the surface of immune cells and binds to IL4 with high specificity. IL4R type II consists of two subunits, IL4Rα and IL13Rα1, which are expressed by hematopoietic cells and can bind both IL4 and IL13. IL4 acts by triggering the Janus kinase/Signal Transducer and Activator of Transcription (JAK/STAT) signaling pathway, the main pathway for intracellular signal transmission from the cytokine receptor13, 14. Type I and II receptors are activated by STAT6[10,23].

MATERIALS AND METHODS

Equipment

In the experiments, a physiological complex was used that maintained the normal course of physiological processes in isolated preparations. The complex included special chambers for placing trachea and bronchial preparations in them, an ultra thermostat, an aerator, a peristaltic pump (ML0146/CV, Multi Chamber Organ Baths, Panlab, Germany), electromechanical sensors (GrassFT-03 force-displacement transducer, Astro Med, West Warwick, RI, USA), electro stimulator (direct-current stimulator, GrassS44, Quincy, MA, USA), personal computer, special software (Chartv4.2 software, PowerLab, AD Instruments, ColoradoSprings, CO, USA).

Animals manipulations

We studied 20 Wistar rats of both sexes with a bodyweight of 190-270 g. Females were taken for experiments during the period of diestrus. The animals were kept in a vivarium, which met all the requirements for the conditions of keeping animals. To obtain samples of the respiratory tract, decapitation was performed with preliminary anesthesia. This approach ensured the rapid euthanasia of the animal (recommendations for the euthanasia of experimental animals, European Commission)[18]. Then the animal was fixed on the dissection table. After that, the chest was opened and then an operation was performed with the extraction of the animal's airways[19]. The airways were washed in Krebs-Henseleit solution, and then trachea preparations were prepared. Each specimen was a trachea sample 0.4-0.6 cm long and 0.5-0.7 cm wide. Samples of the trachea were taken from the bifurcation region (trachea preparations with ganglia) and in the area of straight sections (trachea preparations without ganglia). The tracheal incision line passed through the cartilaginous half rings. The smooth muscle remained intact. Tracheal preparations were placed in a chamber with Krebs-Henseleit solution, where one edge of the preparation was fixed with needles, and the other edge of the preparation was installed with hooks-holders attached to an electromechanical sensor recording the magnitude of the contractile response (measured in mn).

Experiment scheme

Two groups of animals were formed: a control group (received saline) and an experimental group with induced sensitization. Further, the assessment of tracheal muscle contraction, the level of expression of the IL4R gene, and the level of expression of receptors for IL4 in the tracheal preparations of the control and experimental groups were carried out. This study was carried out under the principles of the Basel Declaration and the recommendations of the European Commission on the euthanasia of experimental animals.

Animal sensitization procedure

The rats were sensitized with the introduction of ovalbumin (Sigma-Aldrich, Germany). For a one-time sensitization procedure, 0.5 mg of ovalbumin was dissolved in 1 ml of saline. Then the ovalbumin solution was injected subcutaneously in 0.1 ml doses into the neck, back, both feet, groin, and 0.5 ml of ovalbumin solution was additionally injected intraperitoneally (the total volume of ovalbumin solution administered to one animal was 1 ml). Sensitization procedure with ovalbumin injections on the 1st, 14th, and 21st days. In parallel with the injections of the ovalbumin solution, inhalation with ovalbumin was carried out using a nebulizer on the 14th, 16th, 18th, 21st, and 24th days. For this, the rats were placed in an exposure chamber connected to a nebulizer (Omron, NEC29-E, Russia?). Ovalbumin in an amount of 1 g was dissolved in 100 ml of saline. The ovalbumin solution was sprayed for 30 minutes with a yield of 3 ml/mn and an average particle size of 3.2 μm. The last inhalation with ovalbumin solution was carried out 72 hours before the euthanasia of the animals. The nonsensitized group was injected with physiological saline intraperitoneally as a control[20].

Electrophysiological and mechanographic experiments

In all experiments, stimulation with an electric field was used. For this, two silver electrodes were placed in the chambers with the preparations. During the work, electrical stimulation of postganglionic nerve fibers was used (stimulus frequency - 30 Hz, duration - 0.5 ms ", amplitude - 20 V, duration of stimulation - 10 C). Electrical stimulation simulated the natural conduction of electrical impulses through the postganglionic link of the reflex circuit. In the experiments, the contractile reaction of the smooth muscles of the trachea of the rat was studied using electrical stimulation and pharmacological agents. First, electrostimulation of tracheal preparations was performed. Then the contractile reactions of the muscles were recorded. These answers were taken as the baseline (or 100%). After that, a solution of interleukin-4 was added and the contractile reactions of the muscles were recorded. Thus, the reactions of the tracheal muscles were recorded, taking into account electrical stimulation and the influence of interleukin-4. The magnitude of contractile reactions to the use of the drug largely depended on the initial tone of smooth muscles, as well as on the control contractile reactions due to the use of electrical stimulation against the background of physiological solution. Even though all animals were of the same age, and the sample was homogeneous, the variability of the initial tone and control responses (measured in mn) of organs such as the trachea was quite high, and this fact determined the accounting for the reduction in percentage (calculated as a percentage of baseline activity level taken at 100%). Methods of electrical stimulation of postganglionic nerves are taken from research methods proposed by A. N. Fedin[21].

STATISTICAL ANALYSIS

Statistical analysis was performed using the SPSS statistical package, version 10.0 (SPSS Inc., Chicago, Illinois, USA). Comparison between groups of control and experimental results were performed using independent Student's t-tests (Student's t-test). A P value <0.05 was considered statistically significant. Data were expressed as mean, standard deviation.

Pharmacological procedure

Perfusion was performed with Krebs-Henseleit solution. In the chambers with the preparations, the required oxygen level, temperature (370C), and pH (6.9 - 7.1) were maintained. The inflow of fresh Krebs-Henseleit solution was provided regularly, as was the outflow of the used one[21]. In the course of the experiments, interleukin-4 (Sigma-Aldrich, USA) was injected

exogenously into the chambers with preparations at a concentration of 150 ng/ml using perfusion for 120 min, after which the contractile activity was recorded.

RESULTS

Results of immunohistochemical studies

In control preparations of the trachea with ganglion, 396.61 ± 102.86 cells expressed the molecular receptor for interleukin-4 (this indicator was 32.08 ± 8.32 IL4R-containing cells per 100 cells in a section). In experimental preparations of the trachea with ganglion, 909.05 ± 95.73 cells expressed the molecular receptor for interleukin-4 (66.94 ± 7.05 IL4R-containing cells per 100 cells per section) (Fig. 1, Fig. 2, Table 1). Differences in the levels of expression of molecular IL4R between cells in control and experimental preparations are significant (P = 0.03). In control preparations of the trachea without ganglion, 419.71 ± 97.36 cells expressed the molecular receptor for interleukin-4 (this figure was 31.64 ± 7.34 IL4R-containing cells per 100 cells in a section). In experimental preparations of trachea without ganglion, 688.39 ± 111.12 cells expressed the molecular receptor for interleukin-4 (50.06 ± 8.08 IL4R-containing cells per 100 cells per section) (Fig. 1, Fig. 2, Table 2). Differences in the levels of expression of molecular IL4R between cells in control and experimental preparations are significant (P = 0.04).

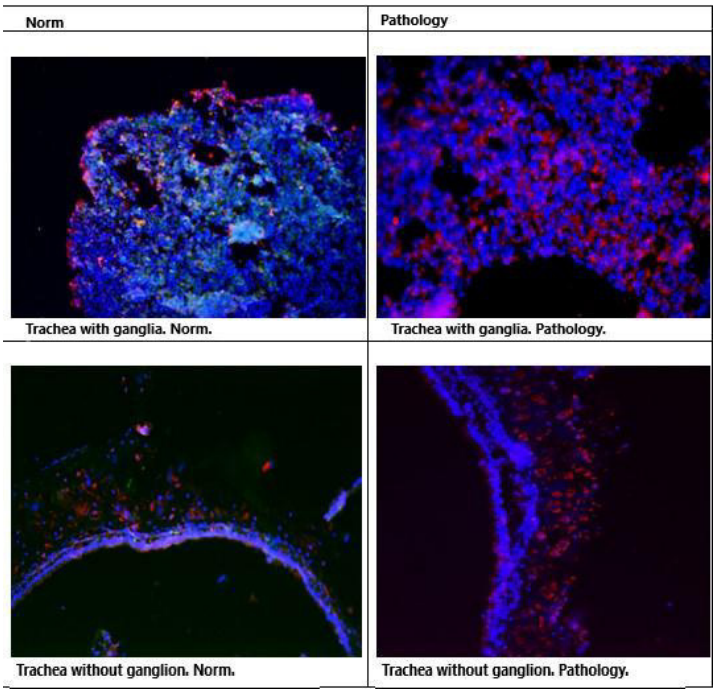

Fig I: Photos were taken with a light microscope. Cells containing the interleukin-4 receptor are marked with a red glow.

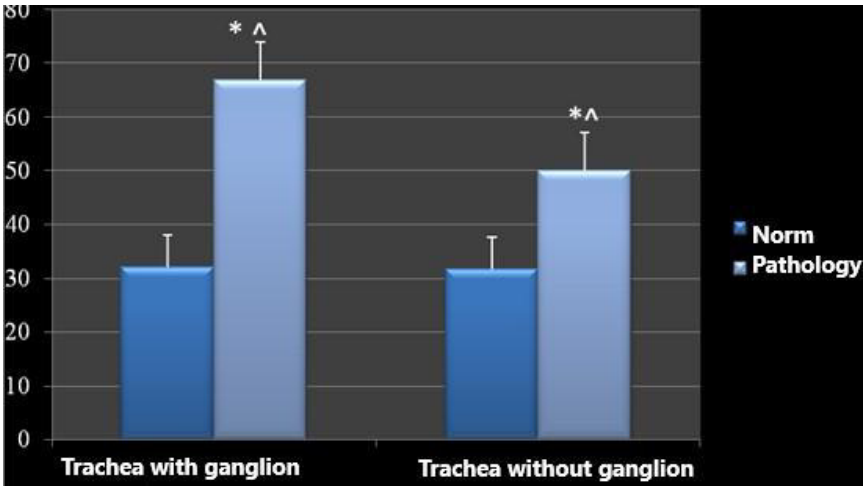

Fig II: Quantitative analysis of cells containing the receptor for interleukin-4.

* - Significant difference in the number of cells containing the receptor for interleukin-4 between control and experimental drugs.

^ - Significant difference in the number of cells containing a receptor for interleukin-4 between experimental preparations of mitrachea with ganglia and trachea without ganglia.

Table I: ***The total number of cells stained in the section and quantitative analysis of cells containing the receptor for interleukin-4 (preparation of the trachea with ganglion).***

Biological product	The total number of cells stained in the section	Total number of cells in a section with an interleukin-4 receptor	The number of cells in a section with an interleukin-4 receptor per 100 cells
Trachea with ganglion, norm	1236,33 ± 321,53	396,61 ± 102,86	32,08 ± 8,32
Trachea with ganglion, pathology	1358,05 ±278,22	909,05 ±95,73	66,94 ±7,05

Table II: ***The total number of cells stained in the section and quantitative analysis of cells containing the receptor for interleukin-4 (trachea preparation without ganglion).***

Biological product	The total number of cells stained in the section	Total number of cells in a section with an interleukin-4 receptor	The number of cells in a section with an interleukin-4 receptor per 100 cells
Trachea without ganglion, norm	1326,51 ± 302,97	419,71 ± 97,36	31,64 ± 7,34
Trachea without ganglion, pathology	1375,13 ±335,71	688,39 ±111,12	50,06 ± 8,08

DISCUSSION

The total number of cells expressing the molecular receptor IL4R significantly increased in the tracheal tissues under pathological conditions as compared with the tracheal tissues of healthy animals. In preparations of the trachea with ganglion, the number of such cells increased from 32.08 ± 8.32 in control animals to 66.94 ± 7.05 in animals with sensitization. In trachea preparations without ganglion, the number of cells containing the receptor for interleukin-4 was also higher in the trachea samples from animals with sensitization (50.06 ± 8.08 cells) than in control animals (31.64 ± 7.34 cells) Thus, under sensitization conditions in rats, there is an increase in the expression of the receptor for interleukin-4, and the number of cells containing this receptor significantly increases. If we compare preparations of the trachea with ganglion and preparations without ganglion, then in rats with sensitization there is a significant difference in the number of cells expressing IL4R. In samples of the trachea with ganglion, the number of such cells was higher than in samples without ganglion (66.94 ± 7.05 cells in a section of the trachea with a ganglion and 50.06 ± 8.08 cells in a section of a trachea without a ganglion). In control animals, there was no difference in the number of IL4R-containing cells. It can be assumed that neurons of the intarmural ganglion enhance the expression of the molecular receptor under pathological conditions. The level of expression of the IL4R gene was also significantly higher in tracheal preparations of animals with sensitization. In trachea samples with ganglia, the amount of mRNA was 0.31 ± 0.05 rel. Units. in control animals and 1.92 ± 0.11 relative units. in experimental animals. In trachea preparations without ganglia, the amount of mRNA was 0.22 ± 0.04 relative units. in control animals and 1.65 ± 0.09 relative units. in experimental animals. It can be concluded that under pathological conditions in the tracheal tissues there is a strong increase in the expression of genes encoding molecular IL4R. It should also be noted that the level of IL4R gene expression in trachea specimens with ganglia is higher than in trachea specimens without ganglion. Perhaps this is because drugs with ganglia increase neurogenic inflammation, which is accompanied by an attack of the trachea by proinflammatory agents, including the cytokine interleukin-4, which itself is known to induce IL4R gene expression through the STAT-6 signaling molecule. These results find indirect confirmation in the works of MikitaT., CampbellD[11], and SchindlerU., WuP.[12]. Mediators, metabolic products of nerve cells, or other signaling molecules secreted by them, directly or indirectly (through the processes of neurogenic inflammation) may serve as a signal for the start of expression of the IL4R gene. Studies on the effect of interleukin-4 on tracheal smooth muscle contractions have shown that this cytokine leads to a significant increase in muscle contractile responses, increasing obstructive events. Against the background of pronounced contractile responses in sensitized rats, interleukin-4 caused an additional increase in contractile responses from 3.06 ± 0.06 mN to 3.53 ± 0.07 mN in the tracheal muscle with ganglion and from 2.39 ± 0.07 mN to 2.71 ± 0.08 mN in tracheal muscle without ganglion. The large values of the contractile responses of the tracheal muscle with the ganglion can be associated with the greater expression of IL4R receptors in these regions of the respiratory tract as compared to the parts of the trachea without ganglia. Also, the sections of the trachea with the ganglion may differ in increased contractile activity due to the presence of local intramural metasympathetic reflex arcs in these sections. Our data on the effect of interleukin-4 on the contractile responses of rat smooth muscle find indirect confirmation in the studies of *Che, Xiao-wen, Y.*[1], and Chuchalin A. G.[4]

CONCLUSION

Thus, it can be concluded that under sensitization conditions in the rat trachea tissues there is a strong expression of the IL4R genes, significant expression of the molecular receptor for interleukin-4, and an increase in the constrictor effect on smooth muscle due to the influence of the cytokine interleukin-4 on it. In trachea regions containing intramural ganglia (bifurcation region), the level of expression of IL4R genes, the level of expression of the molecular receptor IL4R, and the magnitude of muscle contractile responses in response to interleukin-4 administration were significantly higher than in trachea samples without ganglia. It is assumed that these differences are due to the presence in these parts of the trachea of local intramural metasympathetic reflex arcs passing through the ganglia and the possible influence of neuronal biologically active molecules (mediators, signaling molecules, metabolic products, or other compounds) on the expression intensity of the IL4R gene.

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Not applied.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS CONTRIBUTIONS

All authors have contributed equally to this work.

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SP-09

Pulsatility Index: Short Review Of Technical Particularities And Factors Affecting Doppler Flow Velocity Of The Umbilical Artery

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Abstract: The pulsatility index (PI) is now the most widely used index for assessing uterine artery Doppler waveform patterns. So it involves the portion below the curve, the PI best explains the shape of the velocity waveform. This review aimed to clarify the technical particularities and difficulties and to demonstrate also the factors that affect the Doppler flow velocity of the umbilical artery (UA). It was demonstrated that there are certain technical methods showing particularities and difficulties during intrapartum Doppler examination. The greatest important complications associated with the examination techniques include changes in circulatory parameters and fetal during uterus contractions, also the movements of maternal respiration could make it difficult to record Doppler signals, and reduced amniotic fluid volume difficulties of the Doppler examination of fetal vessels, particularly after the rupture of membranes. Additionally, some factors affect Doppler flow velocity waveforms of the umbilical artery (UA) such as gestational age, fetal heart rate, fetal respiration movement, measurement's site, UA radius, the experience of the users, impedance to pulsatile flow propagation, increasing of downstream resistance, and angle of the fetal Doppler insonation.

Keywords: Pulsatility index, Umbilical cord, Doppler velocimetry, Uterine artery

INTRODUCTION

Intrapartum Doppler velocimetry of uterine and umbilical arteries is a non-invasive diagnostic modality, convenient for evaluating the fetal hemodynamics and provides evidence on the fetoplacental and uteroplacental perfusions and the fetal adaptive mechanisms [1,2]. Various Doppler indices were demonstrated for the assessment of the velocity waveform of the uterine artery during pregnancy including the common parameters as the following:

- Time Average Velocity (TAV)
- Systolic Velocity / Diastolic Velocity Ratio of the UA
- Resistive Index (RI)
- Pulsatility Index (PI)
- Peak Systolic Velocity (PSV)
- Mean Velocity (MV)
- End-diastolic Velocity (EDV)

However, Pulsatility Index (PI) is presently the commonest utilized index for the evaluation of uterine artery Doppler waveform patterns. The PI clearly better explains the shape of the velocity waveform, as it comprises the area below the curve in the formula; PI = PSV – EDV / MV. [3] UC is the lifeline that connects the fetus to the placenta [4,5] . The UC in a full-term human neonate average approximately ~50 to70 cm (20″) long and approximately ~2 cm (0.75″) in diameter. It covers from the umbilicus of fetus to the placenta or chorionic plates through the fetal surface connection. The US contains one vein and two arteries (one umbilical vein and two umbilical arteries) repressed within Wharton's jelly as displayed in Figure 1. Nutrients and oxygenated blood are attained from the placenta toward the fetus through the umbilical vein. However, exhausted nutrients and deoxygenated blood are carried from fetus to placenta over the two umbilical arteries. Blood flow impairments inside UC may lead to disastrous issues for the fetus [6].

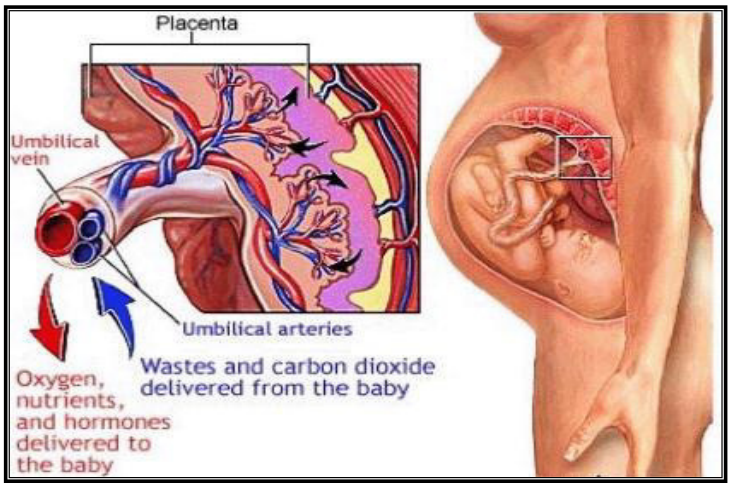

Fig I: Vascular Anatomy and Physiology of the Umbilical Cord 6

MATERIALS AND METHODS

The placenta is an exceptional vascular organ that receives blood supplies from both the fetal and maternal systems, resulting in two distinct blood circulation systems: fetoplacental blood circulation and uteroplacental blood circulation. Through decidual spiral arteries, the circulation of uteroplacenta is normally starting with the blood flow of the maternal into the intervillous space. Nutrients and oxygen exchanges occur with blood flow of the maternal in the intervillous space around terminal villi. The deoxygenated blood is pushed into the endometrial by the blood flow of the maternal artery and consequently moves back to the maternal circulations through uterus veins [6,7]. The circulation of the fetal placenta permits the carrying of exhausting nutrients and deoxygenated fetal blood through umbilical arteries from the fetus to the fetal vessels of the villous core. After nutrients and oxygen exchanges, the fresh nutrients and oxygenated blood are carried by the umbilical vein into the systemic circulation of the fetus. At term, the blood flow of the materna to the placenta is around 700 to 600 milliliters /min [6]. Pressure drops significantly as the uterine arteries give way to the intervillous spaces. The pressure in the uterine arteries, the spiral arteries, and the intervillous space is around 80 to100, 70, and 10 millimeters of mercury respectively. Because of the gradually blood pressure between the uterine arteries and the placental intervillous space and, the low resistance of uteroplacental vessels, the maternal blood can perfuse the intervillous space effectively and efficiently. In general, the wall of the uterus is parallel to veins, while the wall of the uterus is vertical to arteries. This anatomical feature assists veins to closure during contracted uterus and prevents blood flow of mother from the intervillous space [6,7].

RESULTS AND DISCUSSION

Uterine contraction causes a decrease in uteroplacental blood flow. Intrauterine Pressure (IUP) measurement in labor shows that uterine artery blood flow decreases during diastole as pressure rises and falls to zero when IUP reaches approximately 35 to 60 millimeters of mercury. However, fetal umbilical blood flow is significantly less affected, and the fetus can generally compensate for the brief interruption in circulation. Fetal asphyxia occurs if the fetal reserve is already compromised or if there is a tetanic contraction. [8] During intrapartum Doppler examination, there are certain technical methods showing particularities and difficulties. The greatest important complications associated with the examination techniques under labor condition can be created as the following [1,2]:

- During labor, uterus contraction leads to changes in the parameters of the maternal circulation.
- During uterus contractions, the movements of the maternal respiration are frequently taking place that causes difficulty of continual recordings of the Doppler signals.
- The volume of amniotic fluid is reduced in term pregnancy, especially after the membranes rupture, causing difficulties of fetal vessels examination by Doppler.
- The shape of the abdominal wall changes as a result of uterine contractions. In addition, uterine contractions may make modifications in the transducer position, which may result in the loss of the signals of the Doppler.
- In concerning with a fetal skull that is deeply involved in excavating the pelvis, there are obstacles in waves recorded of fetus cerebral vessels during transabdominal Doppler [1].

The ascending division of the uterus artery is well-known by colored and pulsed Doppler ultrasound to record the spectrum of the Doppler. The peripheral vascular resistance is examined by the telediastolic flow aspect [9]. The umbilical cord is best visualized at the point of placental insertion (lower mobility area). The aspect of the UA spectrum corresponds to a vessel supplying an organ with relatively low vascular resistance, with diastolic flow accounting for approximately 30 percentages of the systolic flow value (Figure 2) [1].

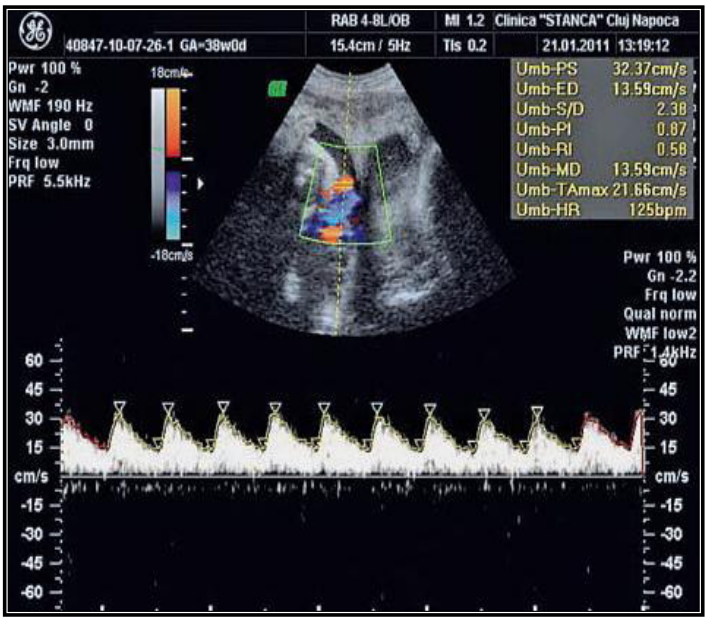

Fig II: UA Color Doppler and Normal Pulsed I

CONCLUSION

- Gestational Age: End-diastolic flow velocity ratio rises with advanced gestational ages.
- The Heart Rate of the Fetus: End-diastolic flow velocity is commonly decreasing with a decreased heart rate of the fetus.
- The Movements of Fetal Respiration: Leads to an increase in measurement variations.
- Measurement's Site: End-diastolic flow velocity is commonly lower near the placental insertion than the UC extended into abdomen of the fetus.
- Used Equipment: Continuous Doppler is more a "blinded technique" in comparison to Pulsed Doppler, allowing two dimensions of real-time ultrasound.
- The Experience of the User: Increasing user experiences are combined with more reliability.
- The UA Radius: The decrease in vasoconstriction leads to rise in end-diastolic flow velocity.
- Impedance to pulsatile flow propagation increases vascular impedance which increasing end-diastolic flow velocity.
- Increasing downstream resistance within the microcirculation decreases end-diastolic flow velocity.
- The angle of the fetal Doppler insonation is the best if less than 45˚73; <15˚ for middle cerebral artery absolute peak systolic flow velocity [10-12].

DATA AVAILABILITY

No data were used to support this study.

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CONFLICT OF INTEREST

There are no competing interests to disclose.

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