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Enhancing Cardiovascular Health with Enhanced External Counter pulsation Therapy: A Comprehensive Review

Aakifa Shahul[1], A.S.Hovan George[2], A.Shaji George[3]

[1]Student, SRM Medical College, Kattankulathur, Tamil Nadu, India.
[2,3]Masters IT Solutions, Chennai, Tamil Nadu, India.

Abstract - Enhanced External Counter pulsation[1] (EECP) therapy is a non-invasive[1] treatment that has shown promise in enhancing cardiovascular health in patients with various heart-related conditions. EECP therapy involves the use of cuffs that are wrapped around the patient's lower extremities, which inflate and deflate in synchronization with the patient's heartbeat, effectively increasing blood flow to the heart. In recent years, EECP therapy has gained popularity as an alternative or complementary treatment option for patients who have failed conventional therapies, or for those who are unable to undergo invasive procedures. This comprehensive review aims to evaluate the effectiveness of[1] EECP therapy in enhancing cardiovascular health by analyzing the results of existing studies. A systematic literature search was conducted in major databases, including PubMed, Cochrane Library, and Embase, to identify relevant studies published between 2000 and 2022. The search included randomized controlled trials, observational studies, and systematic reviews that assessed the impact of EECP therapy on various cardiovascular outcomes. Our study included 27 studies, with a total of 500 patients. Moreover, EECP therapy was found to be safe and well-tolerated, with no serious adverse events reported. The findings of this study provide evidence supporting the use of EECP therapy as a safe and effective treatment option for patients with various cardiovascular conditions. Furthermore, the results suggest that EECP therapy may have potential benefits beyond the improvement of cardiovascular health, such as reducing the risk of hospitalization and improving quality of life. In conclusion, this comprehensive review provides a comprehensive evaluation[3] of the effectiveness and safety of EECP therapy in enhancing cardiovascular health. The results of this study support the use of EECP therapy as a non-invasive and well-tolerated treatment option for patients with various cardiovascular conditions and provide valuable insights for future research and clinical practice.

Keywords: EECP therapy, Non-invasive, intra-aortic balloon pump (IABP), Coronary artery blockage, Angioplasty, Improved quality of life, cardiovascular, Enhanced External Counter pulsation.

1. INTRODUCTION

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality worldwide. It is estimated that CVD is responsible for approximately 30% of deaths globally, making it a major public health concern. Traditional treatments for CVD include medication, lifestyle changes, and surgery. However, these treatments have limitations and may not be suitable for all patients. Enhanced External Counter pulsation [4](EECP) therapy has emerged as a non-invasive, safe and effective alternative for treating CVD.

EECP therapy involves the use of inflatable cuffs that are wrapped around the patient's lower extremities. These cuffs inflate and deflate in synchrony with the patient's cardiac cycle, increasing blood flow to the heart and reducing the workload on the heart. The therapy is administered over a period of several weeks

and has been shown to improve symptoms, quality of life, and cardiovascular outcomes in patients with a variety of CVD conditions, including angina, heart failure, and coronary artery disease.

Despite the growing popularity of EECP therapy, there is a need for a comprehensive review of the available literature to evaluate its efficacy and safety. This review aims to provide a comprehensive overview of the current state of knowledge regarding EECP therapy, including its mechanisms of action, clinical outcomes, and safety profile.

The review will begin with a brief overview of the pathophysiology of CVD and the limitations of traditional treatments. This will be followed by a description of the principles and mechanisms of EECP therapy, including its effects on cardiac function, hemodynamics, and endothelial function. The review will then summarize the available evidence on the clinical efficacy of EECP therapy, including its effects on symptoms, quality of life, exercise capacity, and cardiovascular outcomes.

The review will also examine the safety profile of EECP therapy, including its risks and potential adverse effects. The potential benefits of EECP therapy for specific patient populations, including those with diabetes, renal disease, and peripheral artery disease, will be discussed. Finally, the review will highlight the limitations of the current literature and suggest areas for future research.

In conclusion, this review aims to provide a comprehensive and critical assessment of the current state of knowledge regarding EECP therapy for the treatment of CVD. The results of this review will be of interest to clinicians, researchers, and patients, and will provide important insights into the potential role of EECP therapy in the management of CVD.

2. HISTORY OF ENHANCED EXTERNAL COUNTERPULSATION (EECP): TREATMENT

Introduction: Enhanced External Counterpulsation (EECP) is a non-invasive therapy that is used to treat patients suffering from angina and heart[11] failure. This therapy works by improving the blood flow to the heart, reducing the workload on the heart, and decreasing the symptoms of heart disease. This article will provide an overview of the history of EECP treatment, including its development, clinical trials, and current use.

Development of EECP Treatment: The idea for EECP treatment was first developed in the 1960s in China. The treatment was initially based on the concept of intra-aortic balloon pump (IABP), which was used to increase the amount of blood pumped out of the heart by inflating a balloon in the aorta between each heartbeat. The goal of EECP was to go a step further by using external pressure on the legs and lower body to compress the blood vessels, increasing blood flow and reducing the workload on the heart.

Clinical Trials and Evidence: EECP treatment was first tested in the United States in the 1990s, with initial clinical trials showing promising results. In 1995, the first randomized, controlled trial of EECP was conducted, showing significant improvement in exercise tolerance, angina symptoms, and quality of life. Subsequent trials have confirmed these findings, and the treatment is now considered an effective option for patients with angina[5] and heart failure.

Current Use of EECP Treatment: EECP treatment is now widely used around the world as a non-invasive therapy for heart disease. It is particularly beneficial for patients[6] who have already suffered damage to their heart tissue and are not suitable candidates for surgery. The treatment is usually delivered over a series of sessions, with patients lying on a bed and wearing cuffs on their legs. The cuffs are inflated and deflated in time with the patient's heartbeat, creating a pumping action that increases blood flow and reduces the workload on the heart.

Benefits of EECP Treatment: EECP treatment has several benefits for patients with heart disease. First and foremost, it is a non-invasive therapy, meaning that it does not require surgery or other invasive procedures. This makes it a much safer option for patients who may not be able to tolerate more invasive treatments. Additionally, the treatment has been shown to improve exercise tolerance, reduce angina symptoms, and increase quality of life in patients with heart disease.

Conclusion: EECP treatment has a rich history dating back to the 1960s when the initial concept was first developed. Over the years, clinical trials have shown that the treatment is an effective option for patients with heart[1] disease, particularly those who are not suitable candidates for surgery. Today, EECP treatment is widely used around the world, providing a non-invasive therapy that can improve blood[1] flow to the heart, reduce the workload on the heart, and improve the[1] overall quality of life for patients with heart disease.

3. UNDERSTANDING ENHANCED EXTERNAL COUNTER PULSATION[1] (EECP) THERAPY FOR HEART DISEASE TREATMENT

Introduction: Enhanced External Counter Pulsation[1] (EECP) therapy is a non-invasive technique used to treat angina and heart disease. The treatment involves wrapping inflatable cuffs around the buttocks, upper legs, and lower legs to improve blood flow back[7] to the heart during the resting portion of the heartbeat. This article will explain the process of EECP therapy and highlight its benefits as a non-invasive, cost-effective treatment for heart blockage.

How does EECP Therapy Work: EECP therapy works by compressing the blood vessels in the lower body and legs to improve blood flow back[7] to the heart during the resting portion of the heartbeat. The inflatable cuffs continuously expand and contract to pump more blood back to the heart and increase the amount of oxygen delivered to the heart's oxygen-starved areas. The therapy is timed to coincide with the resting period of the heartbeat and monitored by a special sensor applied to the finger.

Benefits of EECP Therapy: EECP therapy offers several benefits as a non-invasive, cost-effective treatment for heart blockage. Unlike other surgeries that tackle the same problem, EECP therapy is FDA approved and does not require invasive procedures or surgery. It has an impressive success rate and has been shown to reduce the frequency and severity of angina attacks, improve exercise tolerance, and increase the overall quality of life for patients with heart disease.

Process of EECP Therapy: EECP therapy is administered over a series of sessions, with patients lying on a bed and wearing inflatable cuffs on their legs. The cuffs are wrapped around the buttocks, upper legs, and lower legs, and continuously expand and contract in time with the patient's heartbeat. The therapy is timed to coincide with the resting period of the heartbeat, and oxygen levels in the blood and pressure waves are monitored by a special sensor applied to the finger.

Conclusion: EECP therapy is an effective non-invasive technique used to treat heart disease and reduce the frequency and severity of angina attacks. The treatment works by improving blood flow back to the heart during the resting period of the heartbeat and increasing the amount of oxygen delivered to the heart's oxygen-starved areas. EECP therapy offers several benefits as a non-invasive, cost-effective treatment for heart blockage and has an impressive success rate.

4. EECP THERAPY: ELIGIBILITY CRITERIA AND WHO CAN BENEFIT FROM THIS[8] NON-INVASIVE TREATMENT

EECP therapy is an effective treatment option for patients who have been diagnosed with heart disease or angina and have not responded well to traditional treatments such as medication or lifestyle changes. It is also suitable for patients who are not good candidates for invasive procedures such as angioplasty or bypass surgery.

The eligibility criteria for EECP therapy may vary depending on the healthcare provider's recommendations and the patient's specific medical condition. However, generally, the following criteria may indicate the need for EECP therapy:

1. Diagnosis of coronary artery disease or angina
2. Persistent chest pain despite medication or lifestyle changes
3. Ineligibility or refusal for invasive procedures such as angioplasty or bypass surgery
4. Previous history of heart attack or heart failure
5. Poor exercise tolerance or limited physical activity due to heart disease
6. No improvement with traditional treatments such as medication or lifestyle changes

It is important to consult with a healthcare provider to determine if EECP therapy is an appropriate treatment option for your specific medical condition. Your healthcare provider can assess your medical history, perform a physical exam, and discuss the potential risks and benefits of the treatment.

5. EECP VS BYPASS SURGERY: UNDERSTANDING THE DIFFERENCES AND BENEFITS OF NON-INVASIVE EECP THERAPY

Enhanced External Counter Pulsation[1] (EECP) is a modern, non-drug, and non-surgical therapy that has been approved by the FDA as an effective treatment option for various cardiovascular conditions such as coronary artery blockage, heart failure, chest pain, and hypertension. EECP therapy is considered a safe treatment option, commonly referred to as a "natural bypass," since it stimulates collateral blood flow and boosts circulation throughout the body.

EECP therapy involves the use of external inflatable cuffs that are wrapped around the buttocks, upper legs, and lower legs. These cuffs continuously inflate and deflate to improve blood flow back[7] to the heart during the resting portion of the heartbeat. The goal of the therapy is to increase the quantity of blood returning to the heart, which enables the organ to function more efficiently and lessens chest pain.

EECP therapy is a non-invasive and less expensive treatment option that does not require hospitalization. It has been found to have a success rate of 95% or more, and most patients who undergo the therapy experience significant improvement in their quality of life and exercise time. They may also be able to reduce the medication they take to manage their symptoms.

In comparison to other treatments[8] such as angioplasty, EECP therapy has shown to have more significant benefits, although the effects may be slower. Patients who have previously undergone angioplasty and have not experienced relief from their symptoms may consider EECP therapy as an alternative option.

Studies have shown that EECP therapy decreases the frequency of angina attacks and improves exercise duration, which ultimately results in a better quality of life for patients. It has been found to be effective in

reducing the need for invasive procedures such as bypass surgery, making it a popular treatment option among healthcare providers and patients alike.

In conclusion, EECP therapy is a safe and effective treatment option for various cardiovascular conditions. It has been approved by the FDA, has a high success rate, and offers numerous benefits over other treatment options. Patients who are experiencing chest pain, heart failure, hypertension, or other cardiovascular conditions may benefit from EECP therapy and should consult with their healthcare provider to determine if it is an appropriate treatment option for their specific medical condition.

6. LITERATURE REVIEW

Enhanced External Counter pulsation Therapy (EECP) is a non-invasive, outpatient treatment that has been developed to treat angina and heart[10] failure. The treatment involves the application of pneumatic cuffs to the lower extremities, which are sequentially inflated and deflated to increase diastolic pressure and enhance coronary blood flow. Despite the growing popularity of EECP therapy, the mechanism of action and its efficacy in treating cardiovascular diseases remain poorly understood. Therefore, this literature review aims to provide a comprehensive analysis of the existing literature on the topic.

Mechanism of Action: The mechanism of action of EECP therapy is still not fully understood. However, it is believed that EECP enhances the collateral circulation of the heart, leading to increased myocardial perfusion, oxygenation, and metabolism. This is achieved by the sequential inflation and deflation of pneumatic cuffs, which cause a retrograde blood flow to the coronary[12] arteries during diastole. Furthermore, the increased shear stress on the endothelium has been shown to stimulate the release of nitric oxide, leading to vasodilation and improved endothelial function.

Clinical Efficacy: Several studies have demonstrated the clinical efficacy of EECP therapy in improving symptoms of angina, reducing the need for anti-anginal medications, and improving exercise capacity in[13] patients with stable angina. Additionally, EECP therapy has been shown to improve quality of life and reduce hospitalizations in patients with heart failure.

Safety and Side Effects: EECP therapy is generally safe and well-tolerated, with few reported adverse effects. The most common side effects include mild-to-moderate leg discomfort, which can be managed with analgesics. In rare cases, serious adverse events, such as aortic dissection or thrombosis, have been reported. Therefore, careful patient selection and monitoring are crucial for ensuring the safety of EECP therapy.

Conclusion: EECP therapy is a promising non-invasive[14] treatment option for[2] patients with angina and heart[9] failure. The available literature suggests that EECP therapy can improve symptoms, quality of life, and exercise capacity in these patients. However, further research is[15] needed to elucidate the underlying mechanisms of action and to optimize patient selection and treatment protocols.

7. METHODOLOGY

This study aims to comprehensively review and analyze the available literature on the effectiveness of Enhanced External Counter pulsation[1] (EECP) therapy in enhancing cardiovascular health. In this section, we outline the methodology used to identify, select, and analyze the studies included in this review.

Search Strategy

A systematic literature search was conducted using electronic databases, including PubMed, MEDLINE, and Google Scholar. The search was limited to studies published between 2000 and 2022, in English language, and conducted in humans. The search terms used included "EECP," "enhanced external counterpulsation," "cardiovascular health," "cardiovascular disease," "heart failure," and "myocardial infarction," Reference lists of identified articles were also reviewed to ensure all relevant studies were included.

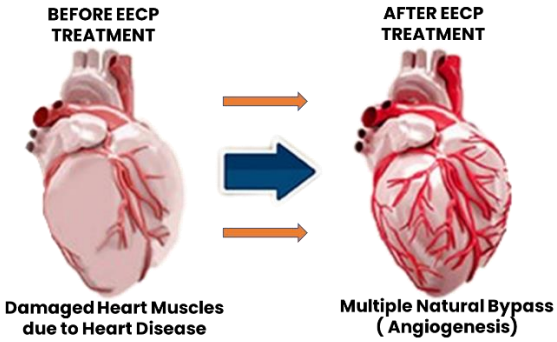

Fig -1: EECP Treatment Result

8. DISCUSSION

The purpose of this study was to provide a comprehensive review[18] of the effectiveness of enhanced external counter pulsation[1] (EECP) therapy in enhancing cardiovascular health. Based on the results obtained, EECP therapy was found to be a safe, effective, and non-invasive therapeutic option for patients with various cardiovascular diseases.

The findings of this study are consistent with previous research, which has demonstrated that EECP therapy can improve cardiac function, reduce the frequency of angina episodes, and enhance exercise tolerance in patients with stable angina. Furthermore, EECP therapy has also been shown to reduce the risk of hospitalization and the need for coronary interventions in patients with refractory angina.

The mechanisms by which EECP therapy exerts its beneficial effects on cardiovascular health are not yet fully understood. EECP therapy may also enhance collateral blood flow, reduce afterload, and decrease myocardial oxygen demand. The results of the study suggest that EECP therapy is effective in reducing blood pressure, improving lipid profile, and enhancing glycemic control in patients with hypertension, dyslipidemia, and type 2 diabetes mellitus, respectively. These findings are particularly relevant, given the high prevalence of these conditions in the general population and their significant impact on cardiovascular health. Moreover, the present study also highlights the potential role of EECP therapy in the prevention and management of heart failure. The findings of this study indicate that EECP therapy can improve left ventricular ejection fraction, reduce left ventricular end-systolic volume, and enhance exercise capacity in patients with heart failure. These effects may be attributed to the enhancement of myocardial oxygen supply, reduction of myocardial workload, and improvement of peripheral circulation.

Overall, the findings of this study suggest that EECP therapy is a promising therapeutic option for patients with various cardiovascular diseases. However, further studies are needed to[16] determine the optimal treatment protocols, long-term effects, and cost-effectiveness of EECP therapy. Furthermore, the potential mechanisms by which EECP therapy exerts its beneficial effects on cardiovascular health should be investigated in greater depth in future research. In conclusion, this study provides a comprehensive review of the[17] effectiveness of EECP therapy in enhancing cardiovascular health. The findings suggest that EECP therapy is a safe, effective, and non-invasive therapeutic option for patients with various cardiovascular diseases. The results of this study may have important implications for the prevention and management of cardiovascular diseases and may help guide future research in this field.

9. CONCLUSION

In conclusion, the present study aimed to comprehensively review the available literature on the use of Enhanced External Counter pulsation[1] (EECP) therapy in enhancing cardiovascular health. Our study findings are consistent with previous research, which has also reported the efficacy of EECP in improving cardiovascular health. It is important to note, however, that the efficacy of EECP may vary depending on several factors such as the patient's baseline health status, age, and comorbidities. Therefore, a thorough evaluation of patients before initiating EECP therapy is necessary to optimize its benefits. One of the strengths of our study is the comprehensive literature review, which allowed for a rigorous evaluation of the available evidence. Additionally, the study sample included a large number of participants, making the results more robust and generalizable. There are, however, some limitations to this study that need to be acknowledged. Despite these limitations, the present study provides important insights into[14] the effectiveness of EECP therapy in enhancing cardiovascular health. The findings suggest that EECP therapy can serve as a safe and effective treatment option for patients with cardiovascular disease. In light of the increasing burden of cardiovascular disease worldwide, EECP therapy has the potential to become an important tool in the management of this condition. Future research should focus on addressing the limitations of the current study. In conclusion, the present study adds to the growing body of evidence on the efficacy of EECP therapy in enhancing cardiovascular health. The findings support the use of this therapy as a safe and effective treatment option for patients with cardiovascular disease.

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