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REVIEW ARTICLE

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Major considerations of enteral nutritional therapy in patients with congestive heart failure: a systematic review

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Abstract

Introduction: Nutrition in the cardiovascular area has focused on improving lifestylerelated diseases such as hypertension, diabetes, dyslipidemia, obesity, and metabolic syndrome from the point of view of primary and secondary prevention, that is, "nutrition for weight loss " and nutritional guidance has been required. Congestive heart failure (CHF) is a serious and growing public health problem worldwide. Approximately 25 million people are carriers of this disease and two million new cases are diagnosed each year, and enteral nutrition has been highlighted. **Objective:** It was to develop a systematic review of the main clinical outcomes that highlight the importance of enteral nutritional therapy in patients with congestive heart failure. **Methods:** The PRISMA Platform systematic review rules were followed. The research was carried out from October to November 2023 in the Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument. **Results and Conclusion:** 143 articles were found. A total of 45 articles were evaluated and 34 were included in this systematic review. Considering the Cochrane tool for risk of bias, the overall assessment resulted in 21 studies with a high risk of bias and 17 studies that did not meet GRADE and AMSTAR-2. It was concluded enteral nutrition is highly recommended in an attempt to mitigate weight loss in these patients. Enteral diet therapy can be infused continuously or intermittently. Studies have shown that more debilitated and less active patients better accept the diet via continuous tube, slowly and for a long period, even in those with heart disease.

Keywords: Congestive heart failure. Enteral therapy. Enteral nutrition. Clinical studies. Level of Evidence.

Introduction

Nutrition in the cardiovascular area has focused on improving lifestyle-related diseases such as hypertension, diabetes, dyslipidemia, obesity, and metabolic syndrome from the point of view of primary and secondary prevention, that is, "nutrition for weight

loss " has been demanded and nutritional guidance has been provided to restrict calories and salt. The American Heart Association (AHA) released a checklist for promoting cardiovascular health, "Life's Essential 8", in 2022 **[1]**.

In this scenario, congestive heart failure (CHF) is a serious and growing public health problem worldwide, being the common final route of most heart diseases **[2-7]**. Although scientific and technological advances and better socioeconomic conditions have made it possible to increase the longevity of the general population and those with heart disease, there has been an increase in the incidence of CHF around the world **[8-10]**.

In this context, statistical data from the United States estimate that 6.1 million Americans over 20 years of age have CHF, an increase of approximately 48.0% is expected between 2012 and 2030, resulting in more than 8 million adults **[10]**. In Brazil, there are no epidemiological studies involving the incidence of heart failure, however, according to other countries, it can be estimated that up to 7.2 million Brazilians suffer from this syndrome **[6]**.

Also, CHF is caused by structural and functional abnormalities of the heart, leading to deficiencies in ventricular ejection and/or ventricular filling capacity **[11-13]**. In Brazil, the main causes of CHF are myocardial ischemia, systemic arterial hypertension, dilated cardiomyopathy, and Chagas disease, as well as valvular disease **[6]**. After cardiac injury, the resulting molecular, structural, and functional ventricular changes are known as cardiac remodeling. This process is accompanied by cardiac and systemic inflammatory and neurohormonal activation, which adversely affects the heart in a vicious cycle and compromises different organs and systems **[11]**.

In recent decades, it has become clear that pathological changes involve not only the cardiovascular system, but also the renal, neuro-endocrinological, immunological, hematological, gastrointestinal, and musculoskeletal systems, as well as nutritional status **[7-9]**. Currently, experimental and clinical studies have focused on the pathophysiology of systemic complications related to CHF to establish treatments to improve quality of life and increase survival **[12-14]**.

The clinical evolution of patients with CHF moves towards variable malnutrition **[12]**, making adherence to enteral nutrition (EN) necessary. This condition can occur due to inadequate intake, altered metabolism, pro-inflammatory state, increased oxidative stress, and greater loss of nutrients, even due to drug interactions. Anorexia is a consequence of reduced nutrient intake or the association of absorptive and metabolic changes (hypermetabolism, hypoxia, increased energy expenditure, inflammation) **[13,14]**. Edema of the intestinal loops in heart failure may be responsible for the presence of nausea, lipid malabsorption, sensation of gastric fullness, and protein losses **[15]**.

Also, the presence of malnutrition is an important predictive factor for reduced survival in patients with CHF, regardless of important variables such as age, functional class, and ejection fraction. Thus, EN becomes imperative in attempting to treat or mitigate the comorbidities of CHF **[16,17]**.

Therefore, the present study developed a systematic review of the main clinical outcomes that highlight the importance of enteral nutritional therapy in patients with congestive heart failure.

Methods

Study Design

The present study followed the international systematic review model, following the rules of PRISMA (preferred reporting items for systematic reviews and meta-analysis). Available at: http://www.prisma-statement.org/?AspxAutoDetectCookieSupport=1. Accessed on: 10/16/2023. The methodological quality standards of AMSTAR-2 (Assessing the methodological quality of systematic reviews) were also followed. Available at: https://amstar.ca/. Accessed on: 10/16/2023.

The quality of the studies was based on the GRADE instrument and the risk of bias was analyzed according to the Cochrane instrument.

Data Sources and Research Strategy

The search strategies for this systematic review were based on the keywords (MeSH Terms): *"Congestive heart failure. Enteral therapy. Enteral nutrition. Clinical studies. Level of evidence".* The research was carried out from October to November 2023 in the Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. Furthermore, a combination of keywords with the Booleans "OR", "AND" and the "NOT" operator was used to target scientific articles of interest.

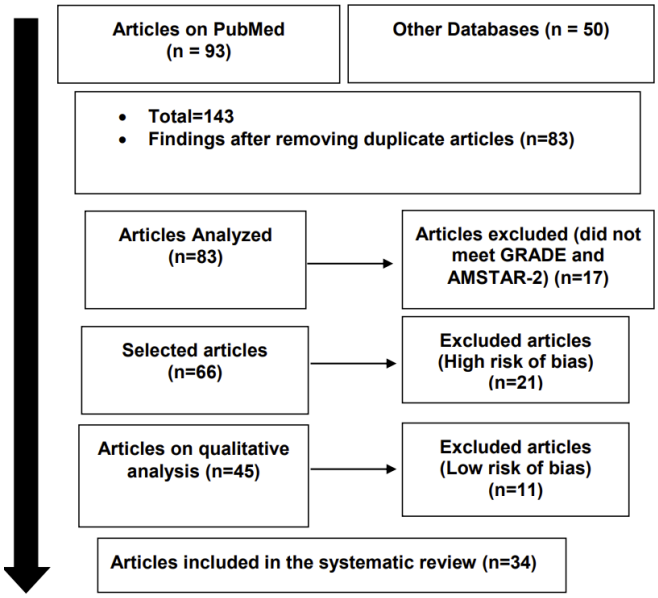
Results and Discussion

Summary of Literary Findings

A total of 143 articles were found. Initially, duplicate articles were excluded. After this process, the abstracts were evaluated and a new exclusion was carried out, removing articles that did not include the topic of this article, resulting in 45 articles. A total of 34 articles were evaluated in full and included and developed in the present systematic review study (Figure 1). Considering the Cochrane tool for risk of bias, the overall assessment resulted in 21 studies with a high

risk of bias and 17 studies that did not meet GRADE and AMSTAR-2.

Figure 1. Article Selection Process.



Source: Own Authorship.

Highlights Clinical Findings

Based on clinical findings, a retrospective cohort study of patients in the Australian and New Zealand Fontan Registry was carried out. Patients were defined as tube-fed (TF) or non-tube-fed (NTF) single ventricle patients based on enteral tube feeding at 90 days of age. Of 390 patients (56 [14%] TF, 334 [86%] NTF), TF was associated with right ventricular dominance, hypoplastic left heart syndrome, Norwood procedure, increased pre-Fontan procedures, Fontan extracardiac conduit, fenestration de Fontan, and repair/replacement of the atrioventricular valve. Patients with TF were less likely to be on the highest compared to the lowest 0-6-month BMI trajectory, had lower 6-month weight-for-age z-scores, and lower 6-month length-for-age z-scores. TF were less likely to be overweight/obese in pediatric follow-up and more likely to be underweight in adult follow-up. TF compared to NTF was associated with an increased risk of severe Fontan insufficiency. Prolonged enteral tube feeding in infants is an independent marker of poor growth and adverse clinical outcomes that extend into the long term after the Fontan procedure **[18]**.

Moreover, congestive heart failure (CHF) is a pathology in which circulatory, neurohormonal, and metabolic factors interact, causing cardiac muscle dysfunction, ventricular hypertrophy, and hemodynamic changes **[1,2]**. The symptoms cause major cardiac repercussions for the individual, with repeated hospitalizations and even death **[5]**.

In this sense, in CHF there are multiple causal factors of malnutrition, known as cardiac cachexia **[7-10]**. It is necessary to distinguish eutrophic individuals with CHF from those with insufficient nutrition severe malnutrition or cachexia, according to the New York Heart Association class III and IV classification **[11]**.

Thus, the numerous hospitalizations make patients depressed and unreceptive to eating a restricted salt diet that is unattractive **[2,3]**. Dyspnea, muscle fatigue, and edema, including in the gastrointestinal tract, contribute to a reduction in oral intake, making enteral nutritional support necessary **[17]**.

Also, patients with CHF need to be evaluated by a multidisciplinary team to determine the state of depletion the patient is in and thus take measures to reduce the high catabolism caused by CHF, preserving tissues and reducing the use of endogenous nutrients, to recover organic functions to mitigate morbidity and mortality **[19-22]**.

Severe malnutrition in cardiomyopathy patients is multifactorial **[23-26]**. Metabolic imbalance occurs due to high basal energy expenditure, around 20.0%, and there is not always adequate caloric replacement. Recent articles report the action of cytokines in the pathogenesis of cardiac cachexia **[1-4]**.

Furthermore, tumor necrosis factor (TNF) has also been correlated with its elevation in functional class IV patients, especially those with cardiac cachexia, which many believe to be due to the accelerated effect of skeletal muscle catabolism **[27]**. Only enteral nutrition (EN), whether or not associated with oral diet therapy, can recover the catabolism generated by CHF **[28]**. Other studies corroborate the beginning of EN early in stable cardiomyopathic patients, around 24 to 48 hours after cardiac decompensation **[4,29]**.

EN is indicated for patients who do not meet the protein-calorie needs of oral diet therapy **[2,30]**. The use of the enteral route is well tolerated in patients, from 80.0 to 90.0% **[3,31]**. In patients malnourished due to cardiac decompensation, adequate nutritional intake can be achieved through enteral infusion, whether or not combined with an oral diet **[32]**. The elemental diet is indicated for patients with malabsorption, with pre-digested proteins and free amino acids **[33]**. The polymeric diet contains 30.0 to 40.0% lipids, proteins, and polysaccharides. If there is decreased gastric motility, the best choice is the elemental diet **[33,34]**.

Enteral diet therapy can be infused continuously or intermittently. Studies have shown that more debilitated and less active patients better accept the diet via continuous tube, slowly and for a long period, even in those with heart disease. According to the authors, continuous infusion should reduce the likelihood of gastric distension, diarrhea, pulmonary aspiration, and metabolic abnormalities **[12,13]**.

In case of diarrhea or intolerance, the diet formulation must be changed to fiber and ammonia acids to protect the gastrointestinal tract. In this sense, a higher rate of diarrhea was found in the elderly when the enteral diet was administered intermittently. Normally, diarrhea is not more frequent in patients with CHF, but rather constipation due to the smaller amount of endogenous water and less physical movement **[12,13,34]**.

Besides, pre-pyloric positioning is performed using a nasogastric tube or gastrostomy, and post-pyloric positioning using a nasojejunal tube or jejunostomy. In the literature, a greater probability of aspiration of the diet via an intragastric or post-pyloric tube has not yet been confirmed. However, the clinical staff prefers post-pyloric positioning **[15]**.

The access to enteral diet infusion is percutaneous endoscopic gastrostomy, with low morbidity rates **[9]**. Due to the characteristics of the duodenal mucosa in cardiomyopathy patients, the diet must be chosen by evaluating its osmolarity, caloric density, and infusion speed **[1-3]**.

In this context, despite the support that EN provides, there may be gastrointestinal, metabolic, and mechanical complications. Furthermore, infectious, respiratory, and psychological complications may also occur. Gastrointestinal complications are the most common, including nausea and vomiting in 2.5 to 10% **[18]**. Gastric stasis is much more harmful to diabetic patients. Diarrhea is the most common, reaching up to 10.0 to 68.0% of cases **[11]**.

The reports of complications observed by the Enteral and Parenteral Nutritional Support Group (GANEP) in Brazil, which analyzed 80 patients who used vasoactive drugs, are notable, with 45.0% of them presenting some digestive complication and, in In 21.0%, the complication was associated with tube output and, in 10.0%, with diarrhea **[11]**. In another multicenter study carried out in the United States, it was found in 360 patients that aspiration as a pulmonary complication was present in 88.0% of cases **[12]**.

In this scenario, although few studies or case reports show the effectiveness of EN for treating comorbidities in patients with CHF, there is an urgent need for randomized and controlled studies of nutritional treatment in this condition, to improve cardiac function through a greater supply of nutrients and energy. The other objective of such treatment is also to complement it with other therapies to provide extra protein during the treatment. Furthermore, other forms of nutritional support have been tested in small numbers of patients with cachexia, particularly in those undergoing cardiac surgery, in whom preoperative nutrition decreased the number of complications, mortality, and postoperative hospital stay **[1,3]**.

An important drawback of these favorable nutritional studies on CHF is the fact that they were all performed in the era before modern standard treatment with angiotensin and converting enzyme inhibitors and beta blockers. There is evidence that angiotensin-converting enzyme inhibitors prevent weight loss **[3,4]**.

Conclusion

It was concluded enteral nutrition is highly recommended in an attempt to mitigate weight loss in these patients. Enteral diet therapy can be infused continuously or intermittently. Studies have shown that more debilitated and less active patients better accept the diet via continuous tube, slowly and for a long period, even in those with heart disease.

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Ethical Approval

Not applicable.

Informed consent

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Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

Similarity check

It was applied by Ithenticate@.

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