Acute Coronary Syndrome: Approach and impacts

https://doi.org/10.56238/sevened2024.016-016

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ABSTRACT

Chest pain is one of the most frequent reasons for seeking emergency care. Among the causes of this pain, acute coronary syndrome comprises one of the main pathologies. Such a syndrome is serious, and must be correctly diagnosed, in order to carry out the correct management of the patient, avoiding irreducible consequences. The objective of this study is to provide the necessary support for the understanding of this syndrome as a whole. For this, a narrative literature review was carried out, with the delimitation of articles published in the last 5 years, from 2019 to 2024, in the Index Scielo and Pubmed bibliographic databases. Articles that did not meet the criteria established in the methodology were discarded, resulting in a total of 25 selected articles. After careful analysis, the information collected served as a basis for the construction of the

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review. It was observed that the syndrome is extremely important, especially in the scenario of emergency medicine and emergency care. Thus, it is necessary that physicians be properly trained on the subject, in order to avoid unfavorable outcomes for patients, and iatrogenesis.

Keywords: Acute Coronary Syndrome, Infarction, Clinical Management, Case Administration.

INTRODUCTION

Cardiovascular diseases are, in the current scenario, still very responsible for global morbidity and mortality. Among them, acute coronary syndrome occupies a place of extreme importance, and is responsible for a considerable portion of hospitalizations, which progressively increases over time (Carvalho et al., 2022). With the lack of knowledge about the approach and management of the subject, countless cases are misdiagnosed or simply treated incorrectly, and the consequences of such actions are not long in coming. All of this leads to excessive expenses for the health system, which could be better managed and even avoided with the correct approach to the condition in question, by health professionals.

When we talk about acute coronary syndrome, the symptom reported by patients is, essentially, chest pain, which is one of the most frequent causes of emergency room visits. Despite this, not all patients with chest pain actually have an ACS and estimates indicate that about 25% of patients actually have a diagnosis of acute coronary syndrome, which again raises the issue of the correct management of this pain in the context of medical care (Brazilian Society of Cardiology, 2021).

Acute coronary syndrome encompasses a spectrum of clinical and laboratory manifestations resulting from the imbalance between oxygen supply and demand in cardiac tissues, resulting in acute myocardial ischemia. This complex of acute syndromes is classified according to its representation on the electrocardiogram (ECG), and thus, there are three main types: unstable angina (UA), non-ST-elevation acute myocardial infarction (NSTEMI), and ST-elevation acute myocardial infarction (STEMI) (Bassan; Bassan, 2006; Carvalho et al., 2022).

Despite being divided into three clinical forms, essentially the pathophysiology of ACS is the same for all of them, and is mainly due to the development and instability of atherosclerotic plaques, formed from cholesterol deposits (Bassan; Bassan, 2006). This process can occur suddenly, or occur gradually throughout life. The problem with plaque stability is commonly associated with plaque rupture, or coagulation problems, which course with the subsequent development of thrombi, which cause myocardial ischemia (Carvalho et al., 2022).

The lack of oxygenation of cardiac tissues can lead to clinical manifestations, especially in the change of the "st" segment of the ECG. However, such a change is not a rule, and therefore the syndrome also includes infarctions that course without alterations in the exam (Carvalho et al., 2022). Therefore, taking into account the severity of the disease and the fact that an incorrect diagnosis can be fatal for the patient, it was established that the ECG should be performed and interpreted within the first ten minutes of medical contact with the patient who has chest pain suspected of ACS (Brazilian Society of Cardiology, 2021).

The risk factors for diseases in general are divided into modifiable and non-modifiable. For ACS, the relationship between modifiable factors and individuals' lifestyle habits is notorious. Such habits can be important contributors to the development of the pathology. As an example, we can mention smoking, high-fat diets, sedentary lifestyle, among others. Previous evidence indicates that ACS tends to be more influenced by these factors, which provides ways to avoid or delay the onset of the syndrome, with a simple change in lifestyle (Carvalho et al., 2022; Saints; Axe; Menezes, 2018). There are also non-modifiable factors, which include advanced age, male gender and family history. In this second group, it is not so easy to change the course of the disease, but knowledge of such fundamentals can be useful in guiding patients during continued care (Santos; Axe; Menezes, 2018).

The syndrome complex also has particularities of clinical presentation and outcome, according to the group of affected individuals. Regarding the disparity between the sexes, it was demonstrated that women with acute myocardial infarction (AMI) are less likely to need reperfusion techniques and clinical treatment, while men have higher reperfusion rates. In addition, it was also observed that there is a lower awareness of the risks among women. As a result of hormonal influences, and the postmenopausal period, it was also observed that when present in women, ACS is associated with older age, and also with the accumulation of other comorbidities and risk factors (Soeiro et al., 2018).

All this knowledge is important when we discuss acute coronary syndrome, and with this it is imperative to highlight that this group of pathologies is complex and requires a lot of study, since professionals are faced daily with cases indicative of one of the three syndromes, and the diagnosis must be made as soon as possible, to avoid irreversible consequences resulting from cardiac hypoperfusion.

In view of the importance of the theme for the health scenario of the population as a whole, and knowing that encouraging the adoption of healthy practices by individuals can contribute significantly to mitigating the impacts of coronary syndrome, we intend with this review to provide the necessary subsidies for the practical understanding of acute coronary syndrome in general, in such a way that we will address its main points, and especially the management of the sick. Therefore, it is also expected that the review will contribute to the implementation of new public policies, and also health promotion actions aimed at this theme, since awareness can help avoid unnecessary expenses and overloads on the health system.

MATERIALS AND METHODS

The present study is a qualitative analysis of a descriptive character, of the narrative review of the literature type. Such methodology is broad and aims to describe and discuss data found on a given subject, based on the analysis of previous literary evidence, from a theoretical and contextual point of

view (Rother, 2007). Added to this is the importance of narrative reviews for continuing education and as a way to provide a basis for future research on the subject. This methodology was chosen in view of the breadth and importance of the theme, and as a way to explore the maximum number of characteristics that describe, in general, the group of syndromes that make up ACS.

The main theme was searched in the Pubmed and Index Scielo (Scientific Electronic Library Online) literary databases using the denominator "Acute coronary syndrome". In order to address current knowledge, the period from 2019 to 2024 (last 5 years) was delimited. In addition, the articles could be written in English, Portuguese and Spanish, and only texts available in full were screened.

At the first moment of screening, the results were selected based on the denominator being present in the title, keywords or abstract of the publications. From this, the second screening took place, made more carefully from the reading of the abstract. Thus, the texts that applied to the theme and match the objectives to be studied in the review were selected. The excluded articles did not meet the established criteria, and were therefore discarded during the screening period.

Subsequently, all the articles included in the review were read and analyzed in a careful manner, in order to extract the necessary information for the construction of the literature review. Finally, as a way to organize the findings and facilitate understanding, the theme was subdivided into the main topics that should be understood about ACS: epidemiology and risk factors, pathophysiology, clinical picture, diagnosis, approach, and management. The development of the discussion took place based on this division.

RESULTS AND DISCUSSION

The research strategy resulted in 1,026 publications, 781 of which were from Pubmed and the other 245 from Scielo. Of these, 64 were selected after the first screening, and finally, 25 articles satisfactorily met the objectives and criteria. Of the articles that made up the review, 03 were written in Portuguese and the other 22 in English.

From what was found in the literature, it is evident the importance of understanding the mechanisms behind the syndrome, in order to consequently elucidate gaps in its approach and management in patient care. Thus, the subcategories related to the understanding of the syndrome were divided in order to facilitate understanding and organize the findings in the reviewed evidence.

EPIDEMIOLOGY AND RISK FACTORS

Despite scientific advances, which contribute to the treatment and development of prevention measures, acute coronary syndrome still remains one of the leading causes of death globally (Abukhalil et al., 2024). Corroborating this, WHO data show that in 2016, ischemic heart disease was responsible for more than 9 million deaths worldwide (Soares, 2020; World Health Organization,

2018). It is believed that much of this is related to the prevalence of risk factors, and therefore the importance of clarifying them (Magalhães; CADE, 2019).

Among the factors reported in the literature are: male gender, smoking, advanced age, hypertension, hyperlipidemia, diabetes mellitus, unhealthy diet, physical inactivity, obesity, previous history of coronary artery disease (CAD), and family history of premature CAD. Their relationship with the development of the disease is clear when relating them to the pathophysiology. Thus, taking into account that the main etiology is atherosclerosis, everything that contributes to the formation of plaques consequently becomes a risk factor for ACS (Abukhalil et al., 2024; Ali et al., 2024).

With regard to smoking, it alone is already related to a greater propensity to develop numerous diseases. Cardiovascular diseases are added to the list, precisely because of its association with atherosclerosis and strokes (Abukhalil et al., 2024). The pathophysiology behind this lies in increased fibrinogen levels, endothelial cell damage, higher levels of platelet aggregation, and vasospasm, all of which are the results of smoking. Smoking is more frequently present in men, and in addition, it can reduce the expected age for the development of cardiovascular events resulting from this risk factor by 10 years. (Shrateh et al., 2024).

The comorbidities hypertension and diabetes are related to ACS due to their association with the cardiovascular system. The two conditions involve endothelial alterations, vascular inflammation, and arterial remodeling in their history of evolution, mechanisms that can result in ischemia of cardiac tissue (Abukhalil et al., 2024). In addition, hypercholesterolemia and high-density lipoprotein, as well as hypertriglyceridemia, obesity, and insulin resistance are factors that may increase the risk of ACS at a young age (Shrateh et al., 2024).

In addition, evidence indicates that the hormone estrogen, in women, works as a protective factor, and prevents the formation of atherosclerosis. Therefore, the lower the chances of developing atherosclerosis, the lower the chances of having an eventual ischemic event resulting in ACS. Therefore, the highest prevalence is in males (Abukhalil et al., 2024; Shrateh et al., 2024).

In the study by Abukhalil et al., 2024, the reported data demonstrate in practice the presentation of these factors. In this cohort, of the 255 patients included, most were men, aged 60 years. The most evidenced comorbidities were hypertension and type 2 diabetes mellitus (Abukhalil et al., 2024). Another study by Shamaki et al., 2024 evaluated the presentation of ACS in younger patients, and observed that young people who do not have such traditional cardiovascular risk factors have worse hospital outcomes, such a result is controversial and requires more research addressing the topic (Shamaki et al., 2024).

Thus, with the recognition of the risk factors most associated with ACS in scientific evidence, it is possible to affirm that personalized interventions aimed at mitigating modifiable risk factors are essential to reduce the occurrence of coronary syndrome cases in the current population.

PATHOPHYSIOLOGY

The mechanism that is most strongly related to ACS, based on the literature and evidence, is atherosclerosis. In addition to ACS, chronic arterial diseases are also related to atherosclerosis, which shows its potential to damage the vessels, causing damage to the cardiovascular system (Rocha; Aguiar, 2020). Succinctly, what occurs, as a rule, is partial or complete occlusion of the coronary artery, causing myocardial ischemia and a potential infarction, and the degree of obstruction is what will determine the severity of the disease (Abukhalil et al., 2024; Cui; Guo; Li, 2024). In agreement, previous research states that nearly half of all sudden cardiac arrests are related to acute plaque complications (Juntunen et al., 2024).

Going deeper into the details of the pathophysiology, the process of plaque formation has been described as a result of the gradual accumulation of cholesterol. In particular, what occurs is receptor-mediated uptake that sequesters the modified low-density lipoprotein, causing it to accumulate in the subendothelial intima layer of the vessel. With the increase in uptake and a greater amount of cholesterol concentrated at the site, plaque increases so much, leading to progressive stenosis, and reducing blood flow (Rocha; Aguiar, 2020; Yu et al., 2024).

As a systemic process, inflammation plays a role in the pathogenesis of the syndrome by promoting extracellular traps of immune cells in the growing plaque. Neutrophil infiltration is critical to regulate inflammation, causing elevated levels of pro-inflammatory cytokines such as IL-1β, IL-6, and tumor necrosis factor. Leukocytes enter the endothelial cells, and cause the formation of microvasculature, causing instability and increasing the chances of plaque rupture. Thus, the atheromatous (atherosclerotic plaque) is the result of a dynamic process, and comprises a living center of inflammatory reactions. In addition, the inflammatory process and subsequent reactions contribute to the evolution of plaque, thrombogenesis, and can even cause activation of the catabolic activities of metabolism, leading to excessive energy expenditure (Yuxiu et al., 2024; Rock; Aguiar, 2020; Yu et al., 2024; Simon et al., 2024; Jercalau et al., 2024).

It is notorious that the growth of plaque itself can already be a factor in occlusion of the artery, but in addition, it is important to note that the rupture of plaque is also one of the causes of such obliteration. When plaque ruptures, the exposed collagen residue generates a cascade of thrombotic events, leading to platelet adhesion and thrombi formation that prevent oxygenation of the heart (Cui; Guo; Li, 2024; Rock; Aguiar, 2020). A partially blocked coronary artery is responsible for unstable angina, whereas coronary arteries with more advanced, complete or almost complete blocks, accompanied by early automatic thrombolysis in the body, will be responsible for AMI, which can be with or without ST unevenness (Cui; Guo; Li, 2024).

CLINICAL PICTURE

Knowing the clinical picture is essential for health professionals, in order to confirm the diagnosis accurately. In addition, it is vital that not only the doctor understands the symptoms, but also that the patient interprets that the perceived symptoms are alarming, so that he or she seeks care as early as possible. What makes such a relationship difficult is the absence of several concomitant symptoms, and also the presence of atypical symptoms (Ninomiya et al., 2024). The presence of thoracic symptoms leads to initial suspicion mainly concentrated in acute coronary syndrome or heart failure (Seo; Lee, 2024).

With regard to ACS, the disease develops abruptly, and this represents an alarming sign of threat to the patient's life. In the initial period, patients may experience digestive tract symptoms. Subsequently, with the progression in the development of the disease, other symptoms appear, such as chest pain, arrhythmias, anxiety, irritability, depression, tension and anger. In addition, as associated symptoms, patients may report sweating, nausea, vomiting, palpitations, and even dyspnea (Cui; Guo; Li, 2024).

Despite this wide variety of symptoms, chest pain (angina) remains the main one, and is accompanied by attributes that can help in the diagnosis. Angina can also be classified as typical and atypical, according to the attributes. The typical quality of angina includes: chest pain, compressive pain, irradiation to the left upper limb or neck, severe intensity reported by the patient, discomfort felt in previous days, presence of vagal symptoms and, finally, improvement of symptoms with the use of sublingual medication. In the atypical characteristics, there are changes in the pain pattern according to the following events: change in position, local palpation, arm movement, and breathing (Filgueiras et al., 2021).

The presence of atypical symptoms may occur in approximately one third of patients admitted to emergency units with a future diagnosis of SAC, and this may make it difficult to delay diagnosis, contributing to the worsening of the condition. It is believed that among these patients, specific populations are concentrated, such as the elderly, women, and individuals with already established heart failure, but this relationship remains controversial among the results of various studies. Therefore, as a way to avoid diagnostic errors, some evidence suggests that the interpretation of symptoms regardless of age would be recommended (Singh et al., 2024; Filgueiras et al., 2021).

Despite the symptoms mentioned, coronary syndrome can manifest in a variety of ways, and the order of the symptoms presented can confuse the diagnostic hypotheses. In a case report by Hashimoto and Nagasaki, 2024, a myocardial infarction was masked by the symptoms of gastroenteritis. The patient presented abdominal pain, followed by nausea, vomiting, and diarrhea, symptoms that do not clearly indicate an episode of infarction. This case reveals the importance of

symptom analysis and complementary tests as a way to aid in diagnosis, in addition to revealing that the variety of symptoms can mimic abdominal diseases (Hashimoto; Nagasaki, 2024).

In view of this, it is important to take note of the main symptoms associated with infarction, as well as to point out that there are atypical symptoms and characteristics that cannot lead to the discarding of ACS from the diagnostic hypotheses. Complementary tests can serve as a strong aid in cases of atypical symptoms, so that AMI does not go unnoticed in the consultations.

APPROACH AND MANAGEMENT

When faced with a patient suspected of ACS, the first measure to be taken is to perform a 12-lead electrocardiogram (ECG), which must be done and interpreted within 10 minutes after the patient's admission (Piccioni et al., 2024; Malentin et al., 2024). An elevation in the "st" segment in the ECG leads already directs the diagnosis, early on, to STEMI, a subtype of ACS. For those who do not have an "st" elevation, it is necessary to delve even deeper into the investigations, in order to identify whether or not it is an ACS, and if so, which of the other two subtypes in question (Ali et al., 2024).

As a way of differentiating the other two subtypes, AI and NSTEMI, the main test to be performed indicates the levels of cardiac troponin (cTn). High levels speak in favor of NSTEMI, while stable levels are more indicative of AI. The cTn protein is present in the contractile apparatus of cardiomyocytes, and is released into the blood after myocardial injury. Although very specific for cardiac tissue, elevated troponin is not pathognomonic of ACS, as it may be present in other pathologies, such as congestive heart failure, kidney disease, and pulmonary embolism. However, when cTn elevation is caused by cardiac ischemia, mortality and reinfarction rates are high, and appropriate therapy should be initiated as soon as possible (Ali et al., 2024).

With the development of high-sensitivity troponin, it has become the gold standard for the diagnosis of NSTEMI. However, it is important to point out that there are divergences in the literature regarding the proportionality of the increase in troponin levels with the degree of coronary artery obliteration. Some authors state that the higher the percentage, the higher the percentage of obstruction, while others counter that the extent of stenosis is not associated with the level of the biomarker (Bravo et al., 2024; Piccioni et al., 2024). Another relevant point in the use of troponin is the need to know the other pathologies that course with troponin elevation, in order to avoid unnecessary treatments, and the overload of the health system. Misdiagnosis of ACS based on protein levels can lead to unnecessary antithrombotic therapy, which may be inappropriate for the patient and, therefore, the need for an accurate diagnosis (Ali et al., 2024).

Studies indicate that the process of carrying out complementary exams and narrowing the hypotheses should be done in approximately one hour. The 0/1 hour protocol is important to prevent

the discharge decision from being unwise. Patients who do not have myocardial infarction (MI) ruled out within 1 hour of admission will have a lower chance of safe discharge (Miller et al., 2024). In addition, patient stratification through scores such as HEART, GRACE, PURSUIT and TIMI is an appropriate tool to assess prognosis, as well as to indicate the need for more diagnostic tests in patients who, even without initial evidence, are populations at risk for cardiovascular events (Piccioni et al., 2024; Abdelmegid et al., 2024; Soares, 2020; Magellan; CADE, 2019; Jercalau et al., 2024; Jobs; Collet; Thiele, 2023).

After a proper diagnosis, treatment should be initiated in order to avoid further tissue damage to the myocardium. Increasingly, researchers have sought to elucidate effective and problem-solving strategies. In addition, the personalized and individual approach for each patient has been put on the agenda, as a promise to adapt the right treatment to the right patient and at the right time (Magalhães; CADE, 2019; Montone et al., 2024). Such an approach combines all the findings in the patient's history and examinations, so that they can be analyzed and taken into account when making decisions about what to do next (Montone et al., 2024).

With regard to the already strongly established treatment for the condition, there are two modalities: invasive or non-invasive. The choice of approach depends on the patient's presentation and clinical evaluation, as well as the classification of ACS, the outcome of cardiac biomarkers, and the availability of equipment in the hospital in question. In addition, many factors can affect responses to treatment modalities, and these are mainly related to the infrastructure of the place where the treatment is performed, and availability of the necessary resources (Abukhalil et al., 2024).

The modality chosen for the treatment has already proven to be very important in the patient's final outcome, and therefore the importance of carrying out a conscious and safe approach. In the cohort study by Abukhalil et al., 2024, the results indicated that patients treated with early invasive strategies had a probability of recurrence within one year in the range of 40.5%, while those who received ischemia-guided therapy had a much lower percentage, around 27.1% (Abukhalil et al., 2024).

Among the invasive approaches, we have cardiac catheterization that aims to clean the narrow or occluded lumen, improving blood flow, and also the surgical option that consists of revascularization of the region. The most widely used interventional therapy for blood vessel dilation is percutaneous coronary intervention (PCI), which consists of implanting stents in coronary arteries narrowed by atherosclerosis. An ally to PCI is thrombolytic therapy, which reduces thromboembolism as well as restores blood flow and myocardial perfusion. PCI can also be performed together with coronary angiography, facilitating and accelerating the management flow. With regard to the surgical technique of revascularization, it comprises a procedure capable of

opening blocked arteries, allowing the passage of blood flow in the coronary arteries (Abukhalil et al., 2024; Cui; Guo; Li, 2024).

In addition, pharmacological measures are also important, and here it is worth highlighting drugs for antiplatelet therapy, to promote blood circulation and to remove blood stasis. Antiplatelet therapy may include aspirin and clopidogrel, which have proven efficacy in reducing the risk of ischemic events. In addition, it is vital to control the other factors involved in the pathophysiology of the disease, such as diabetes, hypertension and hyperlipidemia. Statins play a crucial role in lowering cholesterol levels, preventing the progression of atherosclerotic plaque, and helping to manage lipids. After the interventions, patients tend to maintain the administration of statins for a relatively long period of time to stabilize and control blood lipid levels. Medications to control blood pressure and blood glucose should also be used, when necessary (Abukhalil et al., 2024; Cui; Guo; Li, 2024).

In addition to everything already covered, guidance on lifestyle changes is essential, and should be explained to all patients, since this can reduce recurrence rates and improve long-term treatment outcomes. So, the diet to be followed should be low in fat and salt, and high in fiber. Weight monitoring should be continuously carried out, and physical exercise practices should be introduced. Exercise has the potential to improve cardiovascular health, reduce blood pressure and cholesterol levels, and dramatically decrease the chances of ACS recurrence (Cui; Guo; Li, 2024).

From this perspective, it is clear that management is a powerful dictator of the patient's prognosis, and the speed with which measures are taken and applied can avoid unfavorable outcomes, recurrences, and greater damage.

CONCLUSION

Based on what has been analyzed, acute coronary syndrome is a very prevalent disease, and has a high impact on the health system. Both overdiagnosis and underdiagnosis of such pathology cause damage, the first by overloading expenses with unnecessary treatments, and the second by delaying the diagnosis and can even lead to the death of patients. Knowledge of risk factors is a critical point with major repercussions on the patient's life. From the identification of the factors, it is possible to outline strategies that aim to mitigate the chances of a future occurrence of ACS. In turn, the clinical picture is a major divider, but it can also confuse and hinder diagnosis. There are tests and biomarkers that must be performed and analyzed quickly, and these are increasingly being studied to expand the options. The treatment is effective when implemented not many hours after admission, and the measures can be invasive or not, with PCI being the most applied. Finally, the patient must continue with the use of medications according to the comorbidities presented.

With this article, it is concluded that the investigation of acute coronary syndrome is broad and encompasses multiple factors. It is believed that the review was effective in providing the

necessary support for a general understanding of the syndrome, and in order to assist future studies that address this theme. In addition, it is expected that new actions aimed at preventing this syndrome will be applied, aiming to promote the health of the population.

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