Sexual Activity After Myocardial Revascularization Surgery

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Abstract: After a cardiovascular event, patients and their families often face numerous changes in their lives. Poorly addressing physical and psychological challenges can lead to an impaired quality of life. Sexuality is an important quality of life aspect to many patients and couples who can be negatively affected by a cardiovascular event. Sexual health requires a positive and respectful approach to sexuality and sexual relationships. Time to resume sexual activity after myocardial revascularization surgery is a gap in cardiologic practice. We know from literature that coronary patients have decreased sexual activity. There are barriers from the medical environment such as lack of knowledge, confidence and training, and many others that arise from the patient's perspective, which do not allow generating a space to address sexual problems. This review aims to familiarize and update cardiologists, providing knowledge and resources to face the impact of myocardial revascularization surgery on the quality of sexual life, promoting multidisciplinary

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Introduction

The challenge of returning to sexual activity (SA) after myocardial revascularization surgery (MRS) is often considered a problem; coronary heart disease patients experience a high prevalence of anxiety and depression. They frequently experience physical and mental concerns regarding SA, which as we know is a critical component of people's mental and psychological health, and impaired sex life can reduce quality of life. In the postoperative period of MRS, fears from the patient and partner, and even the low participation of the doctor in giving instructions, turn out to be the most frequently observed causes.[1] Generally, it is observed that returning to SA takes more work than resuming other habitual activities, such as mood, job satisfaction and family relationships.

Given that the original data source comes from 1994 and because there are not different data published later, it is estimated that only 25% of patients return to SA after a diagnosis or cardiovascular procedure, around 50% decrease their usual SA and 25% do not resume it.[2-5] Therefore, it should be an unavoidable topic in the postoperative consultation, between the doctor and the patient, whether the patient received education about it during hospitalization or not.

On one hand, we observe an increasing number of older individuals, in whom predominate chronic degenerative diseases (arterial hypertension, dyslipidemia, diabetes mellitus, and ischemic heart disease), but at the same time advances in medicine and invasive procedures have been developed, resulting in physically and sexually active older adult patients, with deferred mortality. On the other hand, the prevalence of ischemic heart disease in younger individuals has also been increasing, and of course SA is for them an extremely important topic.

The considerable prevalence of sexual dysfunction among cardiovascular patients is associated with physical and mental changes, drug side effects, and other factors. Erectile dysfunction is probably the most frequent cause of this disorder, which produces a decrease in sexual satisfaction, a feeling of deprivation, risk of poor mental health and, consequently, disintegration of family life.

There are various associations between cardiovascular disease (CVD) and SA, although some of them are statistically very rare. Literature shows us that SA can trigger angina pectoris, acute myocardial infarction (AMI), arrhythmias, and sudden death.[6-9] Sometimes sexual dysfunction

may occur secondary to cardiovascular medications. Treatment of erectile dysfunction with phosphodiesterase-5 inhibitors is often contraindicated in this type of patient.[10,11]

Regarding the bibliography, there are few publications referring to the evolution of SA in women after cardiovascular events, more precisely after the postoperative period of cardiac surgery.

This review aims to familiarize and update cardiologists, providing knowledge and resources to face the impact of MRS on the quality of sexual life, promoting multidisciplinary management among doctors and other health professionals.

Materials and methods

Bibliographic search strategy was carried out during May and June 2020 and were selected articles published in the period between 1980 and 2020. Because of relevant reasons, 3 publications dating from previous years have been included.

We used the advanced search engine Pubmed, combining keywords (title/abstract) and MESH terms: "cardiac surgical procedures" AND "coronary artery bypass" AND "quality of life"; "cardiac surgical procedures" AND "coronary artery bypass" AND "quality of life" NOT "angioplasty, transluminal, percutaneous coronary" NOT "heart transplantation"; "coronary artery bypass" AND "sexual behavior"; "coronary artery bypass" AND "sexual behavior" AND "rehabilitation"; in no case were there language restrictions.

Selection of studies included initial selection of titles and abstracts, followed by a full-text reports evaluation of all potentially relevant trials.

Among terms combinations, 65 publications were found, and those referring only to individuals with erectile dysfunction, arrhythmias, and those describing electrocardiographic findings have been excluded.

A manual search was performed in Lilacs, Cochrane and Medline and articles from the references of the addressed studies have been included to identify any other study not retrieved by the initial search; and those exclusively referred to individuals with AMI because cardiovascular responses to SA have been studied in this group of patients.

Results

Definition according to scenario

SA definition is a methodological challenge. The existence of different cultures makes different sexual behaviors. A few years ago, Stein et al.

proposed the term KiTOMI (Kiss, Touch, Oral sex, Masturbation, Intercourse) as suitable for making the medical recommendation according to the patient's clinical condition and CVD.[12]

The family and monogamous scenario has a very modest coronary risk, in fact epidemiological studies suggest benefits in terms of longevity for sexually active individuals. Sedentary patients have 2-3 times higher relative risk of AMI during intercourse than physically active patients, due to greater sympathetic activation. The risk of AMI is generally low, but increases when SA is extramarital. Regarding the latter, energy expenditure is higher (6-7 METS) and generally involves other issues such as increased tension, higher excitement, advanced age, alcohol consumption, a younger couple and eventually the use of sildenafil or other stimulants.[13]

SA metabolic and hemodynamic demand is similar to that of daily physical activity (3-5 METS), although there are interindividual variations.[13] SA cardiovascular and metabolic responses appear to be more related to arousal than physical exertion.

Human sexual response was studied and described by Masters and Johnson in 1966. In 1977, sexologist Helen Kaplan added the Desire phase.[14,15]

Literature preponderance regarding SA suggests that average maximum heart rate (HR) during sex varies from approximately 104-131 beats per minute (average maximum HR 120-130 bpm) and maximum systolic blood pressure from 150 to 180 mmHg. Regarding energy expenditure, it́s considered equivalent to 2 METS (before orgasm) and 5-6 METS (during orgasm).[13] (Fig 1)

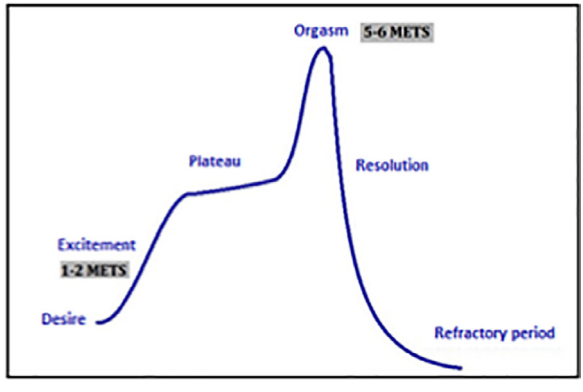

FIG 1. Correlation between METS and phases of human sexual response cycle.[13]

Despite these generalizations, there are hemodynamic and metabolic variations, both interindividual and between different sexual activities, either intercourse in a superior position, supine position, noncoital stimulation by the partner or self-stimulation.[16]

Sexual dysfunction is quite frequent among older people and negatively affects health-related quality of life, psychological well-being, marital quality, and the risk of adverse cardiovascular events. In CVD patients this is probably more frequent than in younger patients, as they often combine high anxiety and stress levels, low fitness, unhealthy body composition, excessive alcohol consumption, smoking, and regular use of cardiovascular medications. Therefore, is important to bear in mind that erectile dysfunction is a CVD hidden marker and also a marker of CVD progression.[17] (Table 1)

Erectile dysfunction is approximately 35% between 40 and 70 years old, while it is close to 75% in those over 80.[18] Ischemic heart disease severity correlates with erectile dysfunction. Several authors postulate cardiovascular risk factors (CVRF) as predictors of post-MRS sexual function. CVRF separately impact on the erectile function index used showed that neither age, smoking, hypertension or dyslipidemia had a negative influence, with the exception of diabetes mellitus.[19,20] Likewise, other studies tackle different factors that predict erectile dysfunction in the postoperative period, among which sexual knowledge, the duration of the disease, communication with the partner, the use of an extracorporeal circulation pump and the state of presurgical erectile function stand out, the latter being the most representative. Although this concept is developed within the framework of written questionnaires, it is clear that individuals with good pre-surgical erectile function have a high probability of preserving it, and those who have some degree of erectile dysfunction prior to surgery, surely will not improve it after surgery, since dysfunction is possibly due to penis previous vascular and tissue damage.[21,22]

Regarding extracorporeal circulation pump, the highest number of patients reporting postoperative improvement in erectile function was found in the group without pump. However, there were no significant changes in ultrasound data (systolic peak, final diastolic speed and

TABLE 1. Causes of erectile dysfunction

Organic	Neurological, hormonal, cavernous, drug-induced, pharmacological, vascular, anatomical
Psychological	Psychosocial stress, anxiety, depression (emotional, family, economic, work)

resistance index), concluding that the characteristics of revascularization surgery can be considered a predictor of sexual function but how penile tissue is affected without any change in the vascular bed is not clearly explained.[20,23]

It should be noted that the vast majority of publications refer only to men's sexual behavior. Regarding female sex, data points to a higher mortality 60 days after an isolated or combined MRS, due to the fact that they possibly arrive later to surgery expressing an underestimation of their CVD.[24-31]

Elderly patients are also poorly represented in the studies. Postoperative quality of life evaluations generally do not include sexual behavior. Only a Finnish study showed a significant improvement at 6 months in mobility, breathing, habitual activities, symptoms, vitality, and SA.[32] Although this one is a subgroup of individuals that probably present more complications in the postoperative period of isolated or combined MRS, it is considered that they can undergo cardiac surgical procedures with reasonable risk and show a notable improvement in their symptoms, functional status and quality of life.[33]

Risk stratification and general strategies

Princeton was the city chosen to hold expert conferences in 1999, 2006, and 2012 that evaluated the scientific evidence between SA and cardiovascular risk stratification, from which guidelines have been developed for the management of erectile dysfunction and SA.[34-36]

Risk is classified as low, intermediate or high. Intermediate risk individuals require re-stratification by cardiological evaluation and eventually stress test. In high-risk patients, SA will be deferred until cardiovascular condition is stabilized (Table 2).

According to De Busk's classification; low-risk patients may be allowed SA KiTOMI (meaning SA may include kissing, touching, oral sex, masturbation, and penetration), moderate-risk patients may have SA KiTOM (all of the above except penetration) and high-risk ones only KiT (SA only kiss and touch).

Clarifications

- In chronic stable angina, functional reserve is greater than that required by SA. A coitus-induced coronary event relative risk is not higher in patients with established coronary disease. Noninvasive

TABLE 2. Risk stratification for return to SA

Low	Intermediate	High
- Asymptomatic moderate intensity exercise - Less than 3 CVRF - Controlled hypertension - Mild CSA - Post asymptomatic AMI (event happened> 6-8 weeks) - Post revascularization, without residual ischemia or symptoms (3-4 weeks) - Mild LV dysfunction (NYHA I) - Mild valve disease	- Asymptomatic and ≥3CVRF - Increased cardiovascular risk, sedentary - Moderate CSA - Post AMI (2-6 weeks) - Ventricular dysfunction (NYHA II) Fey 40% - Noncardiac atherosclerotic sequela (peripheral arterial disease, stroke/TIA history)	- Unstable angina - Uncontrolled hypertension - CHF (NYHA III, IV) - Recent AMI (<2 weeks) - Malignant arrhythmia - Obstructive hypertrophic cardiomyopathy - Moderate-severe valve disease

AMI, acute myocardial infarct; CHF, congestive heart failure; CSA, chronic stable angina; LV, left ventricular; TIA, transient ischemic attack.
Adapted from DeBusk R et al.[34]

evaluation is also suggested. The existence of mild chronic stable angina does not rule out the existence of severe obstructions.[34]

- In patients with ventricular dysfunction, cardiovascular rehabilitation (CR) allows reclassification to a lower risk.[34]
- SA could be resumed 6-8 weeks after MRS or noncoronary open heart surgery. In case of incomplete revascularization, exercise stress tests can provide information on residual ischemia.[34,37]
- Regarding graduated ergometric test, functional capacity and exercise tolerance are extrapolated to the ability to maintain SA, being useful in patients who are not located in the low risk group and whose functional capacity is unknown. In general, individuals who can perform activities of daily living that require more than 3 to 5 METS are authorized to maintain SA. If signs or symptoms of residual ischemia (dyspnea, angina, cyanosis, ST-segment abnormalities, arterial hypotension, or arrhythmias) appear, SA should be restarted according to ergometric test.[38] In elderly, less trained patients, with heart failure or severe coronary heart disease, 6-minute walk test will take place.

At the time of the consultation, the treating doctor should take into account the following recommendations to educate patients with CVD about their SA (Table 3):

TABLE 3. General strategies to resume SA

Recommendation Class I B	Explain alarm signals
Recommendation Class IIa B	Explain energy consumption
	SA risks
	Gradual SA as a bridge to return to SA
	Physical training and CR
Recommendation Class IIa C	Effects of pharmacological treatment
	Environment and surroundings suitable for SA
	Sexual/anal/oral position
Specific recommendations (Class IIa B)	Resume SA in 6-8 weeks (sternal scarring)
	SA increases intrathoracic pressure (stress, breathing)

Taken from Steinke et al.[39]

SA is recommended during the first hours of the morning, avoiding unusual positions, and for the couple to command the sexual act to gain confidence. Avoid SA after heavy food or alcohol intake. An important factor to take into account is the room temperature, and a warm environment.[39]

As mentioned above, it is not until exertion is combined with excitement that the greatest energy expenditure occurs. SA can be compared to an exercise load of 2-3 METS in the preorgasmic stage and 4-6 METS during orgasm; the equivalent of climbing 2 floors upstairs. Some examples of energy expenditure are: man in top position 3.3 METS versus woman 2.5 METS; self-stimulation 1.8 METS, stimulation by the partner 1.7 METS.[40]

Giving alarm guidelines is very important. Patients should be aware that heart rate, blood pressure, and respiratory rate are expected to increase during SA. We should also report the low relative risk of presenting a cardiovascular event in the SA context. However, you should consult your doctor if symptoms such as chest pain, dyspnea, palpitations, dizziness, or asthenia appear on the day after SA. In patients with stable chronic coronary heart disease under treatment with nitroglycerin and symptomatic during SA, this drug should be taken before. Same with oxygen-use patients who usually require it for daily living activities. A gradual return is synonym of trust. Vital signs are gradually increased and this allows patients to assess SA tolerance. Needless to say, physical training improves exercise capacity and lowers the peak heart rate during intercourse.

Sexual counseling

Couples concerns and needs of people suffering from a cardiovascular event are real and no less important. First publications on the subject

were made in the 1980s.[41] Sexual counseling refers to the introduction of sexual health concept; defined by World Health Organization in 2002, as the physical, emotional, mental and social well-being state in relation to sexuality. It is not the simply absence of disease. Sexual health requires a positive and respectful approach to sexuality, including the possibility of obtaining pleasure and safe sexual experiences; in other words, sexual performance improvement and satisfaction.[42]

Although American and European guidelines suggest sexual advice for resuming SA after a coronary event, it is not a fact that generally occurs in medical practice. According to international records, 70% of doctors do not talk about sexuality (risks, instructions, CR), only 40% of patients and 30% of couples consider having received sexual information 1 year after the cardiovascular event. Furthermore, patients consider that dialogue with the doctor is the most important factor in resuming SA.

A few years ago it was postulated that cardiac patients with increased sexual concerns were less likely to resume their SA as often as before a cardiac diagnosis. For some patients, this may be a SA short-term decrease, while for others may be permanent and negatively affect couple's relationship.[43] Various sociodemographic factors, such as lack of a sexual partner, education, unemployment, insufficient income, or smoking, can contribute to a decline in sexual function. A study conducted on cardiac patients suggested that sexual problems might vary depending on the type of SA, since some require more effort than others. For symptomatic cardiac patients, this may be an important consideration regarding return to SA. Furthermore, cardiac and noncardiac co-morbidities can affect the ability to be sexually active, including the number and type of co-morbidities such as stroke, emphysema, or kidney disease.[44]

Role of cardiovascular rehabilitation and sexual quality of life

The paradigm shift proposed by Drs. Hellerstein and Ford in 1950 laid the groundwork for remote CR by promoting mobilization after suffering a coronary event. This proposal radically improved expectations for the frailest and elderly cardiac patients.[45]

CR improves functional capacity, aerobic, and musculoskeletal fitness of all participants. In addition, it improves self-confidence, self-efficacy and body image, presenting an indirect positive effect in reducing fears related to SA after a cardiovascular event.[46] CR is synonym of physical and mental health, and therefore, a strategic ally to improve SA.[47]

Some authors suggest that couple integration in CR sessions (through observation) tends to decrease anxiety. Also, it is always a good opportunity to clarify sexual doubts and prejudices.[10,38]

In the absence of meta-analysis, we have considered semiquantitative approaches that conclude the positive effect of CR on sexual function and frequency. The impact of CR on some endpoints, such as SA resumption and satisfaction, remains controversial.[48,49] Some reports on sex education during CR have shown an impact on libido, erection, sexual satisfaction, frequency of erection and sexual enjoyment from 50% to 87%.[50-52]

Regarding sexual satisfaction, it is suggested that the approach through doctors specialized in sexual therapy could play an important role.[53] In this therapy, the couple participates and focuses on satisfaction of each phase of the sexual response cycle. In patients with erectile dysfunction, attempts are made to enjoy SA even without achieving an erection, therefore there is no feeling of failure. However, the available information does not show that this therapy has a positive impact on partner's satisfaction. It is possible that the latter is due to the fact that sexual satisfaction progress is not reflected in other aspects of the marital relationship.[54]

Another aspect that should not be neglected is socioeconomic status and co-morbidities as preoperative quality of life predictors, because of their association with postoperative morbidity, survival, and quality of life. Patients with lower socioeconomic level have a disproportionate greater burden of disease and more CVD complications. Although it is unknown why patients with low socioeconomic levels present more functional deterioration; it can alert discriminate patients at higher risk of low quality of life in the postoperative period, and is also extremely important for resource allocation and recovery planning after discharge from hospital.[55]

Discussion

SA taboo is oversized when health, especially cardiovascular, is involved. It is enough to look at the scarce number of medical publications that can be found in traditional search engines in the last 40 years, to understand the infrequent handling by the cardiology community.

Female sex and older adults are clearly the least represented subgroups. In the elderly population, a careful assessment of the fragility and cost-benefit of the procedure will be very helpful.[56]

Regarding CVRF distinction and discernment analysis, patient deficiencies are observed in terms of instruction and knowledge.[57-59] It is a truth that the focus of learning and training should include not only patients, but also the patient's partner and the doctor.

A well-known fact is that discomforts emerge during medical questioning and, on the other hand, many patients do not want to expose their SA.[60]

A few years ago, health professionals were questioned in a Serbian publication for not doing their job correctly in addressing "sexual rehabilitation," clarifying that ignorance and prejudice were the main reasons. They also highlight the low participation of the doctor in the delivery of instructions (around 20%) and the resistance of all professionals during the patient's hospitalization, especially nursing.[61] In Ireland, health professionals were also surveyed with the aim of documenting routine practice and assessing the needs in CR areas regarding the evaluation and sexual management of patients. The results support previous findings and indicate that health personnel believe that patients do not expect them to ask about their sexual concerns. Barriers included a general lack of confidence (45%), knowledge (58%), and training (85%). Furthermore, a non-irrelevant fact was that in a high percentage (around 90%) doctors responded that sexuality is a too private topic to discuss with the patient, so it should only be discussed if the patient initiates it.[62] The aforementioned barriers that prevent an open dialogue about SA between the patient and the doctor vary in the publications consulted.[63-65] The magazine articles, chapters and consensus that we have selected based on the bibliographic search carried out, speak for themselves. 36% come from clinical cardiology areas, 18% from sexual health, 12% from nursing, and the rest from internal medicine or surgery, showing that SA approach requires horizontal participation, predominantly clinical which shares knowledge and skills of other specialties and integrates the biomedical, behavioral and social sciences. Implementing an intervention on sexual counseling is not an easy task, since it is necessary a three level intervention (patient, partner, doctor) through conscious training.[66] Usually, anamnesis does not include information about SA and doctors commonly avoid speaking or asking about topics in which they do not feel capable of giving an answer or treatment.[67]

Through this review, we have learned that approach must be multidisciplinary and the goal is to achieve maximum SA quality within the patient's capabilities.

To achieve these objectives, the ideal approach should include predictable and comprehensive long-term programs, from knowing patient comorbidities as predictors of low postoperative quality of life, regular exercise, risk factors modification, psychological support, and appropriate use of cardiovascular drugs. With regard to the latter, many of them negatively influence the sphere of sexual response. It is important to keep

this in mind when prescribing, to choose an alternative medicine that does not influence the sexual response. This approach requires a multidisciplinary team, which focuses not only on CR but also on global quality of life improvement related to health of patients.[68-71] For all this, we must emphasize in our practice that there is sex life after MRS, that we must carry out a proper interrogation and accompany the patient and his partner on this path. It is very important for health professionals to develop communication skills so that approach be gradual, sensitive, and pleasant. We must also create a permissive climate for patients to raise questions, and in this sense the delivery of brochures related to sexual concerns is recommended.[72]

We must think SA as part of the usual medical prescription, as the food plan, medication and physical activity. It is important to take into account the referral to a sexology specialist and working in an interdisciplinary way, as we usually do with other medical specialties.

Lastly, we must remember that each patient is unique, and so is its bonding emotional context, which makes sexuality also unique. And for daily practice, we must always assume that patients want to listen to medical advice.

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