



Sudden Cardiac Arrest Following Sexual Activity in an Asymptomatic Patient with Undiagnosed Hypertrophic Cardiomyopathy: A Case Report

Annie Berg^{1*}; Jigish Khamar¹; Nathan How²; Bennett Haynen^{1,3}

¹Michael G, DeGroot School of Medicine, McMaster University, Hamilton, Ontario, Canada.

²Division of General Surgery, Niagara Health, St. Catharines, Ontario, Canada.

³Division of Cardiology, Niagara Health, St. Catharines, Ontario, Canada.

***Corresponding Author(s): Annie Berg**

Michael G, DeGroot School of Medicine, McMaster University, Hamilton, Ontario, L8S 4L8, Canada.
 Email: annie.berg@medportal.ca

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Keywords: Hypertrophic Cardiomyopathy; Cardiac Arrest; Sexual Activity; Case Report.

Abbreviations: HCM: Hypertrophic Cardiomyopathy; SCA: Sudden Cardiac Arrest; AHA: American Heart Association; ED: Emergency Department; CPR: Cardiopulmonary Resuscitation; PCI: Percutaneous Coronary Intervention; ICU: Intensive Care Unit; MRI: Magnetic Resonance Imaging; ICD: Implantable Cardioverter-Defibrillator; LV: Left Ventricle; LVOT: Left Ventricular Outflow Tract; LVEF: Left Ventricular Ejection Fraction.

Abstract

Background: The American Heart Association (AHA) guidelines suggest that sexual activity is reasonable for most patients with Hypertrophic Cardiomyopathy (HCM) however, it should be deferred for patients with severe symptoms until clinically stabilized. Furthermore, the AHA scientific committee noted that no Sudden Cardiac Arrest (SCA) cases linked to sexual activity in HCM have been documented. Therefore, this case report describes the first documented case of an asymptomatic patient with undiagnosed HCM with Left Ventricular Outflow Tract (LVOT) obstruction having a SCA during sexual activity.

Case presentation: A 62-year-old Caucasian male was brought to the emergency department unresponsive within 10 minutes of sexual activity. His partner initiated cardiopulmonary resuscitation and contacted Emergency Medical Services (EMS). Upon EMS arrival, the patient was in ventricular fibrillation that was successfully defibrillated. In the emergency department, he then suffered another cardiac arrest resulting in pulseless electrical activity requiring intubation. After 50 minutes of down time, there was return of spontaneous circulation. An echocardiogram demonstrated basal septal hypertrophy of 20 mm with a resting LVOT obstruction gradient of 63mmHg. The patient received an implantable cardioverter-defibrillator and was discharged home two weeks post-cardiac arrest.

Conclusions: The patient displayed cardio protective factors including being asymptomatic, having high self-reported levels of physical activity and participating in regular sexual activity with his common-law partner. Clinicians need to incorporate discussions surrounding sexual activity during routine follow-ups for HCM to ensure appropriate patient education.



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Background

Hypertrophic Cardiomyopathy (HCM) is characterized by disorganized myocardial thickening of the Left Ventricle (LV) [1,2]. HCM can be associated with Left Ventricular Outflow Tract (LVOT) obstruction noted at rest or with provocation [3]. Sudden Cardiac Arrest (SCA) is the most common cause of death in HCM patients, resulting from electrophysiological abnormalities related to disorganized cardiomyocytes [4,5]. One case series found that typically younger and asymptomatic HCM patients are affected by SCA [5]. The annual SCA rate in HCM patients is <1%, however, a minority of HCM cases are identified clinically [6,7]. This is compounded by poor risk stratification tools in North America creating a challenging environment for patient education and prophylactic interventions including an Implantable Cardioverter-Defibrillator (ICD) [8].

The inability to appropriately risk stratify and the high prevalence of SCA leads to uncertainty around the safety of physical activity and sexual activity in patients with HCM, and specifically in the subgroup with LVOT obstruction [8,9]. In Germany, it was found that 0.75% of cases of all-cause SCA were associated with sexual activity, with 55% occurring during the sexual activity and 45% occurring within 15 minutes of intercourse [10]. SCA with sexual activity is more common in men, those participating in extramarital sex, and individuals around the age of 60 [11]. During sexual activity, heart rate rises to 110-180 beats per minute, systolic blood pressure increases by 20-60 mmHg, and oxygen consumption increases by 25%, making intercourse a moderate stress [12]. The risk of a cardiac event during sexual activity decreases with higher habitual physical activity levels [13]. Arrhythmias were more common during sexual activity compared to an ergometer test, potentially being explained by psychological factors such as arousal [14,15]. Patients who experience a SCA during sexual activity may have a higher survival rate compared to patients arresting from other circumstances, partially being explained by higher rates of bystander Cardiopulmonary Resuscitation (CPR) [10]. Current American Heart Association (AHA) guidelines recommend sexual activity only being postponed in patients with severe symptoms of HCM until clinically stabilized [9]. However, these recommendations were made on the assumption that sexual activity is similar to participation in intensive physical exercise [9]. Given the variability influenced by culture, personality, and psychology, defining sexual activity is complex. It is important to revise these guidelines, treating sexual activity as a distinct entity rather than equating it to vigorous physical exertion. Notably, the AHA scientific committee recognizes these guidelines' constraints due to the absence of documented instances linking sexual activity to SCA in HCM cases [9].

To the best of our knowledge, this is the first documented case of a patient with undiagnosed HCM having a SCA during sexual activity. This case report represents an unusual presentation of SCA following sexual activity in an otherwise healthy, asymptomatic male resulting in a diagnosis of HCM with LVOT obstruction.

Case presentation

A 62-year-old Caucasian male presented to the Emergency Department (ED) following an out of hospital cardiac arrest after sexual intercourse. Past medical history included abstinence from smoking for two years prior to presentation with a 30 pack-year smoking history, an elevated body mass index of 26.9, a prior uncomplicated laparoscopic cholecystectomy, and

a ruptured appendix requiring a laparoscopic appendectomy in 2019 which was complicated by postoperative delirium and hypoxemia requiring re-intubation. During the 2019 admission, an echocardiogram was performed which showed a Left Ventricular Ejection Fraction (LVEF) of 65% with basal septal hypertrophy measuring 14mm and a provokable LVOT gradient of 105mmHg with Valsalva. There was unfortunately no documented follow-up for his echocardiographic findings and the patient was unaware of the possible diagnosis of HCM. The patient had a sedentary occupation, but remained independent at baseline with an active lifestyle. He consumed alcohol socially on weekends and denied illicit drug use. There was no significant family history of SCA, cardiomyopathy, or unexplained death. He had a documented allergy to penicillin and was not taking any regular medications prior to hospital presentation.

On the day of presentation, the patient noted that he had been active, had been feeling well, and in his usual state of health. He reported being active, including regularly achieving 10,000 steps on a daily basis. He was in a long-term monogamous relationship, and he and his wife routinely engaged in sexual intercourse twice weekly, including on the day of presentation. Within 10 minutes of sexual intercourse, the patient developed acute abdominal discomfort followed by unresponsiveness which was recognized by his wife. CPR was immediately initiated and she contacted emergency medical services. His initial rhythm was ventricular fibrillation which was successfully defibrillated. While in the ED, he unfortunately aspired due to vomiting resulting in pulseless electrical activity cardiac arrest requiring CPR, resuscitation, and intubation. After a total of approximately 50 minutes of downtime, there was return of spontaneous circulation and blood pressure. The electrocardiogram showed ischemic changes with significant ST depressions, deep T-wave inversions in the precordial leads, and LV hypertrophy. His first set of troponin was elevated at 1.359 $\mu\text{G/L}$ which peaked at 4.619 $\mu\text{G/L}$ before down trending. He did not undergo immediate coronary angiography with a view towards primary Percutaneous Coronary Intervention (PCI) due to uncertainty of his neurological prognosis. Therefore, he was admitted to the Intensive Care Unit (ICU) for initial stabilization and neuroprognostication prior to being reassessed for cardiac catheterization in the future. The presumed clinical diagnosis was cardiac arrest secondary to cardiac ischemia and a non-ST-elevation myocardial infarction.

Over 72 hours during ICU admission, he was extubated, awake, and conversant. The patient was maintained in the ICU on acetylsalicylic acid, ticagrelor, atorvastatin, fondaparinux, and metoprolol. There were no focal neurological deficits and he denied any exertional chest discomfort, episodes of dizziness, and shortness of breath, leg swelling, or orthopnea. Studies of the abdomen and head were unremarkable. Physical examination was normal except for a soft systolic murmur over the lower left sternal border.

An echocardiogram was performed on the day after his presentation which showed normal LV size with hyperdynamic systolic function with an estimated LVEF > 65%. He had basal septal hypertrophy of 20mm with evidence of LVOT obstruction with a resting LVOT gradient of 63 mmHg. The echocardiogram findings post-cardiac arrest can be found in **Figures 1 and 2**. When compared with the echocardiogram from 2019, the basal septal hypertrophy had increased by 6 mm. As the patient had a good neurological recovery, he was advanced for a coronary angiogram to assess for obstructive coronary artery disease. It dem-

onstrated a 90% stenosis in the left anterior descending artery, which was treated with PCI using a 3.5 x 32 mm drug eluting Promus stent. There was a no-reflow phenomenon that was treated with intracoronary nitroglycerin and adenosine. After catheterization, there was Thrombolysis in Myocardial Infarction grade two flows down the vessel.

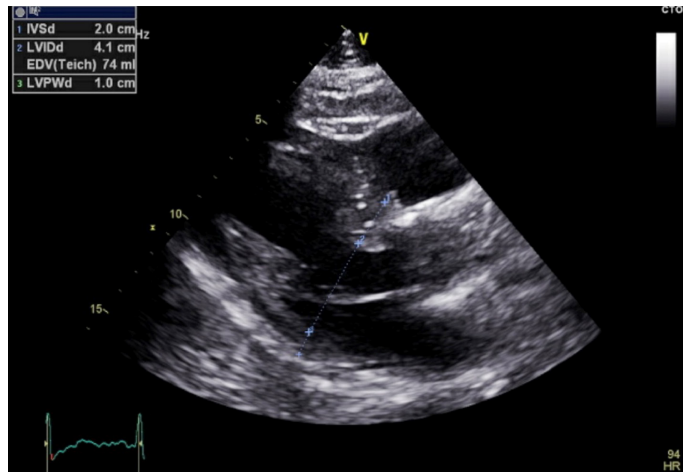


Figure 1: Post-cardiac arrest echocardiogram showing left ventricular hypertrophy, no Valsalva.

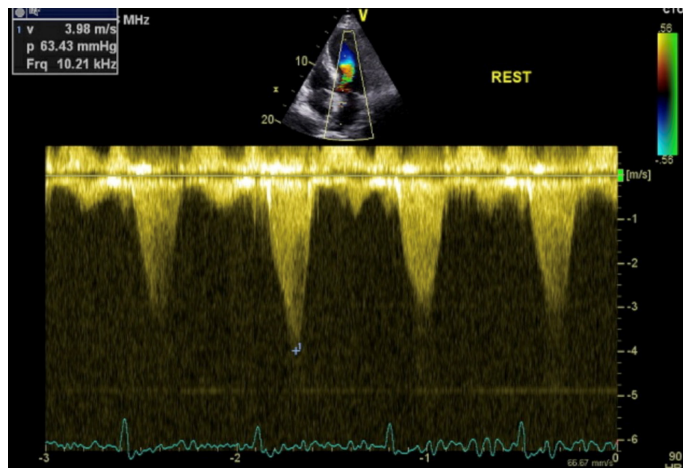


Figure 2: Post-cardiac arrest echocardiogram showing left ventricular outflow tract obstruction, with Valsalva.

During his hospitalization, he underwent cardiac Magnetic Resonance Imaging (MRI), which showed asymmetrical septal thickening (maximally 17 mm) with inferoseptal segments measuring up to 15 mm with possible early fibrosis consistent with HCM. There was no evidence of chronic infarct or systolic anterior motion.

The patient was discharged home two weeks post-arrest with ticagrelor, acetylsalicylic acid, controlled release hydromorphone for chest wall discomfort post-CPR, pantoprazole, metoprolol, and atorvastatin. Short acting hydromorphone and nitroglycerin spray were prescribed to take as needed. One day before discharge, the patient received an ICD due to his diagnosis of HCM and ventricular fibrillation cardiac arrest, without evidence of significant infarction by cardiac MRI from his left anterior descending artery lesion. He was given physical activity guidelines to follow and was notified of his six month private driving restriction. The patient was also advised about genetic counseling for HCM. The patient returned for a scheduled echocardiogram six months later which revealed no LVOT obstruction and normal LV size with asymmetric septal hypertrophy. There were no regional wall motion abnormalities, diastolic

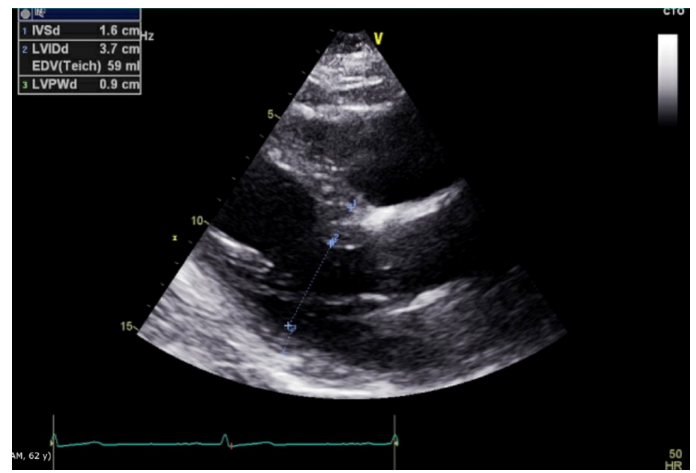


Figure 3: Six month follow-up echocardiogram showing improved left ventricular hypertrophy, no Valsalva.

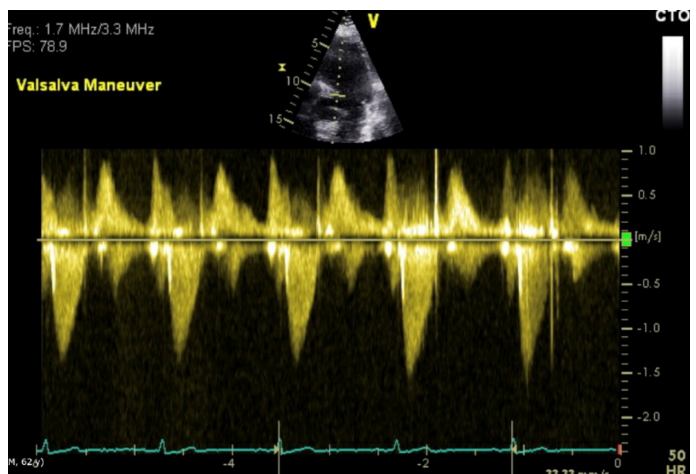


Figure 4: Six month follow-up echocardiogram showing resolved left ventricular outflow tract obstruction, with Valsalva.

function was normal, and contractility was within normal limits with an LVEF of 63%. These were all reassuring findings of a good prognosis. The six month follow-up echocardiogram findings can be found in **Figures 3 and 4.**

Discussion & Conclusions

Patients with known cardiovascular disease are recommended to seek evaluation prior to initiating physical activity, and the ability to reach 3-5 metabolic equivalents on an exercise stress test is seen as a suitable guideline to resume sexual activity [15]. Although the patient had echocardiogram findings of HCM two years prior to his arrest, no cardiology involvement or follow-up was sought at the time. In addition, the patient also had an LVOT obstruction which may have increased his risk of SCA. Unfortunately, in cases of SCA, 55% of men had no prior diagnosis [16]. Despite reducing all-cause mortality by 22%, many patients diagnosed with HCM intentionally reduce their physical activity after diagnosis [17,18]. This case was unique as the patient self-reported high levels of physical activity at baseline such as taking over 10,000 steps per day and participating in regular sexual activity. However, the complication of cardiac arrest displays that these protective factors alone are not sufficient. Patients must be diagnosed with HCM early in order to prompt medical management, potentially obtain a prophylactic ICD, provide patient education, and initiate close follow-up.

With regards to patient education regarding sexual activity, the AHA guidelines recommend sexual activity only being postponed in severely symptomatic patients [9]. However, these recommendations were made on the assumption that sexual activity is similar to participation in intensive physical exercise [9]. However, the intricacies surrounding sexual activity are far-reaching, influenced by cultural norms, personal disposition, and psychological factors [19]. The complexity arises from the fact that individuals may approach sexual activity differently based on their personal objectives and mutual expectations with their partner [19]. Therefore, our suggestions are two-fold. Firstly, it is important to revise these guidelines, treating sexual activity as a distinct entity rather than equating it to vigorous physical exertion since there may be a larger underlying psychosocial component. Secondly, clinicians need to discuss sexual activity routinely during follow-up appointments to ensure that patients are not experiencing HCM sequelae around the time of intercourse.

The 2020 guidelines by the AHA and American College of Cardiology suggest that an ICD is reasonable or recommended for HCM patients with a family history of SCA, LV hypertrophy of 30mm or greater, a previous cardiac arrest, sustained ventricular tachycardia, presence of apical aneurysm, LVEF less than or equal to 50%, or in patients with unexplained syncope [4]. However, these risk stratification tools have low sensitivity, suggesting the need to use novel markers for treatment to account for the wide range of presentations [8]. ICD's have a five year failure rate of 5-15% and are associated with negative psychological outcomes related to the fear of inappropriate shock [4]. Due to our patient's unremarkable family history, LV wall thickness below threshold, and lack of clinical symptoms, even with a diagnosis of HCM he would not have met guidelines to consider prophylactic ICD implantation.

A study in Germany found that 94% of people who had a SCA triggered by sexual activity were male, middle aged, and had an average body weight of 81.6 kg [10,11,20]. Despite our patient being a middle aged male with a weight of 89.8 kg, he had many factors making this case unique. Sudden cardiac events associated with sexual activity are more common in extramarital sex, unknown environments with potency enhancing drugs, and alcohol consumption [11,15,21]. Further, extreme sexual practices like asphyxia are associated with increased risk of death [22]. The patient was participating in routine sexual activity with a common law partner in his own home. The patient reported having similar sexual activity approximately two times weekly. In cases of SCA following sexual activity only 19.4% survive to discharge, and our patient survived likely due to prompt bystander CPR, patient age, and lack of other medical comorbidities [10].

Overall, this marks the first documented case to our knowledge of a SCA following sexual activity in a patient with HCM. In addition to its novelty, the strengths of this case report include thorough descriptions of relevant cardiac imaging, figures showing echocardiography results 6-months apart to allow for comparison, and a thorough past medical history outlining all cardioprotective factors and any risk factors. However, this case report is not without limitations. Firstly, there was no documented emergency medical services log available in the electronic medical record outlining initial interventions and clinical findings. Therefore, there was very limited information regarding the patient's out of hospital care prior to presentation in the ED. Secondly, the 2019 echocardiography results were not

available for download as figures for this case report which limits a longitudinal comparison regarding changes in the patient's HCM and LVOT obstruction status.

Overall, this case report demonstrates the limitations of cardioprotective factors, and the need for prompt diagnosis and management in asymptomatic HCM patients. Furthermore, clinicians should be encouraged to broach the topic of sexual activity regularly with HCM patients in order to provide valuable patient education. Further case reports discussing the impacts of sexual activity in the context of HCM are warranted to aid in guideline formation whereby sexual activity has an independent body of knowledge rather than relying on assumptions based on the recommendations for physical activity.

Declarations

Ethics approval and consent to participate: Ethics approval was not required from the Hamilton Integrated Research Ethics Board as this case report included three or fewer patients.

Consent for publication: Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of data and materials: Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

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Authors' contributions: Conception and design of the study – NH, BH

Acquisition of data – AB, JK

Drafting and revision of the manuscript – All authors

Approval of the final version of the manuscript – All authors

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