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Intracardiac Lipoma in Sports Medicine: A Clinical Case

Intrakardiales Lipom in der Sportmedizin: ein klinischer Fallbericht

CASE REPORT

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Summary

› **A cardiac lipoma** is a benign primary tumor form of adipose tissue, composed of mature adipocytes that can be either capsuled or diffusely infiltrate the myocardium. Cardiac lipomas often are asymptomatic and depend on the size and location of the mass. Voluminous neoformations protruding in the heart cavities can mimic valve pathologies and cause obstructive phenomena affecting the ventricular inflow or outflow tract or cause syncope, arrhythmias, conduction disturbances.

› **Doppler echocardiography** represents the simplest imaging procedure in the study of cardiac masses. However, the most accurate current diagnosis method in terms of sensitivity and specificity is the magnetic resonance, which can determine the morphological characteristics, dimensions, as well as the relationships with the surrounding structures.

› **We present the case** of a young sportsman to evaluate in terms of the risk profile for the practice of competitive sports with a diagnosis of cardiac lipoma. This mass was protruding into the outflow tract of the right ventricle without giving any sign of valvular obstruction. The athlete did not even refer any cardiac-related symptom. In this case the prepartecipation physical evaluation requires a careful medical history, a precise hemodynamic analysis with second and third level imaging studies and a specific stratification of the arrhythmic risk profile.

KEY WORDS:
Magnetic Resonance, Cardiac Masses, Ventricular Arrhythmias, Athlete, Echocardiography

Zusammenfassung

› **Das intrakardiale Lipom** ist ein gutartiger Tumor des Fettgewebes und besteht aus reifen Adipozyten, die entweder von einer Kapsel umgeben sein können oder diffus das Myokard infiltrieren. Der klinische Verlauf eines Lipoms im Herzen ist meist asymptomatisch, hängt allerdings entscheidend von dessen Größe und Lokalisation ab. Voluminöse Neoformationen die in die Herzhöhlen hineinragen können Klappenerkrankungen simulieren und obstruktive Phänomene im ventrikulären Ausfluss- oder Einflusstrakt hervorrufen, zudem können sie Synkopen, Arrhythmien und Überleitungsstörungen verursachen.

› **Der Herzultraschall** stellt die einfachste diagnostische Methode dar, wenngleich die Magnetresonanz in der Darstellung der Herzmasse, hinsichtlich Sensibilität und Spezifität genauer ist. Die Magnetresonanz kann morphologische Charakteristika, Dimensionen und die Verbindung zu den umliegenden Strukturen sehr genau darstellen.

› **Wir präsentieren in dieser wissenschaftlichen Arbeit** den klinischen Fall eines jungen Sportlers mit der Diagnose eines Herzlipoms. Er kam zur sportmedizinischen Visite, um sein Risikoprofil hinsichtlich der Ausübung der Wettkampfsportarten Leichtathletik und Ski Alpin ermitteln zu lassen. Die Masse des Lipoms ragt in den Abflusstrakt des rechten Ventrikels hinein, ohne Anzeichen einer Klappenobstruktion. Der Athlet wies keine kardialen Symptome auf. In diesem Fall erfordert die sportmedizinische Beurteilung eine sorgfältige Anamnese, eine genaue hämodynamische Analyse mit Bildgebungsstudien der zweiten und dritten Ebene und eine spezifische Schichtung.

SCHLÜSSELWÖRTER:
Magnetresonanztomographie, Herzgröße, ventrikuläre Arrhythmien, Sportler, Echokardiographie

Introduction

Cardiac lipomas are rare occurrences and represent the second type of benign tumors in order of frequency (about 10% of cases). They have a similar incidence between the two sexes and affect patients of any age. They can be single or multiple and the dimensions vary according to the localization: most (75%) are localized in the subendocardium or the subepicardium, while the remainder is intramuscular (7, 11, 14). They can consist only of adipose tissue (pure lipoma) or have other types of tissue, such as the fibrous connective one (fibrolipoma).

The etiology is not fully known to date, although many authors lean towards a genetic predisposition. Cardiac lipomas manifest their malignancy concerning the hemodynamic changes caused, as they often provoke blood flow obstructions as a result of their endocavitary growth or peripheral embolization of fragments (30-60% of cases), with ischemic consequences in other organs. This develops a spectrum of symptoms ranging from mild obstruction to flow, up to cardiogenic shock due to engagement of atrioventricular orifices or occlusion of the pulmonary artery, simulating pulmonary embolism (2, 5). ›

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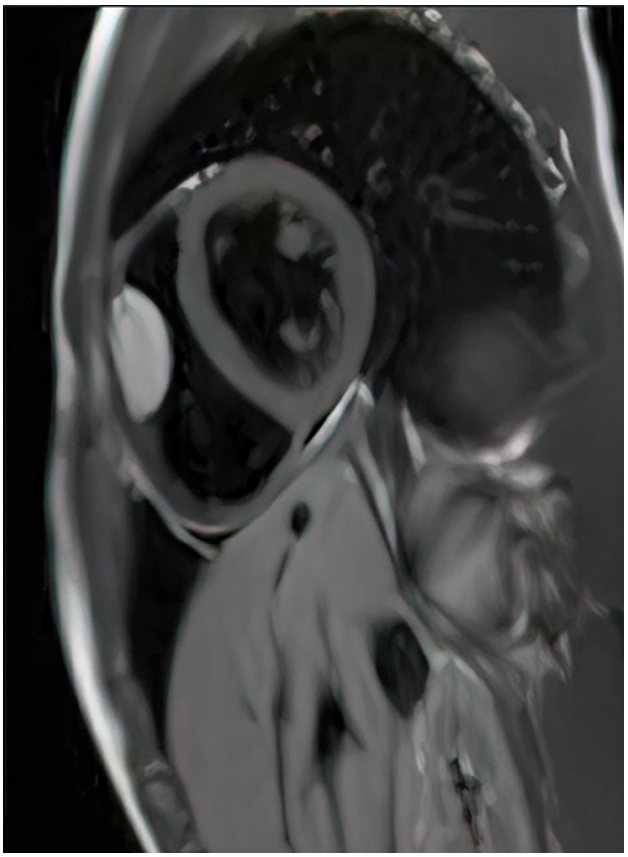

Figure 1

Magnetic resonance of the heart showing a lipomatous mass with epicardial implantation and intramural growth towards the outflow tract of the right ventricle.

Objectivity varies according to tumor location and pathophysiological conditions: tumors of the right sections can lead to right heart failure and, in case of obstruction of the tricuspid valve, it is possible to verify the presence of a diastolic roll that varies with the inspiration.

Jugular venous pressure shows prominent a-waves and Kussmaul's sign, that is, the turgor of the jugular veins in inspiration. Recurrent pulmonary emboli can potentiate pulmonary hypertension (3, 15). Subendocardial tumors can become symptomatic and cause obstruction; subepicardial lipomas can protrude into the pericardial space and impair cardiac function by compression or cause secondary pericardial effusion. Diagnosis of heart tumor is suspected on the base of symptoms and signs and confirmed by Doppler echocardiography, which remains the first choice method in cardiac mass evaluation, thanks to its wide diffusion, the absence of ionizing radiations and iodates contrast agent.

In particular, the two-dimensional transthoracic echocardiogram and the transoesophageal echocardiogram allow direct visualization and identification of cardiac masses, providing accurate information on size, morphology, implantation site and mobility of the mass (16). Cardiac magnetic resonance imaging (Cardiac MRI), a second-level method, is a multiparametric diagnostic imaging technique considered the gold standard for non-invasive soft tissue characterization. Lipomas on MRI appear hyperintense in T1-weighted sequences for fat visualization and hypointense in T2-weighted sequences with Fat Saturation pulses. After the injection of a gadolinium paramagnetic contrast agent, it is possible to identify the vascularity of the tumor, which is important for identifying its degree of malignancy or benignity. Lipomas are less vascularized masses with well-defined structures, homogeneous and capsulated and do not have perfusion (enhancement) at the first passage but they can absorb gadolinium a few minutes after injection. The primary therapy for benign heart tumors is surgical resection of the injury due to the high risk of fatal obstructions, embolization or arrhythmias. The relapse rate after surgical excision is variable (17).

Clinical Case

A 13-year-old young man comes for a medical sports examination to obtain a fitness certificate for the following agonistic sports: alpine skiing and athletics. Following a previous visit to the paediatrician, he was sent by the same in the Cardiology Unit for a casual 1-2/6 holo-mesosystolic murmur. ECG was performed and showed a respiratory sinus arrhythmia and an incomplete bundle branch block.

The Doppler echocardiography found a mass at the level of the anterior wall of the right ventricle between inflow and outflow tract. This mass was oval with well-defined contours, with a 38 mm craniocaudal diameter, 23 mm anteroposterior diameter, a latero-lateral diameter of 28 mm and was probably intramural, not obstructing the right outflow tract. The right and left ventricle were of normal size and their systolic function was within normal limits. Maximal exercise test and Holter dynamic electrocardiogram were negative for hypo-hyperkinetic arrhythmias. In particular, the dynamic ECG according to Holter, showed isolated supraventricular ectopic beats, sometimes present in rare pairs and a triplet which disappeared during training.

For a more complete diagnostic definition, he was thus sent to the Radiology Unit to perform nuclear magnetic resonance imaging which confirmed the diagnostic suspicion of a lipomatous mass with epicardial implantation and intramural expansion in the outflow tract of the right ventricle (Figure 1). In light of the absence of symptomatological manifestations and of the clinical picture characterized by a ventricular sisto-diastolic function within the limits, the suitability for agonistic sport was released, following the 2020 guidelines of the European Society of Cardiology (18).

For a correct prognostic classification, risk assessment and stratification, the boy, hitherto asymptomatic, was entrusted to the Cardiology Unit of the Bolzano Hospital for the follow-up. The following year the medical-sports examination did not show arrhythmias inducible from the effort and /or signs of inducible ischemia on maximal exercise stress test (test interrupted at 200 Watt for muscle fatigue, basal HR 75 BPM, max HR 175 BPM, Basal BP 105/65 mmHg, BP max 170/90 mmHg). ECG Holter was also repeated with the absence of significant hypo-hyperkinetic arrhythmia and Doppler echocardiography showed a left ventricle of normal size, kinetics and wall thickness, a good systolic function (FE 60%) in the absence of regional kinetic alterations and the normal pattern of ventricular filling. The right sections were within the limits in size.

For a more specific volumetric definition, MRI was performed which showed minimal changes in the shape of the lipoma in the various phases of the cardiac cycle with no increase in diameters. The lipomatous lesion, located in the context of the anterior wall of the right outflow tract, during the systolic phase leaned towards the anterior septum, as reported by the cine sequences, but without obstructing the right outflow tract.

Discussion

Diagnosing a heart tumor often represents a real challenge for doctors. Cardiac tumors are difficult to diagnose, due to their rarity, variety and absolute not specific symptoms while history and clinical examination rarely lead to an immediate diagnosis. The judgment of suitability for competitive sport cannot ignore the execution of first and second level cardiological investigations, such as a standard baseline and exercise ECG through a maximal ergometric test, 24/h electrocardiographic monitoring according to Holter aimed at excluding the presence of hypo/hyperkinetic arrhythmias and conduction disturbances at rest or induced by exercise.

Moreover, Doppler echocardiography appears basic in the morphological evaluation of the lipomatous mass and the measurement of valve flows. These examinations require, in this specific case, to be completed with a third level imaging by a Cardiac MRI to define in more detail the size of the cardiac mass and the relationships with the surrounding structures. This allows a valid volumetric comparison with previous findings for the control of any evolution over time (9, 10).

In the case of ventricular outflow obstruction, syncope and complex arrhythmias it is unanimously agreed to refer the patient to surgical excision of the lipoma. Following the cardiological consultations carried out and even in consideration, at the present, of the mild intensity of the cardiovascular commitment to which the young sportsman undergoes, it was decided to postpone to a more mature age and completed growth the possibility of cardiac surgery. A possible follow-up also by performing physical exertion echocardiography was held in consideration.

Conclusions

The presence of intracardial lipoma in medical sport evaluation aimed at releasing a competitive sports fitness certificate requires a careful hemodynamic analysis and a specific stratification of the arrhythmic risk profile. Signs and symptoms such as chest pain from exertion, syncope or pre-syncope, dyspnoea or fatigue disproportionate to the level of exercise, tachycardic palpitation must raise alarm, by suspecting an evolution of the lipoma itself. The collegiality between Sports Physicians, Cardiologists and Radiologists represent, in the specific case, one remarkable tool of prevention and assistance of the state of health of the sportsman's agonistic eligibility.

Conflict of Interest

The authors have no conflict of interest.

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