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Case Report: COVID-19 in the Setting of HCOM

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Abstract: ***Importance: Viral infections have been discussed as one of the most common causes of myocarditis but a rare encounter of a patient suffering with a condition of Hypertrophic Cardiomyopathy (HCOM) incidentally discovered with COVID-19, has been presented in this case report with lesser known facts about the involvement of cardiomyopathies (CMPs) as a further complication or an alleviating factor against severe COVID-19 Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection. Objective: To describe the presentation of corona virus disease (COVID-19) in a patient with incidental HCOM, who experienced influenza like syndrome at first and then developed fatigue and signs of severe upper respiratory tract symptoms along with dizziness and chest tightness. Design, Setting, and Participant: This case report describes a 39-year-old man who tested positive for COVID-19 by rapid antigen testing and was admitted to the respiratory care unit in April 2021 with typical imaging features of COVID-19 for acute respiratory depression syndrome, confirmed on HRCT thorax scanning, 8-10 days after a rapid onset of fever, severe headache, myalgia and dry coughing due toa viral COVID-19 infection. Exposure: COVID-19 aggression with stable yet severe cardiac involvement. Main Outcomes and Measures: Monitoring COVID-19 pulmonary effects along the detection of cardiac involvement with normal ECG but increased changes in systolic ejection fraction levels on echocardiography and gradual recovery and resolution by treatment shown through repeat HRCTthoraximaging and echocardiography. Results: An otherwise healthy 39-year-old man presented to the emergency department with fatigue, fever, myalgia, dry cough and signs of severe respiratory depression. He described weakness, recurrent fever, severe headache, body ache, loss of appetite and constant dry coughing that got worse in 8-10 days. His vitals at admission were documented to be febrile with a feeling of anxiety and suffocation, low in oxygen saturation but with normal blood pressure and based on the second wave of the COVID-19 outbreak, a nasopharyngeal swab was performed with a rapid COVID-19 antigen test resulting positive. Typical findings for COVID-19 infection were apparent on HRCT chest imaging. After the patient's inability of laying in the prone position as a practice to improve oxygen status along with dizziness and chest tightness, a thorough history inclined the consulting physician towards an associated cardiogenic cause. Bedside ECG revealed no serious abnormalities but on echocardiography, left ventricular wall thickness abnormality was evident. The findings were all consistent with HCOM and the patient was placed on 24 hour Holter monitoring which recorded no arrhythmias. He was treated with medications for COVID-19 and its pulmonary and hematological complications till the end of the course of the disease and finally managed with beta-blockers for HCOM. Conclusions and Relevance: This case highlights a progression of cardiac involvement as a complication associated with severe symptoms and signs of COVID-19 sequelae.***

Keywords: COVID-19, HCOM, HRCT & ECHOCARDIOGRAPHY

Learning Points

- COVID-19 may cause CMP complications even in HCOM positive patients without life-threatening symptomatic history.
- While ECG can detect early partial thickening of the heart muscle, two-dimensional (2D) echocardiographic remains a gold standard investigation for HCOM and is particularly useful in further evaluation of its progression.

1. Background

According to the evaluated studies in a systematic review conducted in April 2021 by Fatemeh Omidi et al, 8% of patients of the study developed heart failure/cardiogenic shock as a manifestation of COVID-19 **[1].** The studies showed that common symptoms of COVID-19 in patients with cardiac injury include fever, cough, headache, and fatigue. These findings are broadly consistent with other examining clinical signs in patients with COVID-19 [**2, 3].** COVID-19 has resulted in other organ involvement, and CMPs are among the most significant complications of this rapidly emerging disease, causing more severe disease and increased mortality rates [**4, 5]** but while the clinical course of SARS-CoV-2 infection is mostly characterized by respiratory tract symptoms, including fever, cough, pharyngodynia, fatigue, and complications related to pneumonia and acute respiratory distress syndrome [**6]**, data regarding cardiovascular involvement due to SARS CoV-2 infection are less described but previous severe acute respiratory syndrome (SARS) beta – corona virus infections could be associated with tachyarrhythmias and signs and symptoms of heart failure [**7],** however this current report describes a case presented initially with focus on the apparent manifestations of COVID-19 and its immediate management until later during the course of admission wherein the physician's evaluation led to the associated diagnosis of HCOM. The patient provided consent and the diagnostic procedures were conducted in accordance with institutional guidelines about the protection of human subjects.

2. Case Presentation

Presenting a case of a 39-year-old otherwise healthy male with no past history of any significant hospital visits or any indications of a critical illness except currently that of COVID-19 infection symptoms such as 5days of fever, headache, myalgia, non-productive dry cough, fatigue and no difficulty breathing but a suffocating sensation, consulted a physician on 15/04/2021. On examination, his **vitals**

wereHR: 72, B. P: 130/80, temperature: 99.8 degrees C and oxygen saturation: 97.6 %. The physician diagnosed these conditions as a consequence of a viral flu causing an acute upper respiratory tract infection. However, home isolation was ordered for the patient as well as to perform a RT-PCR test to rule out COVID-19 infectionand prescribed the following medications of standard dose of Paracetamol (5-day course), Azithromycin (5-day course) and Remdesivir (5-day course). The patient then chose to complete the course of the medicines and in the hope of gradually recovering from this flu like illness, he casually avoided the RT-PCR testing. On 22/04/2021 the patient retuned back unable to stand on his own with uncontrollable dry coughing, dizziness, along with all the previous symptoms and an increased sensation of breathlessness, on examination his **vitals were HR: 70, B. P: 140/80, temperature: 100 degrees C and oxygen saturation: 89%**. A complete hemogram remained unremarkable, but biochemical test profile with CRP level and D-Dimer Assay was found to be abnormal and he subsequently tested positive for COVID-19 after a RT-PCR test, his laboratory reports, imaging report with CT features were as follows:


LABORATORY REPORT

Genomics

COVID19 Qualitative by Real time PCR

TEST	RESULTS	UNIT	BIOLOGICAL REF RANGE	REMARKS
COVID19 Interpretation	POSITIVE			
N gene (Ct)	29			
Orf gene (Ct)	28			

Figure 1: RT-PCR Report


HEMOGRAM

Test Name	Result	Units	Biological Reference Interval
Hemoglobin :	14.3	g/dl	[13.0-18.0]
Total RBC Count :	4.97	mill/cmm	[4.7-6.0]
Total WBC Count :	9,600	/cmm	[4000-10000]
Platelet Count :	1,64,000	/cmm	150000-450000
Blood Indices			
P.C.V. :	40.4	%	[40-52]
M.C.V. :	86.14	femtolitre	[78-100]
M.C.H. :	30.49	pg	[27-31]
M.C.H.C. :	35.4	g/dl	[32-36]
R.D.W. :	13.1	%	[11.5-14.0]
Differential WBC Count			
Polymorphs :	78	%	[40 - 70]
Lymphocytes :	19	%	[20 - 40]
Eosinophils :	02	%	[1 - 4]
Monocytes :	01	%	[2 - 6]
Basophils :	00	%	[0 - 1]

BIOCHEMICAL TESTS

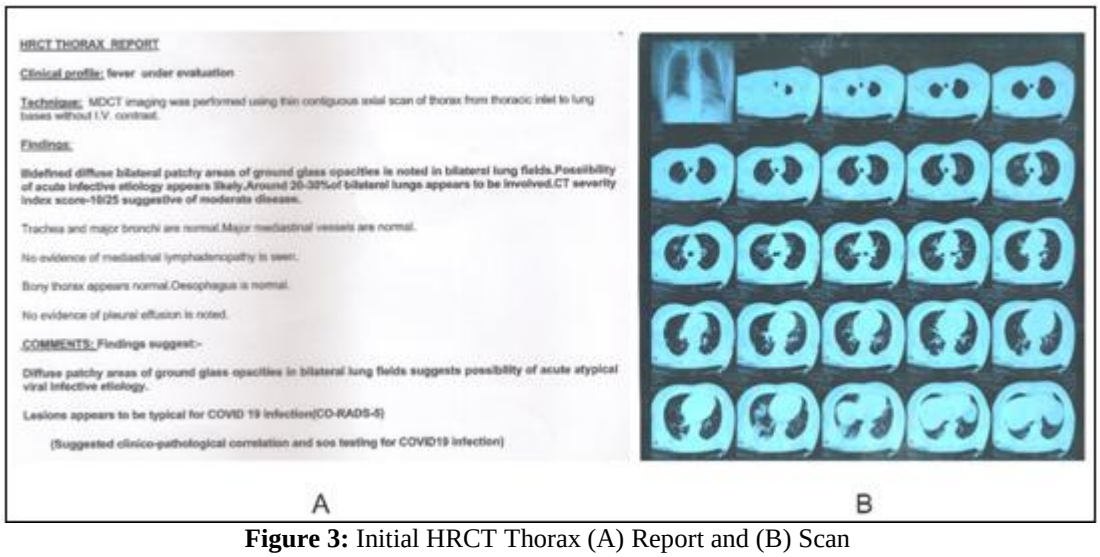
Test Name	Result	Units	Biological Reference Interval
Random Blood sugar :	205	mg/dl	70 to 140
Blood Urea :	38	mg/dl	10 - 50
Creatinine :	1.3	mg/dl	0.4 - 1.3
Bilirubin [Total] :	0.9	mg/dl	0.3 - 1.2
Bilirubin [Direct] :	0.3	mg/dl	0 - 0.6
Bilirubin [Indirect] :	0.3	mg/dl	0 - 5.0
S.G.P.T. :	38	U/L	0 - 40
C.R.P.Test :	110	mg/L	0.0 - 5.0

D - DIMER ASSAY

Test Name	Result	Units	Normal range
D-Dimer Assay :	876	ng/ml	[0 - 500]

Method:Turbilatex

Figure 2: Lab Reports


HRCT THORAX REPORT

Clinical profile: fever under evaluation

Technique: MDCT imaging was performed using thin contiguous axial scan of thorax from thoracic inlet to lung bases without I.V. contrast.

Findings:

Ill-defined diffuse bilateral patchy areas of ground glass opacities is noted in bilateral lung fields.Possibility of acute infective etiology appears likely.Around 25-30%of bilateral lungs appears to be involved.CT severity index score-18/25 suggestive of moderate disease.

Trachea and major bronchi are normal.Major mediastinal vessels are normal.

No evidence of mediastinal lymphadenopathy is seen.

Bony thorax appears normal.Oesophagus is normal.

No evidence of pleural effusion is noted.

COMMENTS: Findings suggest:-

Diffuse patchy areas of ground glass opacities in bilateral lung fields suggests possibility of acute atypical viral infective etiology.

Lesions appears to be typical for COVID 19 infection(CO-RADS-5)

(Suggested clinico-pathological correlation and sos testing for COVID19 infection)

A B

Figure 3: Initial HRCT Thorax (A) Report and (B) Scan

The hospital started COVID-19 protocol management; the patient was immediately admitted and was placed under continuous humidified oxygen therapy which gave the patient much relief with the dry coughing. The patient was administered with I. V normal saline and in spite of the CT features indicating severe COVID-19 infection; there were no signs of multi-organ failure such as hypotension and shock, acute respiratory failure and acute kidney injury. However, in relation to coagulation abnormalities, the **abnormal D-Dimmer Assay test was: 876 ng/ml (Normal: 0-500) and the patient received abdominal subcutaneous injections of Enoxaparin: Low Molecular Weight Heparin (LMWH) with the dosage of 40mg/0.4mL o/d and in the patient's biochemistry profile, CRP was**

raised: 110 mg/L (normal values: 0.0-5.0) so the patient was treated with (10 days) Vitamin C 500 mg/day, (10 days) Zinc Gluconate 50mg/day and Dexamethasone 6 mg o/d for 10 days. On 26/04/2021, a repeat CRP test resulted with 19.8 mg/L and repeat D-Dimmer Assay resulted with 698 ng/ml. As these results improved, the treatment continued however the patient started complaining of dizziness with chest tightness on minimal effort, attributing these symptoms to his present diagnosis the consulting physician still took a detailed history and it was revealed that in the past the patient sometimes felt such symptoms after running up a flight of stairs or with instant vigorous activity, he also mentioned to the doctor that certain heavy weight lifting sports and high intensity soccer training have made him feel in a similar way which made him alter his physical exercises to lighter weights and slow long distance jogging. On the same day, the internist raised this issue with the cardiologist and they decided to perform an ECG and a cardio echogram upon which was discovered that the patient has been suffering from severe concentric non-obstructive hypertrophic cardiomyopathy.

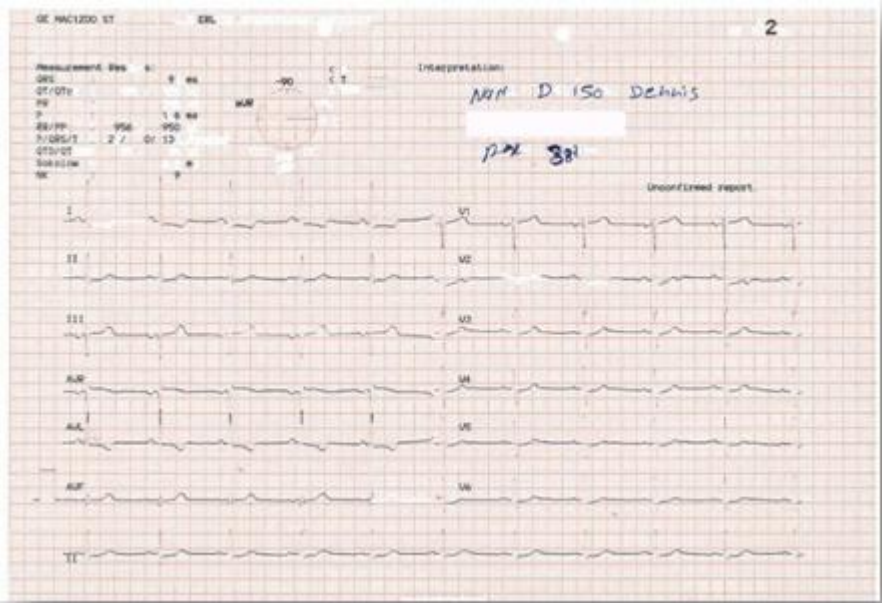


Figure 4: Initial ECG Scan

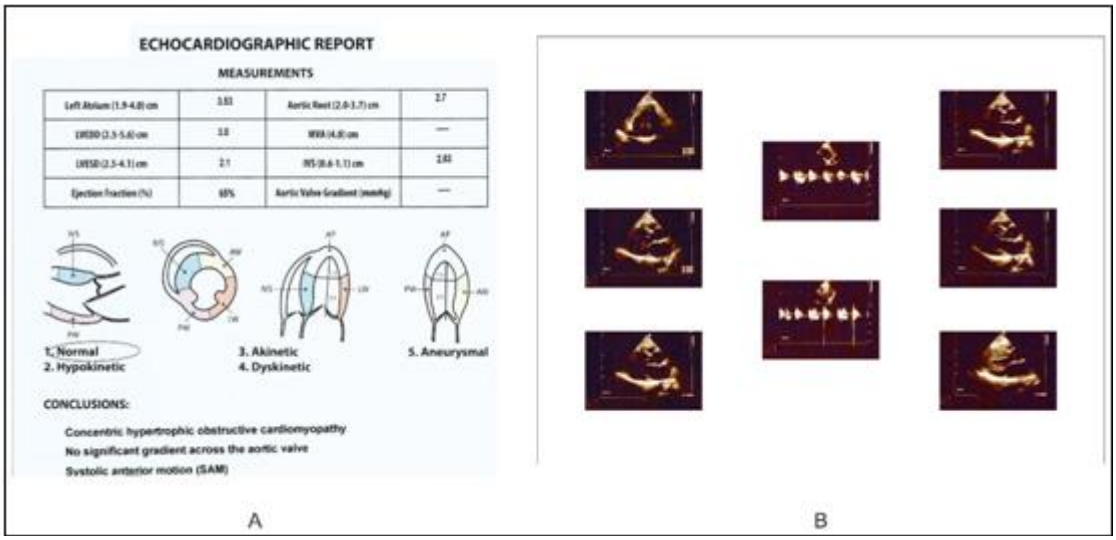


Figure 5: Initial (A) ECHO Report and (B) ECHO Scan

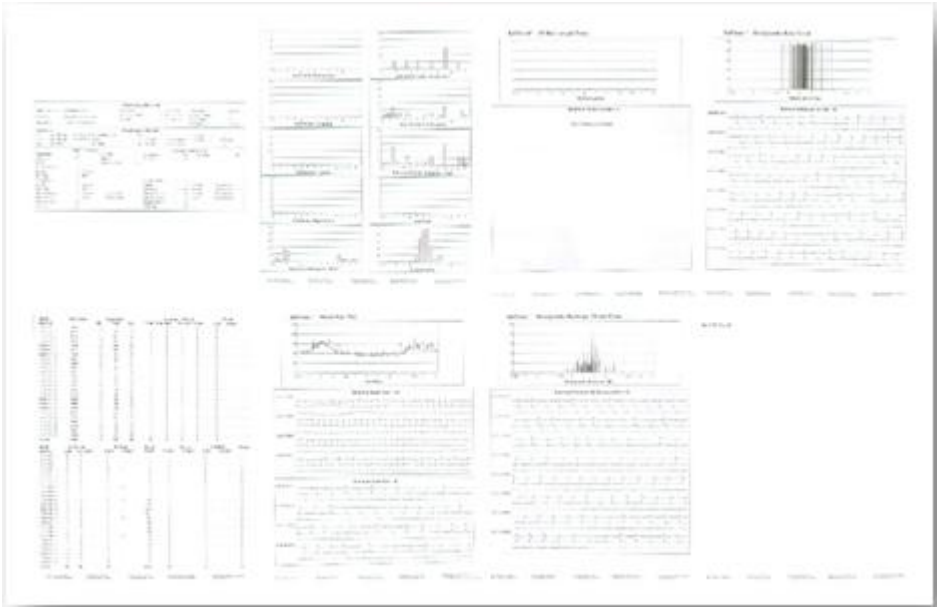
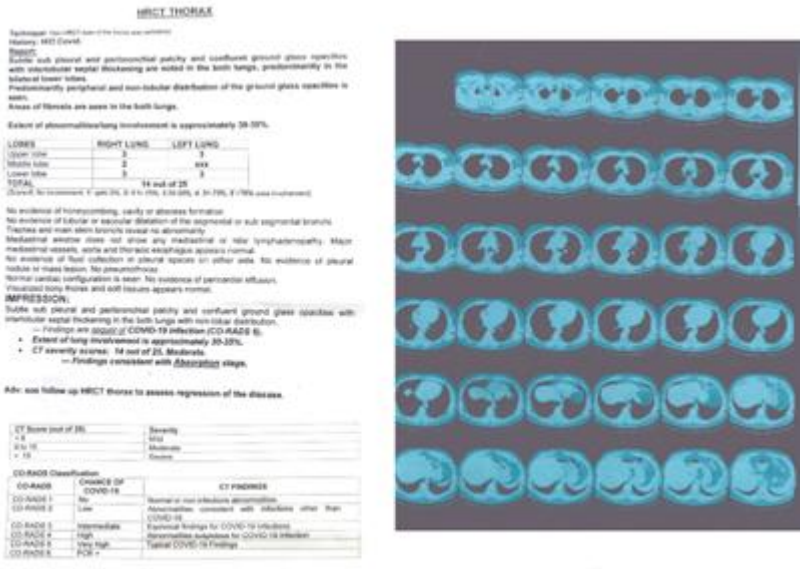


Figure 6: 24 hour Holter Monitoring Report

The patient was informed about this and was advised to be placed on 24 hour Holter monitoring to detect any extended intervals of abnormal rhythms which resulted in no arrhythmias.

On 04/05/2021, **a repeat CRP test was performed and the results were: 1.9 mg/L, however the D-Dimmer Assay was still abnormal at 521 ng/ml but patient's vital stats were much improved and stable, H. R: 80, B. P: 110/80, Temperature: 98 degrees C, Oxygen saturation: 95%** and the next day he was discharged, instructed to comply with strict home isolation and the following medications: **standard dose and duration of Dexamethasone (10-day course) and Remdesivir (5-day course), subcutaneous injections of Enoxaparin: Low Molecular Weight Heparin (LMWH) with the dosage of 40mg/0.4mL o/d (5-day course).**

A Rapid Antigen Test was performed on the 10/05/2021 and the patient tested negative. On 17/05/2021, the patient returned to test his D-Dimmer Assay which was 394 ng/ml and he tested his CRP which was 1.8 mg/L. On20/06/2021, the patient went for a follow up Echocardiogram and HRCT scan, the HRCT SCAN described typical features of the dissipation/absorption stage of COVID-19 and the echocardiogram showed improvement in the systolic ejection fraction compared to the first echocardiogram scan. The cardiologist counselled the patient on lifestyle altercations, treatment measures and their side-effects and according to the extent of the disease the doctor advised **conservative long term therapy with Beta Blockers: Bisoprolol (3.5-10 mg daily)** to be taken to provide protection from any fatal arrhythmias. Lastly, since HCOM is inherited in an autosomal dominant pattern, the cardiologist recommended echocardiograms for the patient's father and the patient's son.



A B

Figure 7: Follow up HRCT Thorax (A) Report and (B) Scan

Figure 8: Follow up ECG Scan

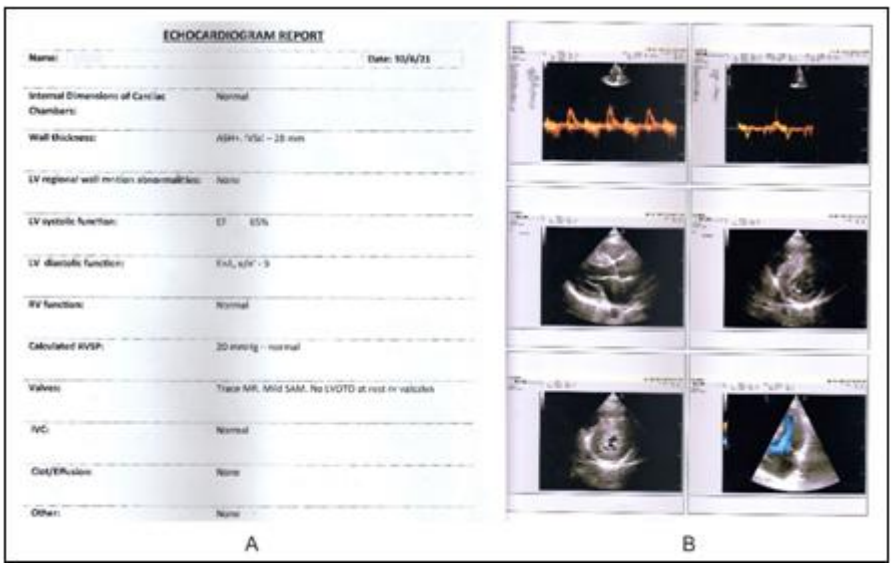


Figure 9: Follow up ECHO Scan and Report

3. Discussion

The patient recovering well from a severe COVID-19 infection was well achieved but what highlighted this hallmark was the incidental finding of the cardiomyopathy that does not eradicate from the body like the virus, instead during the phase of the infection, HCOM was more apparent and symptomatic which led to its investigation and diagnosis. Its management and thorough follow up checkups is imperative and even after the patient has started leading his regular day to day routines, lifetime attention is warranted for risk factors as such.

Pro-thrombotic or endothelitis-inducing effects of the SARS-CoV-2 infection may cause either local coronary thrombosis or formation of a distal embolus [**8]** and pre-existing cardiovascular disease is a proven documented risk factor for severe SARS-CoV-2 infection [**9]** but while the literature of cases/studies analyzing the effects of the virus on the heart and cardiovascular diseases is passed the preliminary phase, it is still being explored specifically for conditions such as HCOM and its pathophysiology in COVID-19 along with reported cardiac complications including arrhythmia, myocarditis and cardiac shock [**10],** with increased myocardial injury biomarkers often being associated with severe disease and higher rate of ICU admissions [**11].**

Approach [12]

In order to establish the diagnosis of HCM (septal-wall thickness ≥15 mm), a systematic echocardiography approach is necessary. The echocardiographic examination should include:

- Confirming LV hypertrophy.
- Assessment of LVOT obstruction.
- Assessment of systolic and diastolic function.

Transthoracic echocardiography is recommended as a component of the screening algorithm for family members of patients with HCM.

Confirming the presence/absence of left ventricular hypertrophy

Hypertrophy preferentially involves the inter-ventricular septum in the basal LV segments, but often extends into the lateral wall, posterior septum and LV apex. Although HCOM is typically characterized by asymmetric septal hypertrophy (ASH), almost any myocardial segment may be involved.

The following two-dimensional (2D) echocardiographic criteria are used to aid diagnosis:

1) Unexplained maximal wall thickness >15 mm in any myocardial segment, or
2) Septal/posterior wall thickness ratio >1.3 in normotensive patients, or
3) Septal/posterior wall thickness ratio >1.5 in hypertensive patients.

Nevertheless, genotype positive adults (including those who die suddenly) may have normal or near normal wall thickness. Assessing the extent and severity of hypertrophy must include the measurement of maximal wall thickness in all LV segments from base to apex, ensuring that the wall thickness is recorded at mitral, mid-LV and apical levels.

Assessment of latent obstruction
Identification of LVOTO is important in the management of symptoms and assessment of sudden cardiac death risk.2D and Doppler echocardiography during a Valsalva manoeuvre in the sitting and semi-supine position - and then on standing if no gradient is provoked - is recommended in all patients.

Assessment of systolic and diastolic function
With the use of strain imaging, it is now possible to identify regional heterogeneity in contractile function, an important advance in our understanding of myocardial mechanics in HCM. Terminally in the disease process, myocardial fibrosis may result in progressive impairment of systolic function end-stage HCM. Deterioration of systolic function has also been associated with increased mortality (up to 11% per year) and sudden cardiac death. A thorough assessment of systolic function by means of a biplane Simpson's ejection fraction and tissue Doppler imaging (TDI)-derived systolic velocities should be performed routinely in the basal inferior-septal and anterolateral walls in all patients at initial diagnosis and on subsequent scans.

Patients with HCM often have diastolic dysfunction, mostly indicating impaired myocardial relaxation, regardless of symptoms or presence of LV outflow obstruction. Assessment of LV filling pressures is helpful in the evaluation of symptoms and disease staging. Doppler echocardiographic parameters are sensitive measures of diastolic function, but are influenced by loading conditions, heart rate and age. Therefore, a comprehensive evaluation of diastolic function, including Doppler of mitral valve inflow, tissue Doppler velocities at the mitral annulus, pulmonary vein flow velocities, pulmonary artery systolic pressure and LA size and volume is recommended as part of the routine assessment of HCM.

4. Conclusion

In summary, this case work represents an investigation of common pulmonary imaging and pathological manifestations of COVID-19 infection along with the intention of creating a familiarity in detail evaluation and history to acquire early diagnosis of any associated risk factors related to major cardiac co-morbidities such as HCOM and its progression. The consulting physician through reference and correspondence with a cardiologist, plays a crucial role in the rapid identification of such cases that can result in benefiting not only the patient's current condition and complaints but also with future follow ups and management.

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