



KARDIA MOBILE FOR REMOTE DETECTION OF MYOCARDIAL INFARCTION IN COVID 19 PANDEMIC

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ABSTRACT COVID 19 pandemic has made it difficult to deliver health care at remote areas. Providing timely advice in cases of emergencies like myocardial infarction, arrhythmias and initiation of life saving therapy remains difficult due to lockdown and travel restrictions. Smartphone based gadgets can be used to measure QT interval , detect atrial fibrillation and guide important therapies during transport to hospital or local primary medical care centre under supervision. Kardia mobile is a hand held device which can be used by a layman to record and transmit electrocardiogram (ECG) to physicians. This seems to have potential to get urgent medical opinion in present COVID 19 pandemic and lockdowns. But its accuracy beyond detection of atrial fibrillation and QT interval measurement is still not proven and whether it can detect ST elevation myocardial infarction needs further testing. We report electrocardiographic accuracy of two cases of ST elevation myocardial infarction presenting to our emergency.

Learning Objective : Public education on use of mobile based electrocardiogram recording and transmitting devices and its incorporation in tele cardiology consultation services are needed to overcome the negative impact of COVID 19 pandemic on global cardiology care. Kardia Mobile integrated with Telemedicine seems to have useful potential for remote consultations of myocardial infarction apart from rhythm and QT measurement during current pandemic

KEYWORDS :

BACKGROUND

The COVID- 19 Pandemic has adversely affected many aspects of acute ST elevation myocardial infarction (STEMI) care , including timely access to the primary percutaneous coronary angioplasty,(1). Kardia Mobile (KM) (AliveCor Inc., San Francisco, CA, USA) is a portable, mobile, connected electrocardiogram (ECG) device available to iOS and Android platform smartphone owners. It consists of a small device with two conducting plates that wirelessly connect with a smartphone, and an application installed on user smartphones. It enables one-lead and six-lead ECG recordings for short durations i.e. 30 seconds. Presently it is US FDA approved for atrial fibrillation detection and corrected QT measurement on arrhythmogenic drugs ,(2,3) . Easy to use KM needs to be assessed for its usefulness in comparison with 12-lead ECG recordings in assessing its usefulness in STEMI. We therefore sought to validate the its use using chest wall electrode positions as used in conventional electrocardiography.

Case Presentation, treatment & follow up

A 57 year old male non hypertensive diabetic presented with chest pain of 8 hours duration . Standard electrocardiogram(ECG) and mobile based electrocardiogram was recorded by keeping Kardia mobile at V4- V5 conventional ECG chest electrode position (Figure 1) . Mobile based electrocardiogram was concordant in V 2,V3,V6 position but discordant in V1 ,V5 position.Patient was admitted to coronary care unit and was taken up for coronary angiography which revealed significant stenosis in left anterior descending artery and successful primary percutaneous angioplasty to left anterior descending artery was done and patient was discharged in stable condition and asymptomatic for last 4 months of follow up.

Another patient 50 year old non diabetic non hypertensive male with chest pain of 12 hours duration presented to emergency and conventional and mobile based ECG was recorded (with two index fingers of both hands and feet touching Kardia mobile electrodes. Limb leads electrodes were accurately recorded with Q wave and ST coving and T inversion in leads III, aVf suggesting inferior wall

myocardial in inferior leads (Figure 2a,b) and V2 , V3 , V6 were accurately recorded but V1, V5 were discordant (Figure 2 c, d) . Patient was taken up for coronary which revealed right coronary artery significant stenosis and successful angioplasty to right coronary artery. Patient is asymptomatic for last 3 months of follow up.

DISCUSSION

COVID- 19 has significantly impacted healthcare delivery around the world,(1). We found that Kardia Mobile can be accurate for limb leads and can show inferior wall myocardial infarction and also some of anterior wall myocardial infarction.COVID 19 myocardial involvement seems to be the result of hypercoagulable state , inflammation and endothelial dysfunction ,(4,5). Recent angiographic case series has revealed normal coronary anatomy in around 40% of cases,(6). Hypercoagulability and thrombosis seems to be aetiology in most cases , (6). A diagnostic device which can transmit ECG from remote or primary healthcare settings to specialised centres or cardiologist can be a great help in initiating anti platelet and fibrinolytic therapy . Also carrying out RT PCR for COVID before interventional procedure and transportation to catheterisation laboratory during lockdowns causes significant delay to treatment and these can be minimised. We were able to diagnose correctly inferior wall myocardial infarction , anterior wall myocardial infarction and atrial fibrillation (Figure 3) in three of our patients. Kardia Mobile can depict changes in limb leads reliably and is valuable in diagnosis inferior wall myocardial infarction. Kardia Mobile when placed on chest positions at V3-V6 can show changes similar to conventional ECG in leads V2,V3 ,V6. Kardia Mobile integrated with Telemedicine seems to have useful potential for remote consultations during current pandemic . Public education on use of mobile based electrocardiogram recording and transmitting devices and its incorporation in tele cardiology consultation services are needed to overcome the negative impact of COVID 19 pandemic on global cardiology care.

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FIGURE CAPTIONS

Figure 1 : A patient with anterior wall myocardial infarction and electrocardio-graphic recording (1 B) using conventional electrocardiography device and Kar-dia mobile device(1C) placed at the left-sided chest lead position (1A)

Figure 2 : Electrocardiographic recordings in a case of inferior wall myocardial infarction. Conventional electrocardiogram for limb leads (2a), Kardia mobile re-cordings for limb leads (2b), conventional chest leads recordings (2c), Kardia Mobile chest leads recordings (2d).

Figure 3 : 65-year-old female with intermittent irregular palpitations) sinus ar-rhythmia (Rhythm strip of conventional 12 lead ECG during one odd episode), b) Atrial fibrillation with fast ventricular rate recorded with alive cor from her home and transmitted on e-mail to the physician. c) Atrial fibrillation in the same patient again taken up from Kardia mobile, on subsequent follow-up

Figure 1

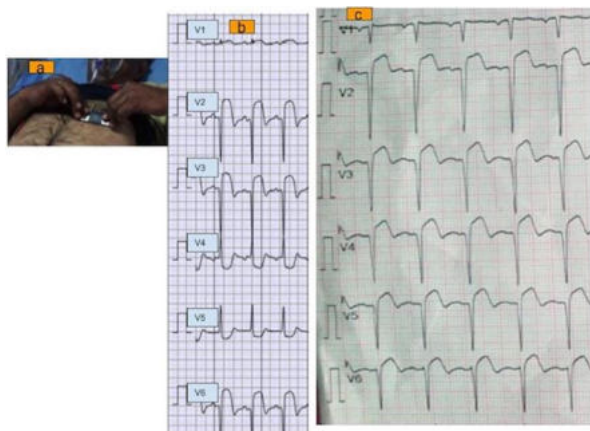


Figure 2

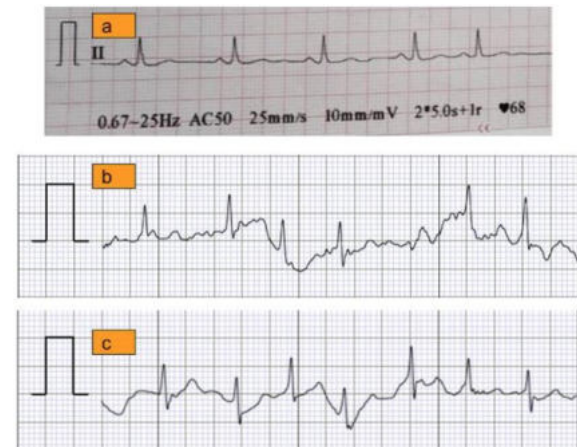


Figure 3

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