Determination of the Mean Electrical Axis in Dogs and Cats (Mini-Review)

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Abstract

In this study we set out to reveal the practical importance of the determination of the mean electrical axis (MEA) in dogs and cats. The Hexaxial Reference System is used for the determination of the cardiac electrical axis. We described 2 methods, that are used the most frequently and we confirmed that the movement of the mean electrical axis is useful in the diagnosis of cardiac diseases.

Keywords: electrocardiogram, lead, mean electrical axis

Introduction

The MEA practically represents the movement direction of the electric potential generated by the heart during the cardiac cycle and corresponds with cardiac physical axis (Cotor and Ghiţă, 2014). It is a non-invasive method that provides information on the topography of the heart in the chest cavity. It is recommended to perform this determination especially for the diagnosis of cardiac enlargements and intraventricular conduction disorders.

The Hexaxial Reference System (6 leads: 3 bipolar and 3 unipolar, designed in the same plane) is used for the determination of the MEA. In practice, two methods are used.

The Method 1 consists in the registration of the ECG in 6 leads (3 bipolar: I, II, II and 3 unipolar: aVR, aVL, aVF). It will be chosen the one that has the smallest amplitude (the ECG closest to the isoelectric line). The MEA will be obtained by drawing a perpendicular line on the direction of this lead from the Hexaxial Reference System (Figure 1).

The Method 2 consists in the measurement of the net amplitude of the QRS complexes from lead I and lead III (the difference between the R wave amplitude and the highest wave amplitude: Q or R). Then, two segments corresponding to those values will be drawn on the direction of the corresponding leads (I and III) in the Hexaxial Reference System. It will be drawn one perpendicular line for each end of two segments. It will be drawn the MEA by connecting the centre of the Hexaxial Reference System with the intersection dot of those perpendicular lines and it is expressed in degrees corresponding to the angle composed of the MEA and 0° line (Cotor and Ghiţă, 2014) (Figure 1).

The normal values of the MEA are comprised between 40° and 100° in dogs (Ghiţă et al., 2007) and between 0° and 160° in cats (Cotor *et al*., 2015).

Right mean electrical axis deviation represents an increase of the right heart (mainly right ventricle), because the growth of the right muscle mass of the heart induces a great electric potential difference during the depolarization phase.

Left mean electrical axis deviation represents an increase of the left heart (mainly left ventricle), because the growth of the left muscle mass of the heart induces a great electric potential difference during the depolarization phase.
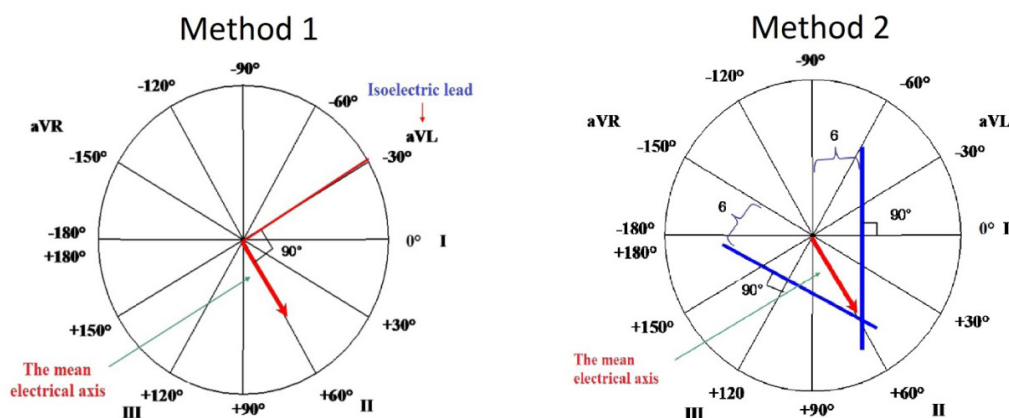
Figure 1. The determination of the MEA

Conclusion

Calculation of the mean electrical axis is important for obtaining the information concerning the diagnosis of heart volume changes. Furthermore, it is used for diagnosis of intraventricular conduction disorders.

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