Indian J Physiol Pharmacol 2006; 50 (1): 90

LETTER TO THE EDITOR

APPLICATION OF EINTHOVEN'S LAW IN CALCULATING MEAN QRS AXIS

Sir,

(Received on July 14, 2004)

We have earlier reported a formula for the calculation of Mean Electrical Axis (MEA) of QRS vector (1). The formula is based on the net voltage of QRS (NQRSV) in bipolar limb I and Lead III i.e.

$$\tan\theta = \frac{I + 2III}{\sqrt{3}I}$$

for accurate calculations of MEA. Though the formula gives accurate estimate of the MEA, it may not be possible to assess the NQRSV correctly when any of these two leads has inconspicuous or low voltage QRS complexes hence may lead to loss of sensitivity of this formula. Therefore, for the calculation of MEA in case of low voltage or inconspicuous QRS complex in lead III, use of voltage in Lead II along with that of Lead I is suggested. Using Einthoven's Law i.e. I+III=II(2), the formula for Lead I and II may be written as follows

$$\tan\theta = \frac{2II - I}{\sqrt{3}I}$$

(in case NQRSV in lead I is negative, Axis = 180 + θ).

Similarly difficulty may be encountered with inconspicuous or low QRS voltage in Lead I, therefore for calculation of MEA a formula based on the NQRSV in Lead II and III would be appropriate. Using Einthoven's Law we can write the equation for Lead II and III as follows

$$\tan\theta = \frac{II + III}{\sqrt{3}(II - III)}$$

(θ can be calculated with the help of a Scientific Calculator).

Besides their application in low NQRSV in Lead I or Lead III the formulae described by us can also be applicable in cases of J point shift, as in one of the bipolar limb leads the incomplete inscription of S wave may possibly lead to problem with the assessment of MEA.

We have now suggested two formulae for calculation of MEA as a substitute of the earlier formula (1) to be used in cases of indistinguishable low voltage QRS complex either in Lead I or Lead III. The calculated MEA through these formulae are comparable to that of the manual method and using software. Since calculation become simpler using Scientific calculator, the formulae can be used in routine assessment of MEA.

These formulae enable the physicians to calculate MEA in conditions with J point shift such as in Acute Myocardial Infarction, alongwith low NQRSV in any one of the biopolar leads. However these formulae may lose their sensitivity in atrial arrhythmias on account of non-linear TP segment of ECG.

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