Clinical Evaluation of a New ECG Lead (CM₅) during Anesthesia

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Abstract: Recently, a new bipolar electrocardiographic (ECG) lead (CM₅) for the monitoring of electrical cardiac function during anesthesia has been introduced by Prys-Roberts. This new method has been proved quite beneficial in the present study. The results of the study are reported here with some discussion.

Key words: electrocardiogram, CM₅ lead, myocardial ischemia.

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Introduction

The electrocardiogram (ECG) is an indispensable monitoring device during anesthesia for surgery. The most commonly used ECG lead today in operating rooms is the standard limb lead II which is considered to reflect well the electrical axis of the heart.

Myocardial ischemia with or without hypertension is one of the problems that all anesthesiologists commonly meet while administering anesthesia in the operating room.

In the present short communication, the author intends to introduce a new ECG monitoring method and to evaluate its clinical validity in the randomly selected subjects.

Methods and Materials

Six patients (30–57 yrs of age, male 2 and female 4) were chosen at random from the elective cases undergoing surgery at our institution.

After induction of anesthesia, the first ECG was recorded with Sanei cardiosuper, type 2E31A in the conventional standard limb lead I which is the best ECG lead during the open chest surgery and records much information on the lateral ventricular myocardial blood supply. Then, the electrode on the left upper chest (positive side) was removed and placed again at the conventional V₅ position according to the description of Prys-Roberts (Fig. 1).

Recording of the ECG was done again and the amplitudes of P-, QRS and T waves were compared with those of the previously recorded ECG by the conventional method.
Results

Two typical examples which clearly demonstrate the difference in the ECG configuration between the two recording methods are shown in Fig. 2.

(A) 57 y/o F Sialolithiasis
(B) 47 y/o F Laryngeal polyp

Fig. 2. Two typical examples of conventional and CM₃ leads. Calibration indicates 1 mV.
Clinical Evaluation of CMs Lead

Table 1. Amplitude values in each wave of P-, QRS and T. Control means standard limb lead I

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<tr>
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<th>P</th>
<th>QRS</th>
<th>T</th>
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<tr>
<td>Control (mV)</td>
<td>0.0646±0.0731</td>
<td>0.4792±0.2786</td>
<td>0.1563±0.0523</td>
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<tr>
<td>CMs (mV)</td>
<td>0.1771±0.1147*</td>
<td>2.1875±0.3853**</td>
<td>0.6354±0.2180**</td>
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* statistically significant (P<0.01)
** statistically significant (P<0.001)

All the values in amplitude of each P-, QRS and T waves were statistically larger (P wave: P<0.01, QRS, T waves: P<0.001) by the new method than by the conventional lead I (Table 1).

The amplitude of QRS complex was most prominently enlarged among these three ECG waves. There were virtually no changes in the intervals of P-Q, QRS and Q-T since the recordings were obtained from the same subject.

Discussion

The CMs lead was introduced by Prys-Roberts at the 30th Annual Refresher Course Lectures of the American Society of the Anesthesiologists which was held recently at San Francisco in 1979.

The lead is a new bipolar method which specifically identifies ST segment depression as an index of inadequate left ventricular perfusion. The standard limb lead I, II or III, Prys-Roberts mentions, is a poor detector of myocardial ischemia. The CMs lead which shows the myocardial electrical activity in the frontal plane is considered to differ from the conventional unipolar V3 lead which is described mainly in the horizontal plane.

In the present study, the amplitudes of P-, QRS and T waves, all of which are usually drawn positively were compared with each other by both the conventional and the new methods. The results obtained showed the marked difference (superiority of the new method) in respect to amplitude.

From these results, the author suggests in conclusion that the CMs lead should be considered for continuous ECG monitoring during anesthesia unless the lead is contra-indicated as in surgery of the left thoracotomy. This new ECG lead will surely provide anesthesiologists with more information on the left ventricular blood perfusion and the severity of myocardial ischemia or hypertension during anesthesia.

Reference

新しい心電図誘導法（CM₅）の臨床的検討

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要 旨: 最近英国の Prys-Roberts により新しく紹介された心電図誘導法（CM₅）の麻酔下での臨床的検討を行った。P波、QRS複合波、T波いずれにおいても従来の標準肢I誘導より有意に大きな波形を得ることができ、左開胸手術など誘導上支障のない限り有効な術中心電図誘導法であると考えられた。なお本法は双極誘導法である点が従来の V₅誘導と大きく異なることを強調したい。