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Importance of Sinus Arrhythmia and Artifact. Clinical Interpretation of Abnormal ECG Patterns in the Absence of Heart Disease

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Introduction

Respiratory sinus arrhythmia (RSA) an index of parasympathetic nervous system (PNS) mediated cardiac control. RSA is the high frequency component of heart rate variability, and is a measure of the magnitude of the rhythmic fluctuations in heart rate across the respiratory cycle which is characterized by increasing heart rate during inhalation and decreasing heart rate during exhalation. RSA is mainly determined by vagal influences on the heart, and therefore provides an index of parasympathetic activity [1].

Four Type of Sinus Arrhythmia

1. Respiratory/phasic sinus arrhythmia: More commonly occurs in children
2. Non-respiratory/Non phasic sinus arrhythmia usually present in adults
3. Ventricular-phasic sinus arrhythmia
4. Prematurity induced sinus arrhythmia (SA)

- Respiratory sinus arrhythmia (RSA) has slow component -0.12 sec, Fast component -0.16 sec.
- PR interval is constant.
- This sinus arrhythmia can be abolished during exercise and vagolytic therapy.

In children, presence of sinus arrhythmia is normal and absence of sinus arrhythmia is abnormal example like atrial septal defect (ASD). In case young adult, these changes can be seen vice versa, presence of sinus arrhythmia is normal and absence of sinus arrhythmia is abnormal for them.

What are the Causes for Artifact Produced in Electrocardiogram Recording (ECG)?

It can be divided into non-physiologic and physiologic artifact; the former is due to equipment problems or interference from neighboring electrical devices, whereas the latter results from muscle activity or skin interference [2].

Patient induced artifact

Somatic tremor induced artifact.

Technician induced

Due to following reasons

- ❖ Changing the speed of recording.
- ❖ Changing the standardization.
- ❖ Changing the ECG lead for recording.

- The four limb electrodes (right arm, left arm, and left leg, with the right leg electrode being a ground wire) may at times be misplaced, leading to changes on ECG recording.
- Right/left reversal involves switching either the arm or the leg electrodes. Arm reversal (right arm/left arm) is one of the most common electrocardiographic electrode misconnection.
- Right arm/right leg electrode reversal. The striking finding on this ECG beyond the rhythm (atrial fibrillation) is the nearly isoelectric recording in lead II [3].
- Left arm/left leg electrode reversal. Reversing the arm and leg electrodes on the left side changes the findings in all limb electrodes except lead a VR maintains its normally abnormal appearance (i.e., upside-down P-QRS-T complex in most cases) [4].
- Pseudo infarction due to misplacement of the precordial electrodes.

Machine induced

If ECG Machine running in slow speed which is producing narrows RR interval. ECG recordings mimic tachyarrhythmia. The machine running in fast speed it widens RR interval, mimics Brady arrhythmia.

1. Depression like changes occur in ECG waveforms due to Stylus speed or pressure is increased. This pressure may be different type like undo, Tapingand over taping.

Stylus is not touching the recording paper, it may produce ST elevation like changes. ECG also shows features like crumpling of all complexes. This kind of problem mostly encountered in computerized ECG machines [5-7].

Differential diagnosis of artifact:

1. Hypocalcemia, 2. Hypokalemia3. Wandering features 4. Sinus arrhythmias.

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Conclusion

Electrocardiographic changes resulting from electrode misplacement or misconnection may simulate clinical problem and lead to misattribution of pathological changes and thus affect diagnosis and treatment. Patterns of electrode reversal or misplacement can be recognized if the physician and technician are aware of the characteristic findings associated with the respective electrode connection errors.

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