The Impact of the Use of Piped Water with Genesis Artifact On Electrocardiogram

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Electrocardiogram is heart diagnostic device that is often used by nurses to assess some heart anomalies. The observations result showed that some nurses use piped water as conductor on EKG recorder and believe piped water is a good conductor for recording EKG. This research aim was to find out the used comparison of piped water and jelly towards genesis artifact. A quasi experiment approach (cross-over) was used in this research. The sample was systematically random sampling with 46 respondents were divided into two groups. The influence of piped water and jelly against genesis artifact was tested by using Chi Square. Research results illustrated piped water was greater 30.5% in the genesis artifact than jelly with only 5.4% which Chi Square value was (P: 0.0001). It indicated that the use of piped water significantly influences towards genesis artifact. Moreover, the Odds Ratio elucidated the usage of piped water was 20.81 times more artifact occurred than jelly as recording media EKG. The use of piped water as conductor on the recording EKG significantly influence towards the recording result quality where the genesis artifact higher than jelly as conductor on EKG recording. Suggestions researchers should avoid using piped water as recording conductor and stay to use the jelly to record EKG and follow the standard procedure of EKG recording.

Keyword:
Artifact
Electrocardiogram
jelly & piped water

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INTRODUCTION

Electrocardiogram is the heart diagnostic device most commonly used on health services, clinic and hospital because of less cost and reliable to assess some heart anomalies such as heart rhythm disorder (dysrhythmias), the heart enlargement (hypertrophy), ischemia and infarction heart muscles, electrolyte balance disorder, assessing the effect of certain drug consuming on the heart and the assessment of the function of the pacemaker (Thaler, 2000; Widjaja, 2009).
Electrocardiogram is a measuring device for heart electrical activity where depolarization and repolarization heart muscles allows the current flows in the body which produces electrical potential on skin. This potential electricity will be detected by electrodes set on the patients’ lower extremities and precordial and will be translated by EKG in waves P, Q, R, S and T (Thaler, 2000; Widjaja, 2009).

For preventing the potential activity differences between grounding electrode sets on patients and the measuring result of potential heart activity which jelly is used jelly to reduce it (Gabriel, 2010). Unfortunately, some nurses still use piped water to substitute the jelly for affixing grounding electrodes EKG to the patient and the interview result was found that the nurses believe piped water is better recording media EKG to be used than jelly.

Genesis artifact on the recording EKG is often found the clinic which can be caused by various conditions. This Artifact will improve wasting amount of EKG paper consumption which will increase costs of health services to the client

METHODS

The design of this study is a quasy experimental study, with a research approach using cross-over design method where group A uses jelly for ECG recording and group B using piped water to perform ECG recording, then cross pattern where group A uses piped water for ECG recording and group B using jelly for ECG recording, after which an analysis of the occurrence of artifacts.

The sampling technique used in this research is systematic random sampling (systematic sampling). The sample size determined in this study used a large sample formula to examine the difference in meaning based on the difference in the proportions of the two groups (Dahlan, 2010). Calculation of the number of samples used in this study using the formula paired proportion with the calculation of 23 respondents every group. Total sample was 46 respondents.

The sample in this research is part of the study population, which are some students of nursing, physically and mentally healthy with total sample is 46 respondents which then divided into two groups (group A = 23 respondents and group B = 23 respondents) with inclusion criteria; Male and female, No congenital heart abnormalities, Respiratory frequency 14 - 20 x / min, Blood pressure systole: 90 - 139 mmHg and diastole: 70 - 89 mmHg, Heart frequency: 60 - 100 x / min and regular rhythm, Body temperature 36 - 37 oC, No pacemaker installed and No attached plate / pen on bone.

The research instruments used were ECG, EKG paper, Jelly and piped water taken at one take. The ECG device used, previously calibrated first, then trials the ECG device in the electromedical laboratory to ensure the device is functioning properly. Genesis Artifacts on each recording are recorded on the observation sheet.

Respondents are entitled to an explanation of the researcher's goals, benefits and expectations on the respondents. After the respondent fully understands the explanation given, the consent of the respondent is obtained by signing on the informed consent form. Subjects research in this case respondents, given an understandable explanation of the purpose of research to be done. Described procedures and techniques to be performed as well as objectives achieved in the study. Respondents are given an explanation of potential risks and potential discomforts to be experienced. If during the research activity the respondent experiences an inconvenience then the intervention is terminated, the Respondent may resign at any time without any consequence and Anonymity and confidentiality must be ensured. Research respondents should be confident that all outcomes and their responses are kept confidential and only used for research and education purposes.
Data analysis in this study was conducted univariat and bivariate. Univariate analysis, which will describe each variable, consist of: respondent's demographic data, artifact event in each group. Bivariate analysis using Chi Square test and followed by calculation of odds ratio.

RESULTS AND DISCUSSION

The group A and B recorded using piped water and jelly (golden standard) then analyzed the genesis artifact in both groups. The using impact of jelly and piped water as EKG recording media influenced the quality of the EKG recording results. Artifact is an interference appear on the EKG recording results when the recording is done using jelly and piped water.

Genesis artifact on the use of jelly and piped water as recording media was found occurring on both condition. The genesis artifact was more frequently occured using piped water as EKG recording media with 35.9 % and only14 % was no artifact. While, EKG recording media, jelly (golden standard) appeared artifact only 5.4 % and no artifact higher about 44.6 %. Chi Square test was obtained P value 0.0001. it indicated that there was a relationship between the use of piped water as EKG recording media on Genesis artifact. Also, the odds ratio 20.815 showed the possibility of a genesis artifact on the use of piped water as recording media 20.815 times greater than jelly. The results of research presented below;

Table 1. Genesis Artifact on the Recording Electrocardiogram Using Piped Water and Jelly

<table>
<thead>
<tr>
<th>Recording Media</th>
<th>Genesis Artifact</th>
<th>p Value</th>
<th>OR (IK 95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piped Water</td>
<td>Yes</td>
<td>33</td>
<td>No</td>
</tr>
<tr>
<td>Jelly</td>
<td>Yes</td>
<td>5</td>
<td>No</td>
</tr>
</tbody>
</table>

Electrocardiography is a device which is able to measure the potential heart action. Do to measure the potential of the human heart action, it is done by positioning electrodes on chest. Electrode is defined as the pair of electrodes spatial structure or a pair of grounding electrodes which is a combination of some electrodes through resistive network. The positioning of the electrode determines the direction of the electrode recording (lead) or lead axis where lead axis is determined by the direction of the negative electrodes to the positive electrodes. In term of heart, depolarization and repolarization propagation direction is one direction from the SA node to the apex heart which is known heart vectors (vectors dipol electricity). The heart electrical recording direction influences the result of the electrical potential result on body surface which was interested the researcher to use precordial electrode V4 as the potential EKG action electrode measurement because precordial electrode V4 is in line with heart vectors (Gabriel, 2010).

Potential offset electrode is the contact potential difference bioelectrode sensor used on EKG device, equal 0.46 V. This difference appears due to the mixing of electrodes EKG material that has two material, silver and cooper. To minimize the potential impact of electrode offset against the heart potential action, the potential offset is a necessity to be decreased as small as possible to zero. Inappropriately, creating the offset potential to zero is impossible because drift or voltage drop slowly will be occurred. Achieving the potential offset electrodes as minimum as possible, electrodes does not touch client’s skin directly, but it need to be covered with the jelly recorder media (gold standard) because the combination of jelly and the material of electrode, chloride silvers do not allow the voltage offset accumulation due to producing a great voltage (until 200 mV). With this voltage is enabling to eliminate very small voltage offset. Generally, the electrodes material being created is chloride silvers to eliminate the voltage offset (Gabriel, 2010). The impact using of piped water as EKG recording media influences the EKG
recording quality where artifact will appear more. Conducting EKG recording very risky occurs artifact which generate the difficulties in analysing and the interpreting (Taigang, H, Gari, C & Tarassenko, L, 2005).

Artifact is an interference appearing on the screen or paper recording Electrocardiogram results. One of the most found artifact in a clinic is 60 cycle artifact where its figure is basic line vibration that enable to cover the P waves or QRS waves perfectly consequently it is very hard to detect the interval high and wide P and PR waves. Once the P waves is not visible on each lead, it will not allow to assess the existence of the atrium space enlargement. Similarly, the PR interval can not be detected, it will be difficult to determine whether there is an AV block on the client or not (Atwood, S, Stanton. C & Storey. J, 1996; poernomo. H, Basuki. M & Widjaja. D, 2003). In detecting the interruptions or artifact on the EKG recording, by looking at general view the form or characteristics of artifact recording can be predicted the cause of artifact generally (Rodrigues. J, Belo. D & Gamboa. H, 2017).

Causing view, artifact generally is divided into four; (1) Wandering baseline, where the basic line up or down EKG recording which is caused by the body movement and respiratory rhythm, (2) Interference AC with characteristic an unclear vary EKG amplitudo and basic isoelectric line which is caused by an inappropriate-paired EKG grounding, electrodes is not attached on skin, and when recording is close to the other electronic devices such as cellphones, pump infusion etc, (3) muscles tremor with characteristic of description EKG there is a sharp and quick jump producing EMG signal, the body vibration and tremor caused by parkinson disease, (4) artifact caused by the body movement with characteristic the EKG recording has a deep swing from the basic line and a great amplitude signal differences which is caused by the effect of epidermal, skin stretching, coughing and ambulation signals. (Kunaryo. BH, Wahyudi & Santoso, 2011; Sivaraks. H & Ratanamahatana. CA, 2014).

Artifact image is occurred because of some of things, excessive hair chest, sweating skin especially where electrodes is attached, loses contact with the patient’s skin and patient touches metal objects or conductor wire touches metal objects during EKG is being recorded. In addition, artifacts can be also caused by giving less gels or dry and using an appropriate media, the use of piped water (Atwood. S, Stanton. C & Storey. J, 1996; poernomo. H, Basuki. M & Widjaja. D, 2003).

The use of piped water as the conductor media induces electrical noise that can affect the quality of the electrocardiograph recording results, one of them is artifact. This artifact appears as a result of the interference of 60 Hz raised by the potential improvement voltage on potential offset metal electrodes that contact with the patient’s skin while EKG recording is being conducted (Atwood, Stanton & Storey, 1996; poernomo, Basuki & Widjaja, 2003; Gabriel, 2010). Research result showed that the use of piped water as EKG recording media can increase the potential action to 143.6 mV which influence the EKG recording quality while the use of jelly as recording media only increase the potential action to 98.7 mV. Moreover, the use of piped water as the EKG recording media is verified increasing the genesis artifact which is presented 33 out of 46 respondents recording EKG experience artifact (Lesmana, H; Wijayanti, D; Entitled Ose, M. I; Utami, PA & Wahyuni, R. 2018). The difference EKG recording result between jelly and piped water media is presented below.
Conquering the genesis artifact, several ways are capable to be done, when recording EKG is being done the patient’s chest ought to be free from excretion using alcohol, shaving on patient having heavy chest hair (if it is possible), cleaning patient’s sweat especially where attaching EKG electrodes, basting adequate jelly between the skin with electrodes, fasten the grounding cables on EKG device (if it available), keeping away the devices the patient, notifying the patient not to touch the iron bed during the recording, enabling EKG filter when the recording is being done, asking patients to remove the metal objects that is wearing such as watches, coins, ring and others before the recording EKG is done, during EKG recording process patients are not cooperative or unconscious the electrodes are attached by using tape to maintain electrodes are aside from the body.

If recording extremity electrode results run into artifact, extremist electrodes adhere to patient’s body can be slide toward the proximal direction (Hermawan & Margo, 2012; Rahayuningsih, 2013; Rizkiawati & Laksmi, 2015).

CONCLUSION AND SUGGESTIONS
The piped water produces genesis artefact greater than jelly as media on the recording electrocardiogram results where an artefact is able to cover EKG waves result. The higher artefact is produced, the higher obstruction on the EKG recording result will be which generates an interference in reading and interpreting the waves P or PR interval. The P wave interpretation is vital part to determine whether the patient encounter the atrium enlargement or not. Furthermore, PR interval is used to detect whether the patient sustain AV block or not.

There are some stages to done before recording EKG being conducted to patient. The better recording media is jelly which is the gold standard of EKG recording procedure. Also, the patient is notified not to move during the EKG recording process. In addition, the patient’s chest is necessary to be hygienically from sweat and excretion because unhygienic condition can influence EKG potential action difference which is able to produce artifact. Another one is being sure the extremity electrode cuff and suction cup tightly adheres on patient’s skin and advising not to touch the iron bed when recording EKG is being done. Lastly, the patient is asked to keep away from handphone or other electronic devices clinging while recording EKG process because it makes electrical noise and influences on interference 60 Hz which create artifact on EKG recording results.
REFERENCES


