Australasian Journal of Paramedicine

Volume 5 | Issue 2 Article 5

2012

Paramedic identification of ECG J Point and ST Segments: A pilot study

Bill Lord Bill.Lord@med.monash.edu.au

Brett Williams brett.williams@med.monash.edu.au

Malcolm Boyle malcolm.boyle@med.monash.edu.au

Recommended Citation

Lord, B., Williams, B., & Boyle, M. (2007). Paramedic identification of ECG J Point and ST Segments: A pilot study. *Australasian Journal of Paramedicine*, 5(2).

Retrieved from http://ro.ecu.edu.au/jephc/vol5/iss2/5

This Journal Article is posted at Research Online. http://ro.ecu.edu.au/jephc/vol5/iss2/5



ISSN 1447-4999

EDUCATION

Article 990237

Paramedic identification of ECG J Point and ST Segments: A pilot study

Brett Williams, BAVEd, Grad Cert ICP, Grad Dip EmergHlth, MHlthSc, PhD (candidate)
Malcolm Boyle, ADipBus (GenAdmin), BInfoTech, MclinEpi
Bill Lord, BHlthSc, GDipCBL, Med, PhD (candidate)
Department of Community Emergency Health and Paramedic Practice,
Monash University, Melbourne

Abstract

Objective

To identify if undergraduate paramedic students are accurate at identifying J Point and ST segments on electrocardiograms.

Methods

A prospective single-blinded observational pilot study asking students to identify ST segment and J point location on four different ECG complexes.

Results

Of 32 students that participated in the study the findings demonstrated variations in students' accuracy with both J Point and ST segment identification. Undergraduate paramedic students in most cases were able to recognise ST segment elevation; however, definition of the amount of ST segment elevation varied greatly. A quarter of students did not complete all 4 J Point estimations. Overall the student's estimations varied considerably.

Conclusion

Results from this pilot study have identified significant variation in students' interpretation of J Point and ST Segment in ECG analysis.

1

Keywords: ECG; ECG analysis; education; electrocardiography; emergency medical technicians; J point; ST segment.

Introduction

Correct identification of the J Point and ST segment on the electrocardiograph (ECG) is an important clinical skill for paramedics working in acute health care settings. This skill is important in clinical practice, especially where paramedics are responsible for the initiation of thrombolytic therapy or are required to diagnose wide complex versus narrow complex tachydysrhythmias to determine appropriate intervention for a potential life-threatening dysrhythmia. The skill of ECG analysis and interpretation is anecdotally known to be challenging to learn and is often a difficult concept to teach.

Previous studies using experienced and inexperienced medical personnel have demonstrated inconsistent clinical interpretation when attempting to identify ST segment elevation and J Point location. The literature relating to paramedic performance of this skill is limited, with only 10 studies being published. No published studies have been located that use paramedic undergraduate students. To our knowledge no formal integration of previous medical research in this area has been included in undergraduate paramedic objectives.

The purpose of this study is to identify if undergraduate paramedic students are accurate at identifying J Point and ST segments on electrocardiograms (ECG).

Methods

This study was a prospective single blinded observational study that used a convenience sample of students over one university semester in the 2006. Students were enrolled full-time in the Bachelor of Emergency Health (BEH) degree offered at Monash University, Victoria, Australia.

The BEH is a paramedic pre-employment (pre-registration) degree course offered full-time over 3 years. The cardiology unit taught in the BEH covers a range of theoretical components that include: cardiac anatomy, physiology, pathophysiology, electrophysiology and ECGs. Students are expected to demonstrate and understanding of acute coronary syndrome, infarction patterns, and follow a systematic approach to ECG interpretation. Students are also expected to recognise over 25 rhythms. The following are the main classifications:

- Bradyarrhythmias
- Atrioventricular nodal blocks
- Tachyarrhythmias (Wide and narrow complex)
- Life-threatening arrhythmias

Participation in the study was voluntary, ethics approval for the study was granted by the Monash University Standing Committee on Ethics in Research Involving Humans. Each participant also had additional data collected, consisting of their age group, course, and year of study being undertaken.

The questionnaire contained 4 enlarged lead 2 ECG complexes all of which illustrated different levels, patterns and characteristics of ST segment elevation. Participants were asked the following questions: a) Is ST segment elevation present, b) If so, how many mm exist, and c) Identify with a mark where the J Point was located. Each author individually reviewed the ECGs identifying the ST Segment and J Point where the final interpretation was reached by consensus using the Cartesian coordinate system (Figure 1). We used the definition of J Point by Marriott, 'J Point: Junction of the QRS complex and the ST segment', for this study. ¹³ The J point was considered elevated if it was above the PR segment.

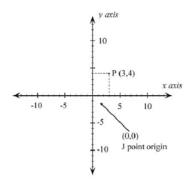


Figure 1 Cartesian coordinate system

Descriptive statistics means and medians were used to summarise the data. Statistical analysis was undertaken using SPSS (Statistical Package for the Social Sciences Version 15.0, SPSS Inc., Chicago, Illinois, USA.). All confidence intervals (CI) are 95%.

Results

There were 32 third year BEH students that participated in the study. The majority of students were female (n=19) with half of the group less than 24 years of age.

The students' results demonstrated variable success in identifying the J Point location and ST Segment elevation in all four ECGs.

ECG 1

Ninety percent correctly identified that ST segment was present. Over one in ten (13%) correctly identified the 2mm of elevation (Figure 2).



Figure 2. ECG 1

ECG 2

ECG 2 reflected 6mm of ST elevation, however, only 6% (n=2) of students correctly identified this (Figure 3).



Figure 3. ECG 2

ECG 3 Almost all students (97%) correctly identified there was no ST elevation in ECG 3 (Figure 4).

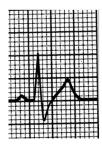


Figure 4. ECG 3

ECG 4

Over one in ten students (12%) reported ST elevation was not present in ECG 4 (Figure 5) when ST segment elevation existed.



Figure 5. ECG 4

Only 78% of students completed all four J point estimations. Overall the students were 0.32mm (95% CI 0.007mm to 0.63mm, range -1.0mm to 2.5mm) from the J point on the horizontal (x) axis and -0.44mm (95% CI -0.68mm to -0.196mm, range -2.8mm to 0.8mm) on the vertical (y) axis.

Discussion

This study demonstrates that undergraduate paramedic students, overall, are quite accurate at identifying ST segment elevation. However, students were less successful at determining the height of the ST segment elevation and precise location of the J Point. These findings highlight some modifications should be considered to the teaching and learning approaches used to teach these interpretative skills.

In three prehospital based studies, paramedic's successful interpretation of acute myocardial infarction (STEMI) varied between 71-80%. Other previously published studies on Other previously published studies on paramedic misinterpretation ranges from 10-40%. 3-12 One explanation could be that paramedic training in these cases has failed to develop the required level of performance, or that educational quality is not maintained throughout continuing education programs. A point also supported by Goebel et al.⁶ The results of this study have highlighted that students have difficulty in accurately identifying J Point locations in a variety of QRS patterns. We would argue that evidence of mastery in this skill is important to enable paramedics to correctly identify ECG and infarction patterns. A similar study by Carley et al was conducted using junior doctors in determining ST segment and J Point locations. Carley argued the importance of accurate ST segment measurement by junior doctors as they were the ones prescribing thrombolysis in a majority of cases. We would argue that this knowledge is also critical to paramedics ECG understanding, particularly given the views of the International Liaison Committee on Resuscitation (ILCOR) in their last consensus statements on resuscitation.¹⁸ Greater emphasis on teaching this skill should be linked to a longitudinal comparative study to quantify the outcome. The results from this study should inform the educational design of programs that aim to teach this skill.

This study is limited by the use of single complex, non-continuous and enlarged ECGs. As this was a pilot study the results lack external validity and should be interpreted with caution.

Conclusion

Results from this pilot study have identified significant variation in students' interpretation of J Point and ST segment in ECG analysis. These inaccuracies have identified that alternative teaching approaches should be considered in ECG analysis. A longitudinal comparative study to quantify the outcome of changes to ECG education should be considered.

Acknowledgements

We are grateful to the students who participated in the study.

Competing interests

None

Funding

None

References

- 1. Carley SD, Gamon R, Driscoll PA, Brown G, Wallman P. What's the point of ST elevation? Emerg Med J. 2002;19(2):126-8.
- 2. Hoyle RJ, Walker KJ, Thomson G, Bailey M. Accuracy of electrocardiogram interpretation improves with emergency medicine training. Emerg Med Australas. 2007;19(2):143-50.
- 3. Brady Jr WJ, DeBehnke DJ, Wickman LL, Lindbeck G. Treatment of out-of-hospital supraventricular tachycardia: adenosine vs verapamil. Acad Emerg Med. 1996;3(6):574-85.
- 4. Furlong R, Gerhardt RT, Farber P, Schrank K, Willig R, Pittaluga J. Intravenous adenosine as first-line prehospital management of narrow-complex tachycardias by EMS personnel without direct physician control. Am J Emerg Med. 1995;13(4):383-8.
- 5. Gausche M, Persse DE, Sugarman T, Shea SR, Palmer GL, Lewis RJ, et al. Adenosine for the prehospital treatment of paroxysmal supraventricular tachycardia. Ann Emerg Med. 1994;24(2):183-9.
- 6. Goebel PJ, Daya MR, Gunnels MD. Accuracy of arrhythmia recognition in paramedic treatment of paroxysmal supraventricular tachycardia: a ten-year review. Prehosp Emerg Care. 2004;8(2):166-70.
- 7. Hill R, Heller M, Rosenau A, Melanson S, Pronchik D, Patterson J, et al. Paramedic interpretation of prehospital lead-II ST-Segment. Prehospital & Disaster Medicine. 1997;12(2):141-4.
- 8. Lozano Jr M, McIntosh BA, Giordano LM. Effect of adenosine on the management of supraventricular tachycardia by urban paramedics. Ann Emerg Med. 1995;26(6):691-6.
- 9. Madsen CD, Pointer JE, Lynch TG. A comparison of adenosine and verapamil for the treatment of supraventricular tachycardia in the prehospital setting. Ann Emerg Med. 1995;25(5):649-55.
- 10. McCabe JL, Adhar GC, Menegazzi JJ, Paris PM. Intravenous adenosine in the prehospital treatment of paroxysmal supraventricular tachycardia. Ann Emerg Med. 1992;21(4):358-61.
- 11. Morrison LJ, Allan R, Vermeulen M, Dong SL, McCallum AL. Conversion rates for prehospital paroxysmal supraventricular tachycardia (PSVT) with the addition of adenosine: a before-and-after trial. Prehosp Emerg Care. 2001;5(4):353-9.
- 12. Wittwer L, Muhr M. Adenosine for the treatment of PSVT in the prehospital arena: Efficacy of an initial 6 mg dosing regimen. Prehospital Disaster Med. 1997;12(3):237-9.
- 13. Wagner G. Marriott's Practical Electrocardiography. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2001.
- 14. Conover M. Understanding Electrocardiography. 8th ed. St Louis: Mosby; 2003.
- 15. Feldman JA, Brinsfield K, Bernard S, White D, Maciejko T. Real-time paramedic compared with blinded physician identification of ST-segment elevation myocardial infarction: results of an observational study. Am J Emerg Med. 2005;23(4):443-8.
- 16. Keeling P, Hughes D, Price L, Shaw S, Barton A. Safety and feasibility of prehospital thrombolysis carried out by paramedics. BMJ. 2003;327(7405):27-8.
- 17. Myers RB. Prehospital management of acute myocardial infarction: Electrocardiogram acquisition and interpretation, and thrombolysis by prehospital care providers. Can J Cardiol. 1998;14(10):1231-40.
- 18. International Liaison Committee on Resuscitation. 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Part 5: Acute coronary syndromes. Resuscitation. 2005;67(2-3):249-69.

This Article was peer reviewed for the Journal of Emergency Primary Health Care Vol.5, Issue 2, 2007