

## EKG Limb Lead Placement

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**Clinical Question:** In hospitalized patients is there a difference between the standard ECG limb lead placements vs. the modified limb lead placements in identifying cardiac dysrhythmias?

### **Summary of Key Evidence:**

#### **Study #1**

The aim of the study by Welinder, Wagner, Maynard, and Pahlm (2010) “was to test the hypothesis that, compared to the Mason-Likar (M-L) electrode placement system, the ‘Lund’ (LU) electrode placement system would produce electrocardiographic waveforms with a closer relation to waveforms obtained from the standard system. This is a repeated measures study (each patient is their own control, each receiving 3 ECGs). All patients were admitted to the Lund University Hospital (Lund, Sweden) during 2008 or 2009. Eighty women and men (27 to 91 years of age) participated. For each of the 80 patients in the study, 4 ECG’s were recorded within a few minutes of each other- 2 standard ECG’s, 1 LU ECG, and 1 M-L 12 lead ECG. The study concluded that the difference in estimated infarct size between standard and M-L recordings was statistically significant ( $p=0.008$ ), but the difference between the standard and LU recordings was not ( $p=0.72$ ). The results confirm the LU electrode-placement system produces electrocardiographic waveforms that more closely resemble the waveforms obtained with the standard ECG than does the M-L electrode-placement system. The LU system might therefore qualify as a “universal system” for diagnostic ECG’s in monitoring.

#### **Study #2**

The purpose of the study by Jowett, Turner, Cole, and Jones (2004) was to “compared 12 lead ECG’s in 100 patients during routine electrocardiography, one being taken in the approved way and one being taken with modified limb electrodes” (p.122). This is a prospective repeated measures study (each patient is their own control, each receiving 2 ECGs). The setting was in the Medical and surgical wards at General Hospital, Haverfordwest, Pembrokeshire, Wales. Sample size was 100 adult patients admitted to the medical and surgical wards ranging from 21-81 years of age. Two sequential 12-lead ECGs were carried out during routine

electrocardiography over a four week period. One recording was made using standard limb lead placement and the second using the modified electrode positions. It was found that the use of torso leads produced important amplitude and waveform changes associated with a more vertical and rightward shift of the QRS frontal axis, particularly in those with abnormal standard ECGs.

### **Study #3**

The aim of the study by Tragardh-Johansson, Welinder, and Pahlm (2010) was “to further validate the Lund system by comparing measurements between Lund, Mason-Likar, and standard ECGs” (p.109). This is a quantitative prospective repeated measures study where each patient is their own control with each receiving 3 ECGs. The setting is within the Clinical Physiology or Cardiology Unit, Skåne University Hospital, Malmö, Sweden and the Clinical Physiology or Cardiology Unit, Skåne University Hospital, Lund, Sweden. In this study the sample size was 167 patients; 100 were male and 67 female. For each patient, 4 ECGs were recorded within a few minutes of each other: 2 standard 12-lead ECGs, 1 Lund ECG, and 1 Mason-Likar ECG. The order of the recordings of the different lead systems was not randomized. Of all measurements tested, only the difference between the first standard recording and the Mason-Likar ECG with regard to T-wave height was found to be statistically significant. (Tragardh-Johansson et al., 2010)

### **Clinical Bottom Line**

The evidence shows that there is a clinical difference between the standard, Mason-Likar, and Lund ECG's. None of the studies concurrently supported that any of the ECG lead placements were the “best” but it did strengthen the idea that hospitals should be using a universal system for ECG monitoring.

### **Implications for Practice**

Electrocardiograms (ECG) are commonly performed daily, in the health care setting, on every floor. Often it is the nurse or aide who performs the ECG and it is important for them to know the proper positioning of the leads, including the preferred limb lead placement. The

research shows that abnormalities may be caused from different position of limb lead placement therefore, the nurse should be aware of where the leads were placed.

**Articles:**

Jowett, N. I., Turner, A. M., Cole, A., & Jones, P. A. (2004). Modified electrode placement must be recorded when performing 12-lead electrocardiograms. *Postgrad Medical Journal*, *81*, 122-125. doi:110.1136/pgmj.2004.021204

Tragardh-Johansson, E., Welinder, A., & Pahlm, O. (2010). Similarity of ST and T waveforms of 12-lead electrocardiogram acquired from different monitoring electrode positions. *Journal of Electrocardiology*, *44*, 109-114. doi: 10.1016/j.jelectrocard.2010.11.012

Welinder, A., Wagner, G. S., Maynard, C., & Pahlm, O. (2010). Differences in QRS axis measurements, classification of inferior myocardial infarction, and noise tolerance for 12-lead electrocardiograms acquired from monitoring electrode positions compared to standard locations. *American Journal of Cardiology*, *106*, 581-586. doi: 10.1016/j.amjcard.2010.03.073