

Transthoracic impedance does not affect defibrillation, resuscitation or survival in patients with out-of-hospital cardiac arrest treated with a non-escalating biphasic waveform defibrillator.

Roger D.White, Thomas H. Blackwell, James K. Russell, David E. Snyder, Dawn B. Jorgenson. Resuscitation 64 (2005) 63–69.

“With this waveform, efficacy was high. The lack of evident [impedance] impact on effectiveness indicates that with this waveform there is no need for energy escalation and the accompanying risk of shock-induced cardiac dysfunction.”

Objective

To determine the influence of transthoracic body impedance on defibrillation, resuscitation and survival in patients with out-of-hospital cardiac arrest treated with a non-escalating impedance compensating 150j biphasic waveform defibrillator.

Methodology

Retrospective analysis was performed on data from two EMS systems. All witnessed arrests from patients who presented with a shockable rhythm and were initially treated by BLS personnel were included. Differences in impedance for successful versus unsuccessful outcomes were reviewed. The effect of call-to-shock time on overall outcome was also examined.

Assessed were:

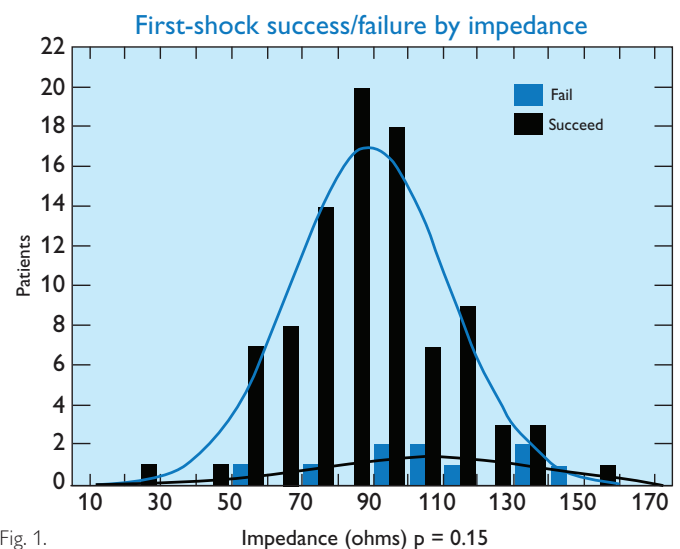
- First shock defibrillation success
- Two-shock defibrillation success
- Three-shock defibrillation success
- Return of spontaneous circulation (ROSC)
- Hospital admission
- Survival to discharge.

Results

102 patients were included. Mean impedance was 90 ohms \pm 23. Impedances ranged from 27 to 152 ohms and were normally distributed. Mean call-to-shock time was 6.8 minutes \pm 2.5.

Initial shocks defibrillated 90% of patients. Cumulative two-shock success was 98%. Three-shock success was 99% (one patient required five-shocks for successful conversion).

By all measures (including defibrillation, ROSC, and survival at discharge), impedance had no bearing on shock success.



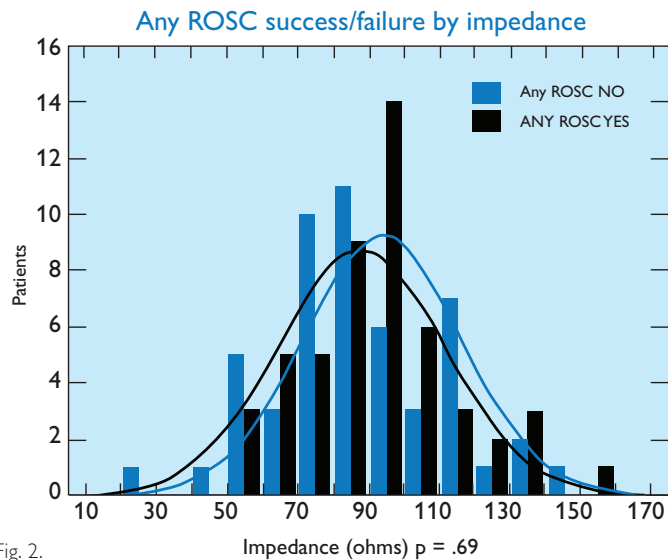


Fig. 2.

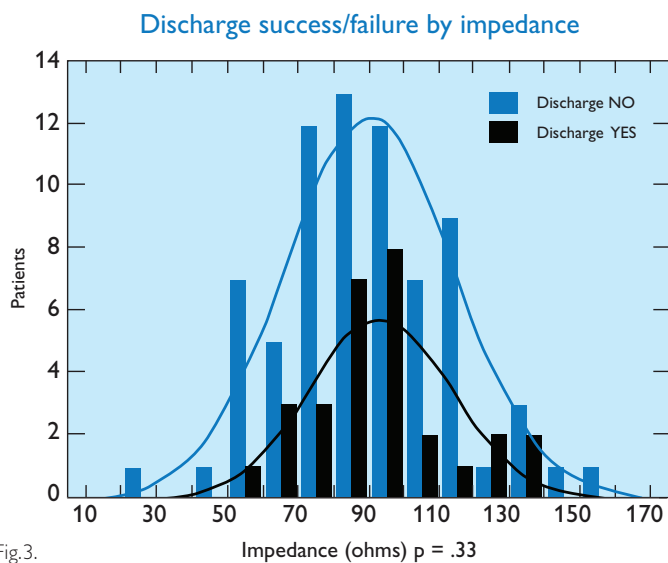


Fig. 3.

Results (continued)

Unsuccessful shocks were not associated with higher impedances. The distribution of impedances did not differ between successful and unsuccessful shocks (see figures 1, 2, and 3). The highest and lowest impedance patients were successfully defibrillated on the first-shock.

In contrast and consistent with previous findings, call-to-shock time and the achievement of ROSC were highly predictive of survival. Call-to-shock time did not affect defibrillation effectiveness but was highly predictive of resuscitation outcomes.

Conclusion

High impedance patients were defibrillated by the biphasic waveform used in this study at high rates with a fixed energy of 150 J and without energy escalation. Rapid defibrillation rather than differences in patient impedance accounts for resuscitation success. Other factors that influence outcomes are underlying diseases, both cardiac and non-cardiac.

With this waveform, efficacy was high. Impedance had no bearing on defibrillation, ROSC, or survival at discharge. The lack of impedance impact on effectiveness indicates that with this waveform there is no need for energy escalation and the accompanying risk of shock-induced cardiac dysfunction.

Philips Commentary

Energy is known to be a poor descriptor for shock strength; current is a more accurate descriptor.^{1,2,3,4} The Philips SMART Biphasic waveform delivers high peak current from the very first shock, yet has low energy to avoid stunning a fragile heart. If a waveform has sufficient peak current from the start, escalating to high energy levels is not necessary, even for high and low impedance patients.

References

- ¹ American Heart Association Guidelines 2005. Circulation 2005; 112.
- ² European Resuscitation Council Guidelines 2005. Resuscitation 2005; Vol 67 Supplement 1.
- ³ Tang et al. Journal of the American College of Cardiology 2004; Vol 43 No 7:1228-35.
- ⁴ Niemann et al. Acad Emerg Med 2005; Vol 12, No. 2.



© 2008 Koninklijke Philips Electronics N.V.
All rights are reserved.

Philips Healthcare reserves the right to make changes in specifications and/or to discontinue any product at any time without notice or obligation and will not be liable for any consequences resulting from the use of this publication.

Philips Healthcare is part of Royal Philips Electronics

www.philips.com/healthcare
healthcare@philips.com
fax: +31 40 27 64 887

Printed in The Netherlands
4522 962 39781 /861 * NOV 2008

Philips Healthcare
Global Information Center
P.O. Box 1286
5602 BG Eindhoven
The Netherlands