

BEST EVIDENCE TOPIC REPORTS

Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary

Edited by K Mackway-Jones

Emerg Med J 2003;**20**:464–470

Best evidence topic reports (BETs) summarise the evidence pertaining to particular clinical questions. They are not systematic reviews, but rather contain the best (highest level) evidence that can be practically obtained by busy practising clinicians. The search strategies used to find the best evidence are reported in detail in order to allow clinicians to update searches whenever necessary. The BETs published below were first reported at the Critical Appraisal Journal Club at the Manchester Royal Infirmary¹ or placed on the BestBETs web site. Each BET has been constructed in the four stages that have been described elsewhere.² The BETs shown here together with those published previously and those currently under construction can be seen at <http://www.bestbets.org>.³ Six BETs are included in this issue of the journal.

- ▶ Biphasic or monophasic defibrillation for adult ventricular fibrillation
- ▶ Ascorbate for alkali burns to the eye
- ▶ Leucovorin (calcium folinate) in "antifreeze" poisoning
- ▶ Vasopressin or adrenaline (epinephrine) in cardiac resuscitation
- ▶ Is the central venous pressure reading equally reliable if the central line is inserted via the femoral vein
- ▶ Oucher or CHEOPS for pain assessment in children

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1 **Carley SD**, Mackway-Jones K, Jones A, *et al*. Moving towards evidence based emergency medicine: use of a structured critical appraisal journal club. *J Accid Emerg Med* 1998;**15**:220–2.

2 **Mackway-Jones K**, Carley SD, Morton RJ, *et al*. The best evidence topic report: A modified CAT for summarising the available evidence in emergency medicine. *J Accid Emerg Med* 1998;**15**:222–6.

3 **Mackway-Jones K**, Carley SD. [bestbets.org](http://www.bestbets.org): Odds on favourite for evidence in emergency medicine reaches the worldwide web. *J Accid Emerg Med* 2000;**17**:235–6.

Biphasic or monophasic defibrillation for adult ventricular fibrillation

Report by Rob Torok, *Specialist Registrar*

Checked by Jeremy Till, *Staff Grade*

Abstract

A short cut review was carried out to establish whether biphasic defibrillatory shocks were superior to monophasic shocks in patients in ventricular fibrillation. Altogether 337 papers were found using the reported search, of which seven presented the best evidence to answer the clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of these best papers are tabulated. A clinical bottom line is stated.

Clinical scenario

An adult is brought into the emergency department following an out of hospital ventricular fibrillatory arrest. Ventricular fibrillation persists despite repeated shocks. You remember reading about biphasic defibrillation and wonder if it offers any advantages.

Three part question

In [an adult in ventricular fibrillation] is [external biphasic shock better than monophasic shock] at [achieving defibrillation]?

Search strategy

Medline 1966–06/03 using the OVID interface. Biphasic.mp AND (defib\$.mp OR shock\$.mp OR exp electric countershock) LIMIT to human AND English.

Search outcome

Altogether 337 papers were found of which seven related to out of hospital studies relevant to the original question.

Comment(s)

The studies shown in table 1 represent two independent groups of patients. The first two studies are a prospective randomised controlled trial (PRCT) and subsequent subgroup analysis of data from it. The last five studies represent ongoing investigation by a group of researchers with some overlap of patient groups between each study because of differing selection criteria and differing dates of study.

The PRCT provides good evidence for the superiority of biphasic defibrillation over monophasic. Analysis of the data from this study gives an NNT of three for successful defibrillation with first shock, and an NNT of four for successful defibrillation within the first three shocks by biphasic compared with monophasic waveforms. These out of hospital studies follow on from extensive in hospital and animal studies showing the superiority of biphasic defibrillation.

All the studies reported used the Heartstream Forerunner defibrillator with non-escalating 150 J shocks. This device uses an impedance compensating biphasic truncated exponential waveform. Laboratory and hospital based studies show the superiority of biphasic waveforms to be broadly applicable and not confined to this specific example of a biphasic waveform. Work is ongoing to refine which parameters of the waveform influence effectiveness. Evidence should be appraised for the effectiveness of the specific waveform used when selecting a defibrillator. Local considerations will determine when biphasic devices replace monophasic defibrillators.

▶ CLINICAL BOTTOM LINE

Biphasic defibrillation is currently the best treatment for adult VF and should be used when available.

White RD. Early out-of-hospital experience with an impedance-compensating low-energy biphasic waveform automatic external defibrillator. *J Interv Card Electrophysiol* 1997;**1**:203–8.

Poole JE, White RD, Kanz KG, *et al*. Low-energy impedance-compensating biphasic waveforms terminate ventricular fibrillation at high rates in victims of out-of-hospital cardiac arrest. LIFE investigators. *J Cardiovasc Electrophysiol* 1997;**8**:1373–85.

Table 1

Author, date and country	Patient group	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
White RD, 1997, USA	18 SCA patients, 10 VF receiving biphasic shocks	Observational	1st shock efficacy for initial VF episode 1st shock efficacy	70% 82% (CI 70 to 92%)	Small number—an early subset of 2
Poole JE <i>et al</i> , 1997, USA & Germany	100 consecutive AED uses. 44 patients received biphasic shocks	Observational	1st shock efficacy for initial VF episode compared with pooled and best monophasic data published	89% (CI 75 to 97%) v 63% (CI 60 to 67%) and 77% (CI 70 to 83%)	Descriptive study—no controls. Inclusion of patient data between this and following studies occurs
Gliner BE <i>et al</i> , 1998, USA, UK, Italy, Germany	286 consecutive AED uses. 100 patients received biphasic shocks	Observational	1st shock efficacy for initial VF episode 1st shock efficacy for all VF episodes 3 shock efficacy for all VF episodes	86% (CI 78 to 92%) 86% (CI 81 to 91%) 97% (CI 91 to 99%)	Includes patients from reference 2
Gliner BE and White RD, 1999, USA	All AED uses—29 patients treated with biphasic shocks, 87 monophasic Biphasic v monophasic	Observational	1st shock efficacy 3 shock efficacy	85% v 66% p<0.0001 99% v 85% p<0.0001	Retrospective comparing data from differing periods. Includes some data from references 2, 1, and 6
Schneider T <i>et al</i> , 2000, Germany, Finland, Belgium	246 SCA patients, 115 in VF Biphasic (54) v monophasic (61)	PRCT	ROSC during ALS 3 shock efficacy for initial VF episode 1st shock efficacy for initial VF episode	76% v 54% p=0.01 98% v 69% p<0.0001 (% relate to biphasic then monophasic) 96% v 59% p<0.0001	Randomisation of defibrillation waveform by day rather than episode
White RD <i>et al</i> , 2001, USA	35 witnessed VF arrests receiving biphasic shocks	Observational	% ROSC during ALS % ROSC with shocks alone % discharged home	74% 38% 46% including all who required shocks alone	Excludes unwitnessed arrest Includes some data from references 1 and 4
Martens PR <i>et al</i> , 2001, Germany, Finland, Belgium	246 SCA patients, 115 VF—54 treated with biphasic, 61 with monophasic shocks—48 MTE, 13 MDS	Subgroup analysis of PRCT	ROSC during ALS 1st shock efficacy for initial VF episode 3 shock efficacy for initial VF episode	76% v 54% p=0.024 or 54% p=0.17 96% v 54% p=0.0001 or 77% p=0.047 98% v 67% p<0.0001 or 77% p<0.021 (% relate to biphasic v MTE then MDS)	Subgroup analysis of above so small numbers for MDS

Gliner BE, Jorgenson DB, Poole JE, *et al*. Treatment of out-of-hospital cardiac arrest with a low-energy impedance-compensating biphasic waveform automatic external defibrillator. The LIFE investigators. *Biomed Instrum Technol* 1998;**32**:631–44.

Gliner BE, White RD. Electrocardiographic evaluation of defibrillation shocks delivered to out-of-hospital sudden cardiac arrest patients. *Resuscitation* 1999;**41**:133–44.

Schneider T, Martens PR, Paschen H, *et al*. Multicenter, randomized, controlled trial of 150J biphasic shocks compared with 200- to 360J monophasic shocks in the resuscitation of out-of-hospital cardiac arrest victims. *Circulation* 2000;**102**:1780–7.

White RD, Hankins DG, Atkinson EJ. Patient outcomes following defibrillation with a low energy biphasic truncated exponential waveform in out-of-hospital cardiac arrest. *Resuscitation* 2001;**49**:9–14.

Martens PR, Russell JK, Wolcke B, *et al*. Optimal response to cardiac arrest study: defibrillation waveform effect. *Resuscitation* 2001;**49**:233–43.

clinical question. The author, date and country of publication, patient group studied, study type, relevant outcomes, results and study weaknesses of this best paper are tabulated. A clinical bottom line is stated.

Clinical scenario

A 22 year old man has been cleaning out an old chemical drum. He attends the emergency department with severe burning in his eyes. He says the drum was marked as NaOH 20%. You arrange for copious irrigation and oral pain relief. You contact the duty ophthalmologist who asks to start mydratics, antibiotic ointment, and ascorbate drops. You do not have the ascorbate drops and wonder whether there is any evidence for their use.

Three part question

In [patients with alkali eye burns] do [ascorbate drops] [reduce short-term symptoms and long-term sequelae]?

Search strategy

Medline 1966- week 1 06/03 using the OVID interface. {(injury.mp OR exp “wounds and injuries” OR exp burns OR burn\$.mp) AND (eye\$.mp OR exp eye)} OR (eye injury.mp OR eye injuries.mp OR exp eye injuries OR eye burn\$.mp OR exp eye burns)} AND (alkali\$.mp OR exp alkalies) AND (ascorbate\$.mp OR ascorbic acid.mp OR exp ascorbic acid OR vitamin C.mp)

Ascorbate for alkali burns to the eye

Report by Kevin Mackway-Jones, Consultant

Checked by Janet Marsden, Senior Lecturer

Abstract

A short cut review was carried out to establish whether ascorbate drops are useful in the management of alkalis burns to the eyes. Altogether 33 papers were found using the reported search, of which one presented the best evidence to answer the