Is defibrillation effective in accidental severe hypothermia in adults?

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Three part question

In [accidental severe hypothermia (less than or equal to 30 degrees celcius) induced ventricular fibrillation in adults] is [defibrillation] [effective at restoring a sinus rhythm]?

Clinical scenario

A 50-year-old man is found collapsed in the snow on a very cold winter's night. He is admitted to hospital unconscious with adjuvant cardiopulmonary resuscitation and a low reading rectal thermometer measures his core temperature to be 26°C. He is in ventricular fibrillation. Should an attempt at defibrillation be made at this temperature or should he be re-warmed first and then defibrillated?

Search strategy

Medline 1966–06 using Ovid interface. [AED\$ or automated external defibrillat\$ or defibrillat\$ or VF or ventricular

fibrillati\$ or CPR or cardiopulmonary resus\$ or ALS or advanced life support] and [severe hypothermia or hypothermi\$]mp. [mp = title, original title, abstract, name of substance word, subject heading word]. Limited to humans and English language. Cochrane Library Issue 3 2006: hypothermia [title, abstract or keywords] and defibrillation [title, abstract or keywords] or ventricular fibrillation [title, abstract or keywords].

Search outcome

A total of 385 papers initially found, of which 17 were relevant.

Comment(s)

The only published data on this subject is in the form of case reports and a few case series. No higher-level evidence is available. From these there is insufficient data to definitively say whether or not defibrillation is effective in severe hypothermia. 55.6% of cases do however report successful defibrillation at temperatures at or below 30 degrees celcius (15 of 27 cases). This may be due to publication bias and further work would be necessary to be sure.

► CLINICAL BOTTOM LINE

It is reasonable to attempt defibrillation at temperatures below 30 degrees celcius in accidental severe hypothermia. This therapeutic strategy is supported by the current European Resuscitation Council guidelines (18).

Table 4

Author, date and country	Patient group (age)	Study type (level of evidence)	Outcomes	Key results	Study weaknesses
Towne WD <i>et al</i> , 1972, USA	58	Case Report	Successful defibrillation at 34.4°C	Repeated attempts at external defibrillation unsuccessful.	
Schissler P <i>et al</i> , 1981, USA	67	Case Report	Successful defibrillation at 30.0°C	Previous shock at 22.2°C unsuccessful	
Althaus U <i>et al</i> , 1982, Switzerland.	40, 42 and 24	Case Series	Successful defibrillation at 26, 36 and 29°C respectively.	Two cases were of successful defibrillation at < 30°C	
Nordrehaug JE, 1982, Norway	33	Case Report	Successful defibrillation at 28°C.	Defibrillation attempts at 24, 26 and 27°C unsuccessful	
Splitterger FD <i>et al</i> , 1986, USA	≤ 18. 6 cases	Case Series, 11 cases ineligible	All patients that lived defibrillated at >34°C.	Unsuccessful defibrillations attempted at temperatures lower than 30°C. Two of the cases died.	Further 11 cases analysed from literature, not analysed here as risk of duplication.
Cohen DJ <i>et al</i> , 1988, USA.	32	Case Report	Successful defibrillation at 30°C	Earlier attempts at defibrillation failed	
Walpoth BH <i>et al</i> , 1990, Switzerland	4 adults	Case Series, 12 cases ineligible	Mean temperature of successful defibrillation at 25.6°C		No exact patient details given
Wisborg T. <i>et al</i> , 1991, Norway	33	Case Report	Successful defibrillation at 31°C	Rewarmed prior to first shock	
Bolgiano E <i>et al</i> , 1992, USA	22	Case Report	Successful defibrillation at 30°C	Initial defibrillation at 24°C unsuccessful	Data on other cases did not meet minimal data set criteria
Wolfe CS, 1993, USA	38	Case Report	Successful defibrillation at 24°C	Initial defibrillation at 23°C unsuccessful.	
Schwartz AJ <i>et al</i> , 1997, Austria.	54	Case conference	Successful defibrillation at 31°C	Earlier attempts at defibrillation failed	
Steedman DJ <i>et al</i> , 1997, UK	29	Case Report	Successful defibrillation at 37°C.	Initial defibrillations unsuccessful at 28.3, 29.0 and 31°C	
Ireland AJ <i>et al</i> , 1997, UK,	48	Case Report	Successful defibrillation at 24.3°C	First shock was sufficient.	
Thomas R <i>et al</i> , 2000, UK	82	Case Report	Successful defibrillation at 25.6°C	Patient eventually died	
Ko CS <i>et al</i> , 2002, UK.	37	Case Report	Successful defibrillation at 37°C	Previous defibrillation at 30°C unsuccessful.	Core temperature recorded (17°C) tympanic, therefore accuracy unclear
Mulpar AK <i>et al</i> , 2004, UK	20	Case Report	Successful defibrillation at 28°C	Previous defibrillation at 25°C unsuccessful	
Moser B <i>et al</i> , 2005, Austria	62	Case Report	Successful defibrillation at 29°C	No previous defibrillation attempts	
Soar J <i>et al</i> , 2005	All patients	Guidelines			

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