

Sodium Bicarbonate in Cardiac Arrest

Introduction

1. Out-of-hospital cardiac arrest (OHCA) remains a leading cause of mortality and a substantial issue of public health concern worldwide.
2. Sodium bicarbonate (SB) administration has been considered an important part of treatment for severe metabolic acidosis in cardiac arrest, because based on pathophysiologic considerations, normalization of extracellular and intracellular pH was considered a meaningful endpoint of resuscitation.
3. Correction of metabolic acidosis with SB was recommended by early advanced cardiac life support (ACLS) guidelines published in 1973, and SB was the medication most frequently used during cardiac arrest until mid-1980s
4. The 2010 ACLS Guidelines for adults published by the American Heart Association (AHA) state that "Routine use of sodium bicarbonate is not recommended for patients in cardiac arrest" (class III recommendation, based on level of evidence (LOE) B)

Pharmacology	
Dose	0.5-1 meq/kg/dose <ul style="list-style-type: none"> • Repeat doses should be guided by arterial blood gases
Administration	IV injection during cardiac arrest
PK/PD	Onset IV: Rapid Duration IV: 8-10mins Excretion: Urine (<1%)
Adverse Effects	Hypocalcemia Intracellular acidosis (without adequate ventilation) HYPERNATREMIA Hyperosmosis Shift O2 release by hemoglobin
Compatibility	Sodium bicarbonate solution may inactivate catecholamines such as epinephrine

* May decrease of the biological effect of epinephrine to 77- 82 % of nonalkaline solution
* not powered

Overview of Evidence

Author, Year	Design/ sample size	NaHCO ₃ regimen	Outcome
Chen YC, 2018	Observational/ n=5589	Not reported	Sodium bicarbonate during ED resuscitation was significantly associated with an increased rate of survival to hospital admission.
Kawano T, 2017	Prospective observational/ n= 13,865	Not reported	In OHCA patients, prehospital SB administration was associated with worse survival rate and neurological outcomes to hospital discharge.
Ahn S, 2017	RCT/ n=50	50 mEq/L vs Placebo	No difference in sustained ROSC (4% vs 16%) or good neurological outcome (0% vs 4% , p=.1) SB had significant effect on pH (6.99 vs. 6.90, P=0.038) and bicarbonate levels (21.0 vs. 8.0 mEq/L)
Wang CH, 2016	Retrospective observational study/ n=109	Not Reported	SB was positively associated with sustained ROSC when serum potassium level was <7.9 mEq in IHCA Calcium and SB was positively associated with sustained ROSC when serum potassium level <9.4 mEq/L IHCA
Vukmir RB, 2005	RCT/ n=792	1 mEq/kg NaHCO ₃	Overall survival rate was 13.9% No difference in survival in those who received bicarbonate 2-fold increase in survival in arrest >15 min (32.8 vs 15.4)*
Bishop RL, 1976	Animal+human case studies/ n=6	1 mEq/kg of 7.5% sodium bicarbonate in dogs 0.5-0.9 mEq/kg in humans	Animal 1 mEq/Kg SB resulted in increases in the Pco ₂ (27→49), pH (7.38 →7.56) and the serum osmolality (309→349) Man 0.5-0.9 mEq/Kg SB resulted in increases in the Pco ₂ (24.5→38.8), pH (7.23 →7.48) and the serum osmolality (308→343)

References

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