Interposed Abdominal Compression CPR
Paramedic Mini-CAT

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Background - OHCA

- Cardiac arrest occurring outside of a hospital
- ~40,000 occurrences per year in Canada; >350,000 in the United States
- 8/10 occur out-of-hospital, and only 1/10 survive
- Increased survival rate with immediate high-quality resuscitation
- Time taken to initiate CPR has greatest impact on survival
- Many OHCA encountered by first responders during circulatory phase (Weisfeldt and Becker, 2002)

Background - Interposed abdominal compressions

First utilized in OR. Adapted for external use and described in 1982 by Ralston et al. as an adjunct to traditional chest compressions. Compressions are performed on abdomen out-of-phase with chest compressions (1:1), using a synchronised rate on the upper abdomen, to a depth sufficient to palpate abdominal aorta.

PICO

Does interposed abdominal compression CPR, compared to standard chest compressions, result in increased survival from cardiac arrest?

Search Criteria

(Interposed abdominal compression OR iac) AND (cpr or cardiopulmonary resuscitation)

Databases searched: MEDLINE, CINAHL

Results: 80 results. Preferentially selected human RCTs that examined survival to discharge and relevant hemodynamic parameters associated with ROSC

Author, year	n	Objective/Design	Results	Strengths/weaknesses
Sack et al. 1992	103	Randomized - IAC vs standard CPR ICU, CCU, telemetry unit, general medical and surgical wards	IAC group: • 2x incidence of ROSC • 3x rate of survival to discharge • Increased neurologically intact status	Strengths: • Controlled for cause of arrest: excluded trauma, respiratory arrest, abdominal aortic aneurism, pediatrics and pregnancy; etiologies unlikely to be good candidates for IAC • Assessed for demographic and clinical variables that may influence likelihood of resuscitation • Followed pts through to discharge and assessed neurologic/function status Weaknesses: • Small sample size • Unable to blind investigators to the study • Clinical outcomes as only end-points in study: failed to address parameters of resuscitation
Sack et al. 1992	143	Asystolic or PEA cardiac arrests Randomized - IAC vs standard CPR ICU/medical ward	IAC group: • increased rate of ROSC • 49% vs. 28%, p=0.01 • increased survival at 24 hours • 33% vs. 13%, p=0.009 • No notable IAC-CPR-induced complications	Strengths: • Assessed for demographic and clinical variables that may influence likelihood of successful resuscitation • Assessed for differences in initial blood gas values which may affect likelihood of successful resuscitation • Assessed duration of resuscitation – equal between groups Weaknesses • Post-mortem analysis of complications performed on subset of pts who died during experiment, small sample size • Did not evaluate neurologic status • Limited sample population by inclusion of those presenting only with asystolic and PEA initial rhythms • These pts have grave outcomes to begin with, potentially skewing data

Mohavedi et al. 2016	80	Randomized - IAC vs standard CPR ED/surgical/medical wards	IAC group • Increased intra-arrest ETCO2 levels • Larger increase in ETCO2 from baseline when compared standard CPR • Insignificant but notable difference in ROSC	Strengths: • Standardized inclusion/exclusion criteria • Measured parameters associated w/ high-quality resuscitation as well as outcome of ROSC itself and survival at 24hrs Weaknesses: • Small sample size • Patient populations not comparable IAC group contained older patients w/ more comorbidities, unable to control for these factors • Conducted on ward floors; did not control for down-time/time since cardiac arrest
Wang et al. 2018	122	Randomized - IAPP vs. standard CPR ED	At 30 min of CPR, IAPP-CPR group demonstrated: • increased MAP, PaO2, ETCO2 • decreased PaCO2, lactic acid • increased ROSC, decreased time to ROSC • increased 24-hour survival and survival-to-discharge	Strengths: • Assessed multiple factors associated w/ efficacy of resuscitation in addition to clinical outcomes (ROSC, survival, etc.) • Assessed for clinical and demographic variation within sample population Weaknesses • Sample size
Zhang et al. 2018	75	Non-randomized, IAPP-CPR v standard CPR in cardiac arrest presenting to ED. ED	IAPP-CPR group: • increased carotid blood flow • increased MAP and SpO2 • No significant difference in ROSC or 48-hr survival • increased cerebral perfusion w/ IAPP-CPR	Strengths: • Only study which measured carotid blood flow as indication of cerebral perfusion. • Addressed confounding factors which may influence successful resuscitation (age, gender, etiology of arrest) Weaknesses • Small sample size • Allocation of patients into IAPP vs CPR group not randomized; allocated according to patient/family wishes

Discussion

Variable techniques were utilized in the included studies, which may influence outcomes. In addition, studies were unable to blind healthcare professionals due to nature of study, thus there may be a compounding Hawthorne bias. Studies reported minimal complications with IAC-CPR - there was only one reported case of trauma

Questions remain around the logistics of application, such as the integration with automated/mechanical devices, additional resources required, and the optimal patient population for application.

Clinical bottom line

IAC-CPR shows an increase in metrics that are associated with ROSC. IAC-CPR demonstrates increase in ROSC, survival at 24 hours, survival-to-discharge, and potentially improved neurological outcome, increased cerebral perfusion w/ IAC-CPR. There are no negative effects when compared to standard CPR evident in the literature. Currently available data presents promise, but further research is needed. Currently a Class IIb recommendation, we are unable to recommend as new standard of pre-hospital practice.

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