INPLASY PROTOCOL

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None declared.

Clinical outcomes of mild hypothermic circulatory arrest versus moderate hypothermic circulatory arrest in aortic arch surgery: a systematic review and meta-analysis

Wang, L[1]; Lv, X[2]; Huang, L[3]; Hou, Y[4]; Chen, J[5]; Zhong, G[6]; Chen, L[7].

Review question / Objective: **In adult aortic arch surgery, especially in Standford type A aortic dissection repair, the optimal temperature for circulatory arrest is controversial, and it has a tendency to be warmer. Moderate hypothermia circulatory arrest with selective cerebral perfusion are widely used, but the application of mild hypothermia circulatory arrest with selective cerebral perfusion is still controversial. Our meta-analysis is conducted to compare the clinical outcomes of mild and moderate hypothermia circulatory arrest in adult aortic arch surgery, including permanent neurological dysfunction, temporary neurological dysfunction, mortality, renal failure, spinal cord injury, and so on. We assumed that there is no increased mortality or neurological complications in mild hypothermia circulatory arrest.**
Main outcome(s): **The primary outcomes included postoperative permanent neurological deficit, temporary neurological deficit, and mortality.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 02 May 2022 and was last updated on 02 May 2022 (registration number INPLASY202250005).

INTRODUCTION

Review question / Objective: **In adult aortic arch surgery, especially in Standford type A aortic dissection repair, the optimal temperature for circulatory arrest is controversial, and it has a tendency to be warmer. Moderate hypothermia circulatory arrest with selective cerebral perfusion are widely used, but the application of mild hypothermia circulatory arrest with selective cerebral perfusion is still controversial. Our meta-analysis is conducted to compare the clinical outcomes of mild and moderate hypothermia circulatory arrest in adult**

aortic arch surgery, including permanent neurological dysfunction, temporary neurological dysfunction, mortality, renal failure, spinal cord injury, and so on. We assumed that there is no increased mortality or neurological complications in mild hypothermia circulatory arrest.

Condition being studied: Deep hypothermic circulatory arrest (DHCA) (14.1-20°C) used to be a classic technique for neuro-protection in aortic arch surgery involving diseases such as Standford type A aortic dissection (TAAD) and degenerative aneurysm. But in recent years, on account of the technique of selective antegrade cerebral perfusion (SACP) which prolongs the safe time of circulatory arrest, moderate hypothermic circulatory arrest (MoHCA) (20.1-28°C) with SACP is more popularized. Moreover, the temperature level is constantly rising, and the employment of mild hypothermic circulatory arrest (MiHCA) (> 28°C) with SACP is gradually recognized and adopted. However, cerebrum and viscera organ are probably accompanied with ischemic risks at warmer temperatures. Previous meta-analyses are mainly limited to the comparison of MoHCA and DHCA, while studies comparing MiHCA and MoHCA are still few and their meta-analysis has not been summarized. Therefore, the present meta-analysis aims to evaluate mortality and morbidity in mild and moderate circulatory arrest.Deep hypothermic circulatory arrest (DHCA) (14.1-20°C) used to be a classic technique for neuro-protection in aortic arch surgery involving diseases such as Standford type A aortic dissection (TAAD) and degenerative aneurysm. But in recent years, on account of the technique of selective antegrade cerebral perfusion (SACP) which prolongs the safe time of circulatory arrest, moderate hypothermic circulatory arrest (MoHCA) (20.1-28°C) with SACP is more popularized. Moreover, the temperature level is constantly rising, and the employment of mild hypothermic circulatory arrest (MiHCA) (> 28°C) with SACP is gradually recognized and adopted. However, cerebrum and viscera organ are probably accompanied with ischemic risks at warmer temperatures. Previous meta-analyses are mainly limited to the comparison of MoHCA and DHCA, while studies comparing MiHCA and MoHCA are still few and their meta-analysis has not been summarized. Therefore, the present meta-analysis aims to evaluate mortality and morbidity in mild and moderate circulatory arrest.

METHODS

Search strategy: Electronic searches were performed using PubMed, Embase, Cochrane Library and Web of Science from their inception to March 2022 comparing clinical outcomes of MiHCA or MoHCA in aortic arch surgery or TAAD repair. The reference lists of retrieved articles were reviewed for further identification of potentially relevant studies.

Participant or population: Adult patients underwent aortic arch surgery with hypothermic circulatory arrest (HCA) including TAAD and aortic aneurysm repair.

Intervention: Study intervention: Patients undergoing aortic arch surgery with mild hypothermic circulatory arrest or moderate hypothermic circulatory arrest.

Comparator: Studies comparing clinical outcomes in aortic surgery with mild hypothermic circulatory arrest or moderate hypothermic circulatory arrest.

Study designs to be included: Observational or randomized controlled trial studies.

Eligibility criteria: The approach of participants population, interventions, comparisons, outcomes, and study designs (PICOS) were used to establish the inclusion criteria for our meta-analysis. Studies meeting the following criteria were included: (1) Study participants: Adult patients underwent aortic arch surgery with hypothermic circulatory arrest (HCA) including TAAD and aortic aneurysm repair. (2) Study intervention and comparator: Studies comparing at least one interested outcome between MiHCA and MoHCA

cohort. (3) Study outcomes: The primary outcomes included postoperative permanent neurological deficit (PND), temporary neurological deficit (TND), and mortality. The secondary outcomes included visceral injury (mainly referred to postoperative dialysis-dependent renal failure), spinal cord injury (mainly referred to paraplegia), coagulation disorders (volume of chest tube drainage, rate of reexploration for bleeding), and other outcomes (ventilation time, intensive care unit (ICU) and in-hospital length of stay). (4) Study type: Observational or randomized controlled trial (RCT) studies.

Information sources: Electronic searches were performed using PubMed, Embase, Cochrane library and Web of science from their inception to March 2022 comparing clinical outcomes of MiHCA or MoHCA in aortic arch surgery or TAAD repair. The search terms of "Aortic arch" or "Aneurysm, Dissection" and "Hypothermia" or "Mild hypothermia" or "Moderate hypothermia" or "Hypothermic circulatory arrest" were combined as medical subject heading terms. The reference lists of retrieved articles were reviewed for further identification of potentially relevant studies. When insufficient data were available from publications, corresponding authors were contacted to provide additional records. All identified articles were systematically assessed using the inclusion and exclusion criteria.

Main outcome(s): The primary outcomes included postoperative permanent neurological deficit, temporary neurological deficit, and mortality.

Additional outcome(s): The secondary outcomes included visceral injury (mainly referred to postoperative dialysis-dependent renal failure), spinal cord injury (mainly referred to paraplegia), coagulation disorders (volume of chest tube drainage, rate of reexploration for bleeding), and other outcomes (ventilation time, intensive care unit (ICU) and in-hospital length of stay).

Data management: The odds ratio (OR) with a 95% confidence interval (CI), mean difference (MD) or standard mean difference (SMD) were used as summary statistics.

Quality assessment / Risk of bias analysis: Quality assessment was performed using the Newcastle Ottawa Scale (NOS), and a total score of ≥ 6 (of 9) was considered of high quality and low risk of bias. Evidence of publication bias was explored through visual inspection of funnel plots, Egger's test and Begg's test. It indicated no bias when funnel plot looked symmetrical, and Egger's and Begg's P > 0.05. Otherwise trim and fill method were employed to aid in interpretation of potential publication bias.

Strategy of data synthesis: Studies not comparing clinical outcomes between MiHCA and MoHCA cohorts; Studies including fewer than 10 patients for either cohort; Review articles, conference abstracts, case reports, letters, editorials, animal studies; articles not available for full texts; and non-English articles.

Subgroup analysis: Subgroup analysis was conducted to determine whether temporal variation was a potential source of heterogeneity.

Sensitivity analysis: The leave-one-out sensitivity analysis was performed to examine the influence of individual studies on the summary effect estimate, in which the meta-analysis estimates were computed omitting one study at a time. The radial plot analysis were visually assessed for heterogeneity which was reflected through extent of vertical scatter.

Language: English.

Country(ies) involved: China.

Keywords: aortic arch surgery, Standford type A aortic dissection, mild hypothermic circulatory arrest, moderate hypothermic circulatory arrest, meta-analysis.

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