INPLASY PROTOCOL

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Corresponding author:
Beibei Yu

shpingg@126.com

Author Affiliation:
Xi'an Jiaotong University School.

Support:Xi'an Jiaotong University.

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None declared.

Effects of miRNA-modified exosomes alleviate cerebral ischemic reperfusion injury in Pre-clinical Studies: A Meta-analysis

Yu, B[1]; Zhang, Y[2]; Gong, S[3].

Review question / Objective: The purpose of this study was to investigate the effect of miRNA-modified exosomes in alleviating cerebral ischemic reperfusion injury compared with the non-treatment group. The research object is an animal model of middle cerebral artery occlusion. The research method is a controlled study. The primary outcome of this study was infarct volume, and the secondary outcome was neurobehavioral performance.

Main outcome(s): The primary outcome of this study was Infarct volumes, which was measured by 2,3,5-triphenyltetranzolium chloride (TTC) staining. And it was calculated as followed: Infarct volume % = lesion area of each section = (contralateral hemisphere area/ipsilateral hemisphere area) × ipsilateral lesion area. Neurobehavioral performance was the secondary outcome, and was assessed by three scoring scales: modified neurological severity score (mNSS), Longa scoring system and neurological deficit score (NDS).

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 May 2022 and was last updated on 11 May 2022 (registration number INPLASY202250062).

INTRODUCTION

Review question / Objective: The purpose of this study was to investigate the effect of miRNA-modified exosomes in alleviating cerebral ischemic reperfusion injury compared with the non-treatment group. The research object is an animal model of middle cerebral artery occlusion. The research method is a controlled study. The primary outcome of this study was infarct volume, and the secondary outcome was neurobehavioral performance.

Condition being studied: Two investigators (Bei-bei Yu and Yong-feng Zhang)

independently assessed studies for inclusion and exclusion, and disagreements were resolved by Shouping Gong. MiRNA-modified exosomes can significantly reduce the infarct volume (SMD=4.50; 95% CI=3.02-5.99; p<0.01) and improve the neurological score (SMD=2.80; 95% CI=1.37-4.23; p< 0.01).

METHODS

Search strategy: We searched PubMed, Embase and Web of Science to identify the pre-clinical studies on the effects of exosomes and miRNAs on CIRI. The Medical Subject Headings (MeSH) we searched were as follows: ("Exosomes" or "Exosome") and ("Cerebrum" or "Cerebra" or "Left Cerebral Hemisphere" or "Cerebral Hemisphere, Left" or "Right Cerebral Hemisphere" or "Cerebral Hemisphere, Right" or "Cerebral Hemispheres" or "Cerebral Hemisphere" or "Brain" or "Encephalon") and ("Ischemia reperfusion" or "Reperfusion Injuries" or "Reperfusion Damage" or "Damage, Reperfusion" or "Reperfusion Damages" or "Ischemia-Reperfusion Injury" or "Ischemia Reperfusion Injury" or "Injury, Ischemia-Reperfusion" or "Injury, Ischemia Reperfusion" or "Ischemia-Reperfusion Injuries" or "Injury, Reperfusion").

Participant or population: Animal model of middle cerebral artery occlusion.

Intervention: miRNA-modified exosomes.

Comparator: No treatment.

Study designs to be included: Control study.

Eligibility criteria: Infarcts were observed by 2,3,5-triphenyltetranzolium chloride (TTC) staining.

Information sources: PubMed, Embase and Web of Science database; original image; word description; Supplementary material.

Main outcome(s): The primary outcome of this study was Infarct volumes, which was measured by 2,3,5-triphenyltetranzolium chloride (TTC) staining. And it was calculated as followed: Infarct volume % = lesion area of each section = (contralateral hemisphere area/ipsilateral hemisphere area) × ipsilateral lesion area. Neurobehavioral performance was the secondary outcome, and was assessed by three scoring scales: modified neurological severity score (mNSS), Longa scoring system and neurological deficit score (NDS).

Data management: The mean and SD were acquired from the article which was available from the text. GetData Graph Digitizer (version 2.26, https://apps.automeris.io/wpd/index.zh_CN.html) software was applied for extract data from articles of unavailable numerical values.

Quality assessment / Risk of bias analysis: The quality of included study was assessed by SYRCLE's revised cochrane risk-of-bias (ROB 2) tool and assessed independently by two authors (Bei-bei Yu and Yong-feng Zhang).

Strategy of data synthesis: R software (version 4.1.1, Vienna, Austria) was used for statistical analysis and graphing. The primary and secondary outcome were expressed by standardized mean difference (SMD) and its 95% CI. If I2 ≥ 50% or P ≤ 0.10, it was considered that there was heterogeneity, and the random effect model was used for analysis; Otherwise, the fixed-effects model was used for analysis.

Subgroup analysis: Subgroup analyses were performed in 4 subgrouops, arterial occlusion time, administration method, overexpressedmiRNA and injection frequency.

Sensitivity analysis: R software (version 4.1.1, Vienna, Austria) for sensitivity analysis.

Country(ies) involved: China.

Keywords: exosomes; miRNA; cerebral ischemia-reperfusion injury; meta-analysis.

Contributions of each author:
Author 1 - Beibei Yu.
Author 2 - Yongfeng Zhang.
Author 3 - Shouping Gong.