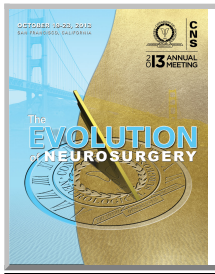

Oscillating Mechanical Impact Aspiration Device to Remove Cerebral Thrombus in an Ex Vivo Model: Proof of Concept

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Introduction

Cerebral mechanical thrombectomy for acute stroke has become more efficient but is still not successful in 100% of cases.[1] One strategy to increase clot removal was ultrasonic cerebral clot lysis, which utilized high-frequency, low amplitude oscillation as a destructive force on the thrombus but has met with limited clinical success.[2] More powerful ultrasound caries the risk of increased heat, threatening cerebral tissue.[3] It is possible that applying significantly higher amplitude mechanical oscillation with concurrent aspiration could break up and clear a thrombus, using the same principles of high-power ultrasonic destruction without increased heat.

Methods

An oscillating mechanical impact aspiration device was created with a Penumbra Aspiration System. A Penumbra 5Max catheter was placed in a flow model and attached to a Penumbra aspiration pump with a 4-way stop-cock and primed to 25mmHg. A 2mm x 3mm artificial clot that was too large to fit through the 5Max with syringe suction was placed at the catheter tip. 1 Hz oscillation between 25mmHg and 0 was then applied for 5 minutes. This was repeated 7 times.

Results

The clot was removed from the flow model in all trials within 5 minutes.

Conclusions

An oscillating mechanical impact aspiration device utilizing the Penumbra Aspiration System can destroy and remove clots too large to fit through a 5Max catheter. Further study will involve experimentation with rate and amplitude to find the most effective combination.

Learning Objectives

Understand the principles of ultrasound clot lysis and how they can be manipulated to create a more effective device

References

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