

عنوان مقاله:

Dual frequency ultrasound-enhanced tissue plasminogen activator thrombolysis in an in vitro human clot model

محل انتشار:

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خلاصه مقاله:

Introduction: Stroke causes death and disability in patients throughout the world. At present, the only FDA- approved drug for ischemic stroke is recombinant tissue plasminogen activator (rt- PA). Unfortunately, rtPA can cause intracerebral hemorrhage and must use within limited time window (within ۳-۴.۵ hour after onset of stroke). Ultrasound with rtPA loaded liposomes (rtPA_L) was suggested as adjuvant therapy that reduce the dose of rt-PA and increase its efficiency. Different frequency protocols such as kHz and MHz were used for sonothrombolysis. In this study, we suggested a protocol including both kHz and MHz with rtPA_L. The kHz wave could fragment rtPA_Ls and release rtPA, the MHz enhances lytic efficiency of released rt-PA by stable cavitation and its microstreaming. This protocol may reduce bioeffect of ultrasound wave and simultaneously at least maintain rt-PA lytic effect. **Materials and Methods:** The rt-PA loaded liposomes were prepared by hydrating lipid film with rt-PA and freezing liposomes under air pressure (۴ atm). Cylindrical human whole blood clots (1 mm diameter) formed in and around micropipette at ۳۷ °C. In combination with rtPA_L ([rtPA]=۵۰ µg/ml) and human plasma, three protocol were used: ۱ MHz (۱.۵ W/cm^۲_ ۳۰ minutes), ۱۳۰ kHz (۰.۰۱ W/cm^۲_ ۱۰ s) + ۱ MHz (۰.۵ W/cm^۲_ ۳۰ minutes) and control. Clots were imaged under microscope and clot lysis were quantified by measuring clot diameters before and after sonication. **Results:** Statistical analysis of clot diameter variation between two sonication groups (1 MHz (1.۵ W/cm^۲_ ۳۰ minutes), ۱۳۰ kHz (۰.۰۱ W/cm^۲_ ۱۰ s) + ۱ MHz (۰.۵ W/cm^۲_ ۳۰ minutes)) do not show significant difference. **Conclusion:** Not significant difference between two sonication groups indicates that the dual frequency protocol by using less energy and consequently lower bioeffects may have similar effect as single frequency protocol.

کلمات کلیدی:

Ultrasound Sonothrombolysis, Tissue plasminogen activator, Liposome

لینک ثابت مقاله در پایگاه سیویلیکا:

