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Novel sclerosant foam for ablation and compression of polycystic kidney cyst

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Objectives: Polycystic kidney disease (PKD) is a genetic disorder entailing proliferating and enlarging cyst. Since enlarged cyst limits kidney function and causes pain, it needs to be removed to alleviate patients' quality of life. Sclerotherapy has been recently introduced in cyst ablation, yet it is only performed as case-study by a selected group of patients, and the outcomes from the use of sclerosant vary greatly. As sclerosant is initially developed for treating blood vessel malformation, we suggest sclerosant foam for cyst ablation and compression analyzed its effect from the cellular level.

Methods: The novel active agents for sclerosant foam containing polidocanol, glycerol, and rose Bengal was prepared. The cellular membrane-disrupting effect and the cytotoxicity were measured in vitro by LDH assays in transwell system along with CCK assays. Photochemical tissue bonding from rose Bengal delivered by foam was studied using 523nm green laser and two-photon laser. Bonding strength was characterized ex vivo.

Results: We optimized novel foam with 3% w/v polidocanol, 10% v/v glycerol and found the addition of glycerol is more than five times better in membrane disruption than 3% polidocanol foam. Foam retention time was also improved by the addition of glycerol. The potential for cyst compression was observed via tensile strength analysis and histology by using 1% w/v rose Bengal added novel foam after exposure to 532nm laser and two-photon laser.

Conclusions: Our novel foam showed improved foam quality and glue-like quality by photochemical tissue bonding by active agent rose Bengal potent and apt for cyst ablation. This study is the first suggesting novel foam that integrates sclerotherapy and cyst compression by photochemical tissue bonding. We suggest this foam as promising new therapy for polycystic kidney cyst ablation.