Dural sealant

The use of a dural sealant seems to be the logical method to prevent Cerebrospinal fluid fistula. However, based on the efficacy of currently available dural sealants according to systematic reviews and in vitro studies, a significantly effective dural sealant seems to be still lacking. A new dural sealant has to be thoroughly assessed before clinical application in vitro, in vivo, and clinical trials. A new research area within sealant development might be the introduction of dural sealants with both antimicrobial and analgesic properties [1].

Existing tissue adhesives and sealants are far from satisfactory when applied on wet and dynamic tissues.

Li et al. reported a strategy for designing biodegradable super-strong aqueous glue (B-Seal) for surgical uses inspired by an English ivy adhesion strategy and a cement particle packing theory. B-Seal is a fast-gelling, super-strong, and elastic adhesive sealant composed of injectable water-borne biodegradable polyurethane (WPU) nanodispersions with mismatched particle sizes and counterions in its A-B formulation. B-Seal showed 24-fold greater burst pressure than DuraSeal®, 138-fold greater T-pull adhesive strength than fibrin glue, and 16-fold greater lap shear strength than fibrin glue. In vivo evaluation on a rat cerebrospinal fluid (CSF) rhinorrhea model and a porcine craniotomy model validated the safety and efficacy of B-Seal for effective Cerebrospinal fluid fistula prevention and dura repair. The plant-inspired adhesion strategy combined with particle packing theory represents a new direction of designing the next-generation wet tissue adhesives for surgeries [2].

Adherus

Fibrin sealant

Matrix sealant

Immiseal™

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see Fat

In a study, Kawai et al., test the use of a new gelatin glue as a dural sealant in in vitro and in vivo canine models of transdural Cerebrospinal fluid fistula. The in vitro model was sutured semicircles of canine dura mater and artificial dural substitute. The sutures were sealed with gelatin glue (n = 20), fibrin glue (n = 20), or a polyethylene glycol (PEG)-based hydrogel sealant (n = 20). Each sample

was set in a device to measure water pressure, and pressure was increased until leakage occurred. Bonding strength was subjectively evaluated. The in vivo model was dogs who underwent dural excision and received either no sealant (control group; n = 5) or gelatin glue sealant (n = 5) before dural closure. Twenty-eight days post-surgery, the maximum intracranial pressure was measured at the cisterna magna using Valsalva maneuver and tissue adhesion was evaluated. The water pressure at which leakage occurred in the in vitro model was higher with gelatin glue (76·5 ± 39·8 mmHg) than with fibrin glue (38·3 ± 27·4 mmHg, P < 0·001) or the PEG-based hydrogel sealant (46·3 ± 20·9 mmHg, P = 0·007). Bonding strength was higher for the gelatin glue than fibrin glue (P < 0·001) or PEG-based hydrogel sealant (P = 0·001). The maximum intracranial pressure in the in vivo model was higher for the gelatin glue group (59·0 ± 2·2 mmHg) than the control group (13·8 ± 4·0 mmHg, P < 0·001). Tissue adhesion was lower for the gelatin glue group than the control group (P = 0·005). The new gelatin glue provides an effective Water-tight closure when used as an adjunct to sutured dural repair [3].

see Vivostat.

1)
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