

Evaluation of application techniques of fibrin sealant to prevent cerebrospinal fluid leakage: a new device for the application of aerosolized fibrin glue.

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Abstract:

OBJECTIVE: This report evaluates the sealing effects of fibrin sealant applied on the dura mater using different techniques.

METHODS: Three application methods were studied: a sequential layer method, a simultaneous method using a cannula, and a spray method using a newly developed spray device. The sealing effects of these methods were compared using in vitro histological analysis and a pressure resistance test. The clinical efficacy of the fibrin sealant to prevent water leakage through the dura mater was retrospectively analyzed in a total of 509 patients. The process of absorption of a clinically applied fibrin clot in vivo was examined using surgical specimens.

RESULTS: The fibrin plate made using the spray method withstood a hydrostatic pressure greater than 200 cm H₂O. A scanning electron microscopic study of the fibrin clots showed that the sequential and simultaneous methods produced a fibrin fiber network; in contrast, our spray method formed a dense fibrin tissue in which the fibrin molecules fused together forming stratified laminae. Of the 295 supratentorial craniotomies during which spraying was used, postsurgical cerebrospinal fluid leakage occurred in 9 cases (3.1%), whereas of the 214 craniotomies during which spraying was not used, cerebrospinal fluid leakage occurred in 19 cases (8.9%). Histological examinations of 10 surgical specimens obtained during second craniotomies revealed that the spray-made fibrin

clots had been gradually replaced by mature granulation composed of collagenous connective tissue.

CONCLUSION: The optimal technique for applying fibrin sealant is the spray method that aerosolizes fibrin glue and produces a tough fibrin plate.