

# **Development of new biodegradable hydrogel glue for preventing alveolar air leakage.**

Authors: Araki M., Tao H., Nakajima N., Sugai H., Sato T., Hyon S.-H., Nagayasu T., Nakamura T.

Publication Date: 2007

## **Abstract:**

Objective: Air leakage is a frequent complication during lung surgery. A new hydrogel glue was created by mixing aldehyded dextran and epsilon-poly(L-lysine), and its feasibility as a surgical sealant was evaluated in comparison with that of conventional fibrin glue. Methods: Bursting pressure after application of each glue to 30 x 30-mm pleuroparenchymal defects was evaluated in two groups of 14 beagle dogs. Biodegradability and histotoxicity of the glues were evaluated in another 6 dogs with 15-mm circular pleuroparenchymal defects. Adhesions, infections, and histologic changes were observed on scheduled days for 6 months. Results: The mean bursting pressure after application was  $38.4 \pm 4.6$  cm H<sub>2</sub>O for the new glue and  $32.1 \pm 4.5$  cm H<sub>2</sub>O for fibrin glue ( $P = .02$ ), the former providing more effective sealing of pulmonary air leakage than the latter. Macroscopically, no adhesions or infections were observed in areas of glue application. About 90% of the new glue degraded within 3 months, but complete disappearance was not observed by 6 months. On the other hand, the fibrin glue was replaced by white pleural tissue at 4 weeks. Histologically, the new glue was covered by one layer of mesothelial cells at 2 weeks and completely covered by thick fibrous tissue at 4 weeks. Inflammatory reaction was minimal around the residual glue after 3 months. Although the new glue degraded more slowly than did the fibrin glue, the biocompatibility of the new glue was sufficient for clinical use. Conclusion: Our new hydrogel glue demonstrates a strong sealing effect, with good biocompatibility, and has potential usefulness as an adhesive in lung surgery. © 2007 The American Association for Thoracic Surgery.