Triple-layer sealing with absorptive mesh and fibrin glue is effective in preventing air leakage after segmentectomy: Results from experiments and clinical study.

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Publication Date: 2014

Abstract:

OBJECTIVES: Fibrin glue in combination with polyglycolic acid (PGA) mesh is effective in preventing air leakage after segmentectomy, but we frequently experienced air leakage with single-layer application. To investigate improved usage, we compared the sealing effect among single-, double- and triple-layer PGA mesh and fibrin glue in both experimental and clinical segmentectomy. METHODS: Ex vivo pig lungs were used for experiments. As a model of segmentectomy, the lateral segment of the left lung was removed using electrocautery. As a model of peripheral lung defect, peripheral lung tissue was resected with scissors. The inter-segmental plane and the peripheral lung defect were sealed using one of the following four methods: (i) fibrin glue alone (Group 1, n = 8), (ii) single-layer with PGA mesh and fibrin glue (Group 2, n = 8), (iii) double-layer (Group 3, n = 8) and (iv) triple-layer (Group 4, n = 8). The seal-breaking pressures among them were compared. In clinical segmentectomy, the periods of chest-tube drainage were compared retrospectively between 17 patients treated by the single-layer and 17 treated by the triple-layer method. RESULTS: In experimental segmentectomy, the seal-breaking pressure in the triple-layer (100 +/- 25 cmH<inf>2</inf>O) was significantly higher than those in the other methods (26 +/- 17, 48 +/- 12 and 69 +/- 19 cmH<inf>2</inf>O in the Groups 1, 2 and 3, respectively, P < 0.001-0.05), while there were no significant differences among other methods. For peripheral lung defect, the seal-breaking pressures did not differ among the methods. In clinical segmentectomy, the mean chest-drainage period with the triple-layer was 2 +/- 0.9 days, which was significantly

shorter than 3.6 +/- 2.8 days with the single-layer (P = 0.009). CONCLUSIONS: Stronger sealants are required to prevent air leakage from inter-segmental planes than from peripheral lung. To prevent air leakage after segmentectomy, triple-layer PGA mesh and fibrin glue is recommended.