

# Concentrated Albumin for Hemorrhage Control on Hepatic Resection with Argon Ion Beam Coagulation: A Long-term Evaluation in a Porcine Model

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## Background

Hemorrhage from injuries of solid organs, such as liver, spleen and kidney is commonly difficult to control using conventional suture or electrocautery. In our laboratory, a 38% albumin associated with argon ion beam coagulation applied to liver resection to seal the active bleeding surface of the liver (1). This study investigated the long-term responses of the concentrated albumin to host in the liver repairs.

## Methods

All animal experiments were performed according to NIH guidelines for the care and use of laboratory animals. Thirteen Yucatan microswines received a non-anatomic liver resection under heparinized anticoagulation. Complete hemostasis was achieved by using the concentrated human albumin with argon ion beam coagulation (ABCA, N=8) or using argon ion beam coagulation alone (ABC, N=5). The liver repairs in each group were evaluated grossly and microscopically at postoperative periods of 6 and 12 months for healing responses. The rank of abdominal adhesion and inflammatory response were measured in both groups.

## Results

Study Variables	ABC	ABCA
Total No. of swine	5	8
No. of swine at 6 months period	3	4*
No. of swine at 12 months period	2	3
Sex No. of M:F	4:1	3:4
Amount of Albumin use, ml (mean, range)		2.5 (1.2-4.2)
Weight gained, lb. (mean, range)		
At 6 months post-op	72 (62-87)	78 (57-89)
At 12 months post-op	110 (104-116)	114 (97-129)

All animals tolerated surgery. One animal in ABCA group has to be sacrificed at 2 weeks post-operatively because an undiscovered renal problem prior to the surgery that led to renal failure. Of twelve

animals entered into study points. There was no evidence of rebleeding, bile leakage or intra-abdominal infection in any animals. Blood analysis showed liver chemistry indices were within normal range, with no significant differences between ABC and ABCA groups. The histology showed that the post-operative reaction was similar in both groups: a moderate chronic inflammatory response as part of an ongoing normal healing process. The repaired liver surface was encapsulated by fibrous tissue reaction. There were no differences in the scores of postsurgical adhesion ( $p=1.0$ ) and inflammation ( $p=0.8$ ) between the groups. There was also no difference in inflammatory response between 6 and 12 months after ABCA treatment ( $p=0.5$ ).

## Conclusions

ABCA is an efficient and safe procedure to control hemorrhage in hepatic injuries. The concentrated albumin provides durability without adding late complications in hepatic injury repair.

## Reference

1) Wolf RF, Xie H, Petty J, Teach JS, Prah SA: Argon Ion beam hemostasis with albumin following live resection. *Am J Surg.* 2002; 183 (5): 584-7

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