Albumin Transfusion Following Paracentesis

Drew Brotherston[1], Alejandro Dau[2], Abbas Albaghli[2], Shane Arishenkoff[2]
[1] Division of General Internal Medicine, University of Calgary, [2]Division of General Internal Medicine, University of British Columbia

Background

Paracentesis is first line therapy in the management of tense ascites.[1] Large volume paracentesis, defined as > 5L of fluid removed, is often required for symptom relief.

Complications following large volume paracentesis include kidney injury/progressive renal failure, rebound accumulation of ascites, and hypotension/circulatory dysfunction.[2] These complications are thought to be driven by paracentesis-induced circulatory dysfunction (PICD) an entity where fluid shift from paracentesis results in marked activation of the renin-angiotensin system in the setting of arterial vasodilation (due to increased baseline nitric oxide levels in cirrhosis); it's presence is confirmed by an increase in plasma active renin (PAR) of >50% from baseline <6 days following paracentesis.[2] In absence of plasma expansion PICD rates are up to 80%.[3]

Plasma expansion with colloids has been shown to reduce PICD and other complications of fluid shift. Albumin has been the plasma expanding agent of choice since it was first shown in an RCT to reduce acute kidney injury (AKI), electrolyte abnormalities, and PICD (using renin measurement) when administered following paracentesis.[4]

The most up-to-date guidelines from the American Association for the Study of Liver Diseases (AASLD) recommend albumin transfusion following large volume paracentesis.[1]

Why give albumin?

Albumin is thought to minimize PICD via plasma expansion. Other expanders such as starch hemaccel, and dextran 70, have been shown to be inferior to albumin in reducing PICD and are not recommended.[5-7]

What dose do I give?

Originally, albumin dose was based on replacing the amount of albumin removed 1:1.[8] The first trial comparing albumin to no albumin post-paracentesis used 40 g for 4-6L of fluid removal to standardize the amount transfused and roughly approximate the amount of albumin removed.[4] Other trials investigating albumin replacement most commonly use 6-8 g/L removed and in a meta-analysis of 17 trials with this dose range mortality benefit was demonstrated with odds ratio of 0.63.[9] Thus the AASLD have recommended this replacement dose.

Interestingly 1 RCT from 2011 found no significant difference in outcomes with 4 g of albumin/L fluid removed versus 8.[10]

What do the guidelines say about albumin transfusion after paracentesis?

Current AASLD recommendations suggest transfusion may not be necessary with <4-5L of fluid removal.[1] A single study comparing saline vs. albumin for volume expansion showed albumin only had benefit in reducing PICD above 6L.[11] Interestingly, a recent small trial showed slower drainage (below the mean of 65ml/min) and <8L total, did not increase PAR renin suggesting the development of PICD may be dependent on the rate of removal.[12]

What do we at Vancouver General Hospital (VGH) recommend for albumin transfusion?

As mentioned AASLD does not provide specific guidance for transfusion after small volume paracentesis other than it may not be necessary. Based on our review of the evidence we believe that albumin transfused at a rate of 6-8 g/L removed should be strongly considered for therapeutic paracentesis of ANY volume in patients with risk for PICD (see our document on PICD for specific risks), AKI, or risk for AKI.

We recommend this more aggressive transfusion approach based on the fact that the inclusion criteria in a majority of trials investigating albumin replacement in inpatients was based on having **only** symptomatic ascites

and those with infection, gastrointestinal bleeding bleeding, renal impairment/hepatorenal syndrome (HRS), hepatic encephalopathy (HE), heart failure, and electrolyte disorders were largely **excluded**.[4,8,10,11,13] Therefore, the generalizability of avoiding albumin transfusion in volumes less than 5 L in typical VGH inpatient cirrhosis patients may be limited. Additionally, albumin is known to decrease mortality and morbidity in cirrhotic patients with spontaneous bacterial peritonitis, HRS, HE, and hyponatremia.[13]

Furthermore, with some evidence to support the rate of drainage potentially being a precipitating factor for PICD[12] we believe it is also prudent to consider using passive drainage versus vacuum drainage for patients at high risk for PICD or kidney dysfunction in addition to transfusion with albumin for any therapeutic paracentesis.

Can I give albumin to a patient who is a transplant candidate?

Local expertise suggests that antigenicity of albumin is minimal when compared to other blood products and that albumin should be used when indicated in patients awaiting transplant.

Given the potential risk for precipitation of PICD, renal dysfunction, and infection associated with paracentesis we recommend that prior to pursuing therapeutic paracentesis in patients imminently going for transplant to discuss with the Transplant Service whether to proceed with the procedure. Diagnostic paracentesis should always be performed as recommended by AASLD regardless of transplant status.

Bottomline

- **Always** give albumin after large volume paracentesis
- Guidelines recommend an **albumin dose of 6-8 g/L removed**, but there is evidence less (4 g/L) is as effective and slow drainage could further reduce risk of PICD
- We recommend **albumin transfusion for any therapeutic paracentesis volume** in sick inpatients with high risk for AKI and circulatory dysfunction, and for these patients to consider passive versus vacuum drainage
- **Albumin is safe in pre-transplanted patients** but discussion should be undertaken with the Transplant Service in patients imminently going for transplant

References

1. Runyon BA. Introduction to the revised American Association for the Study of Liver Diseases Practice Guideline management of adult patients with ascites due to cirrhosis 2012. *Hepatology.* 2013;57:1651-3.
2. Hoefs JC. Prevention of the Paracentesis-Induced Circulatory Dysfunction (PICD) in Cirrhosis: Is the SPA Treatment Worthwhile? *Dig Dis Sci.* 2016;61:2773-5.
3. Gines P, Guevara M, De Las Heras D, Arroyo V. Review article: albumin for circulatory support in patients with cirrhosis. *Aliment Pharmacol Ther.* 2002;16 Suppl 5:24-31.
4. Gines P, Tito L, Arroyo V, et al. Randomized comparative study of therapeutic paracentesis with and without intravenous albumin in cirrhosis. *Gastroenterology.* 1988;94:1493-502.
5. Fassio E, Terg R, Landeira G, et al. Paracentesis with Dextran 70 vs. paracentesis with albumin in cirrhosis with tense ascites. Results of a randomized study. *J Hepatol.* 1992;14:310-6.
6. Gines A, Fernandez-Esparrach G, Monescillo A, et al. Randomized trial comparing albumin, dextran 70, and polygeline in cirrhotic patients with ascites treated by paracentesis. *Gastroenterology.* 1996;111:1002-10.
7. Salerno F, Badalamenti S, Lorenzano E, Moser P, Incerti P. Randomized comparative study of hemaccel vs. albumin infusion after total paracentesis in cirrhotic patients with refractory ascites. *Hepatology.* 1991;13:707-13.
8. Salerno F, Badalamenti S, Incerti P, et al. Repeated paracentesis and i.v. albumin infusion to treat 'tense' ascites in cirrhotic patients. A safe alternative therapy. *J Hepatol.* 1987;5:102-8.
9. Bernardi M, Caraceni P, Navickis RJ, Wilkes MM. Albumin infusion in patients undergoing large-volume paracentesis: a meta-analysis of randomized trials. *Hepatology.* 2012;55:1172-81.
10. Alessandria C, Elia C, Mezzabotta L, et al. Prevention of paracentesis-induced circulatory dysfunction in cirrhosis: standard vs half albumin doses. A prospective, randomized, unblinded pilot study. *Dig Liver Dis.* 2011;43:881-6.
11. Sola-Vera J, Minana J, Ricart E, et al. Randomized trial comparing albumin and saline in the prevention of paracentesis-induced circulatory dysfunction in cirrhotic patients with ascites. *Hepatology.* 2003;37:1147-53.
12. Tan HK, James PD, Wong F. Albumin May Prevent the Morbidity of Paracentesis-Induced Circulatory Dysfunction in Cirrhosis and Refractory Ascites: A Pilot Study. *Dig Dis Sci.* 2016;61:3084-92.
13. Walayat S, Martin D, Patel J, et al. Role of albumin in cirrhosis: from a hospitalist's perspective. *J Community Hosp Intern Med Perspect.* 2017;7:8-14.