Management of Liver related ascites in children

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Ascites in liver disease occurs most commonly due to poor albumin synthesis in a cirrhotic patient leading to an imbalance in the osmotic and hydrostatic pressures. **Clinically:** 1) Mild ascites (grade 1): Puddle sign/ detectable with ultrasonography; 2) Moderate ascites (grade 2): shifting dullness; 3) Gross ascites (grade 3): fluid thrill.

DIAGNOSTIC MODALITIES:

1. Ultrasonography: For fluid quantification and hepatoportal Doppler for hepatic veins and IVC flow and phasicity (for acute portal vein thrombosis and Budd Chiari syndrome).
2. Ascitic fluid examination:
   - Total and differential cell count:
     - Absolute Neutrophil count (ANC)>250/µL in absence of bacterial culture positivity suggests culture negative neutrocytic ascites (CNNA).
     - ANC> 250/µL with positive fluid bacterial culture : Spontaneous bacterial peritonitis (SBP).
     - ANC<250/µL and positive bacterial culture: Monobacterial Non-neutrocytic bacterascites (MNB)
   - Total protein and Albumin: Serum albumin – Ascitic fluid albumin (Serum-ascites albumin gradient or SAAG) > 1.1 suggests portal hypertension as etiology; <1.1 suggests etiologies other than portal hypertension. Serum albumin should be performed in simultaneity with ascitic albumin.
   - Ascitic fluid culture: to diagnose SBP/MNB/CNNA as mentioned above.
   - Site of tap: Usually 2- 3 cm above and medial to the left anterior superior iliac spine, using a Z technique. Can use midline or even right iliac fossa in case of massive splenomegaly. Ask child to void urine to empty bladder pre-procedure.

TREATMENT OF ASCITES OF HEPATIC ORIGIN

1. Salt restricted diet: Dietary sodium restriction to <17-35 mEq (0.4-0.8 g) per 1000 calorie intake (1-2 grams/day in adults). Avoid "added salt" in diet or maximum 2mEq/kg/day of sodium. 1 teaspoon (6 grams) of common salt has 2.3 gram Sodium. 1mEq Na=23 mg ; For a 20 Kg child: 40mEq/day = approximately 1g/day (1/2 a teaspoon salt).
2. Diuretics: *For mild ascites*, not amenable to dietary salt restriction alone: Spironolactone at 3 mg/kg/day morning dose to start with (100 mg initial maximum); Can increase dose every 5-7 days upto 5-6mg/kg/day (upto 400 mg/day).

For initial moderate ascites: Start with a combination of Furosemide (1mg/kg/day, maximum 40mg) and Spironolactone (at 2.5mg/kg/day, upto 100 mg) maintaining the ratio of 1:2.5 for optimum synergistic effect of both diuretics. Sequential increase is permitted if ascites does not mobilise.

Older patients and near adults can tolerate a maximum 160 mg Furosemide and 400 mg Spironolactone.
Goal is to reduce body weight by 0.5-1% daily (maximum 300-500 g/day)
Monitor: 1) Weight 2) Abdominal girth 3) Urine output; 4) Hydration status 5) Serum Na^+, K^+ 6) Spot Urinary Na^+, K^+, and 7) resolution of pedal edema and anasarca
Diuretic refractory ascites: Inability to mobilize ascites in spite of maximum dose of diuretic and salt restriction for a period of 1 week.
Diuretic intractable ascites: Inability to use effective full dose of diuretic, due to drug related complications.
In case of "apparent" refractory ascites: Spot Urinary Na^+/K^+ ratio >1: Poor dietary salt compliance; Urinary Na^+/K^+ ratio <1: Inadequate diuretic dosage.

3. Large volume paracentesis (LVP): Indicated in gross ascites with abdomino-respiratory discomfort or

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difficulties in ambulation. On a single setting, upto 200mL/kg of ascitic fluid can be extracted preferably under albumin cover. Supplemental salt free human Albumin(20% w/v) at 1 g/kg within 1 hour of starting LVP given as half infusion over 2 hours and remaining half over 6-8 hours helps to prevent post paracentesis circulatory dysfunction and renal dysfunction. Continuous drain with bag and tube set with 20-23G needle is recommended. All LVP must be accompanied with a diagnostic fluid analysis. Repeated LVPs may be required in those with rapid re-accumulation of ascites till underlying condition is treated.

4. Treatment of Spontaneous bacterial peritonitis: Community acquired: Third generation cephalopsporins like Cefotaxime (50 mg/kg/dose 8 hourly i.v for 5 days); Nosocomial: Carbapenems ± Vancomycin/Linezolid (if gram positive ascitic/blood culture or any other focus)

   Treatment as above to be given also for culture negative neutrocytic ascites(CNNA) and symptomatic monomicrobial non-neutrocytic bacterascites(MNB).

   SBP prophylaxis: a) Primary prophylaxis (to prevent any episode of SBP): In case of ascitic fluid protein < 1.5g/dL or in case of acute gastrointestinal bleeding in a cirrhotic ; b) Secondary prophylaxis (to prevent recurrence of SBP): After the first episode of SBP, long term prophylaxis till ascites free for a considerable period.

   Norfloxacin at 5-7.5 mg/kg/day is the preferred 1st line drug for SBP prophylaxis.

5. Child should be referred to an appropriate pediatric hepatology center in the following situations a) refractory or complicated ascites, b) workup and management of underlying cause once ascites is under control, c) Transjugular Intrahepatic Portosystemic Shunt (TIPS) and d) liver transplantation

FURTHER READING:

1. Angeli P, Bernardi M, Villanueva C, et al. EASL Clinical Practice Guidelines for the management of patients with decompensated cirrhosis. *J Hepatol*. 2018;69(2):406-460. doi:10.1016/j.jhep.2018.03.024
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3. Giefer MJ, Murray KF, Colletti RB. Pathophysiology, diagnosis, and management of pediatric ascites. *J Pediatr Gastroenterol Nutr*. 2011;52(5):503-513. doi:10.1097/MPG.0b013e318213f9f6