The Paediatric Surgical and Paediatric Gastroenterology teams have agreed that infants with Cholestasis should initially be referred to the gastroenterology team. The team will ensure that all relevant investigations including liver biopsy will have been completed before the child is considered for laparotomy and possible Kasai Surgery.

**Diagnosis**

Diagnosis is based on:
- Clinical history – particularly acholic stools
- Exclusion of other causes of neonatal cholestasis on blood tests e.g. alpha1 antitrypsin deficiency.
- Absent or contracted gall bladder on fasting ultrasound
- Non-excreting TIBIDA scan after 3 days of phenobarbitone 5mg/kg nocte
- Characteristic liver biopsy showing cholestasis, fibrosis, proliferation of bile ductules

**Management Pre & Post Operative Cholangiogram & Kasai**

The child will have received adequate nutritional support including fat soluble vitamins. Refer to below for recommended starting doses of vitamins.

**Preoperative Bloods on Day Before Surgery:**
- FBC/LFT’s/coag screen/electrolytes
- Clear oral fluids only for 12 hours preoperatively.
- IV fluids from when NBM

**Anaesthetic and Operative Details:**
- General Anaesthetic +/- epidural
- Dual lumen percutaneous central line
- Urinary catheter
- NG on free drainage
- Usually no peritoneal drains are used
- The operation is a portojejunostomy, with a 45 cm Roux limb, passed retrocolic and joined as an end to side anastomosis.
- Managed in High Dependency Area in Ward 24B post op
Antibiotics:

IV antibiotics for 5 days:
- Gentamicin once daily dosing 7.5mg/kg/day. Administer as an infusion over 30mins. Trough levels should be measured less than 60mins before the next dose. Trough <0.5mg/L. Measure trough before the second dose and every 3-5 days or more frequently in at risk patients.
- Amoxicillin IV 25mg/kg/dose 8hrly for 5 days

Long term prophylaxis:
- On Day 6 commence long term oral prophylaxis.
- Use Co-trimoxazole (2mg/kg/day as trimethoprim component once daily) for 3months post Kasai. (NB: Liquid formulation is trimethoprim 40mg and sulfamethoxazole 200mg/5ml)

Steroids:

Start steroids on day 1 post op unless there is fever/evidence of sepsis:
- Methylprednisolone IV 20mg daily, decreasing 2.5mg daily until 5mg/day (Lasts 7 days)
- Then Prednisolone 5mg daily orally, for one week and stop.

Post-Operative Monitoring:

- Repeat FBC/ LFT's/ coag screen/electrolytes day 1 post op and then on 3rd post op day unless any indications to do them sooner/more often
- Full maintenance fluids IV.
- Analgesia is epidural/narcotic for 2-3 days with paracetamol from day 1.
- Feeding as clinically indicated after 24-48 hours initially with clear fluids then milk

Nutritional Management Including Fat Soluble Vitamin Supplements

Fat Soluble Vitamin Supplementation

All children undergoing investigation of conjugated hyperbilirubinaemia should commence fat-soluble vitamin supplementation as soon as possible.

Baseline fat-soluble vitamin levels should be sent to the lab (Vitamins A, D and E and a prothrombin ratio) but this MUST NOT delay the supplements being commenced.
Nutritional Management Including Fat Soluble Vitamin Supplements, Continued

**Vitamin A**
Available preparation: Vitadol C® = 2000 micrograms vitamin A per gram = 1 ml = 7500 IU
Starting dose is 1 ml once daily.

NB: Vitadol C® is only partially subsidised in the community; families should be informed they will be required to pay a part charge for this medicine.

**Vitamin D**
Starting dose = 30–50 nanograms/kg once a day rounded to nearest 100 nanograms
Available preparation = Alfacalcidol (One-Alpha drops®) = 100 nanograms of 1-alpha-OH vitamin D3 per drop.

NB: This preparation should be prescribed in drops.

**Vitamin E**
Starting dose = 50 mg (68 IU) once a day.
Available preparation = d-alpha-tocopheryl acetate (Micelle E®) = 156 IU/ml
Suggested dose is therefore 0.5 ml once daily.

NB: SPECIAL AUTHORITY is required for vitamin E administration and will be completed by the child’s paediatrician prior to the child leaving hospital.

**Vitamin K**
Suggested dose = 2.5 mg once a day
This is ¼ of an adult 10 mg Konakion tablet which can be crushed and mixed with water.

Continued on next page
BILIARY ATRESIA – PROTOCOL FOR DIAGNOSIS AND MANAGEMENT

Nutritional Management Including Fat Soluble Vitamin Supplements, Continued

In babies with a successful Kasai, vitamins will be continued until the baby has a normal bilirubin and repeat vitamin levels will be sent one month after the normal bilirubin has been achieved. If these levels are normal, vitamins can be stopped. Levels should then be measured at least annually and if the child becomes jaundiced again or reports pruritis.

In babies with an unsuccessful Kasai who remain jaundiced, long-term fat-soluble vitamin supplementation will be needed and the doses will need to be adjusted according to weight gain and blood vitamin levels. Vitamin levels should be performed monthly.

Follow – Up Patients Following Kasai Portoenterostomy

Blood Tests

Bloods weekly following discharge for the first month:
• LFTs including conjugated and total bilirubin, ALP, GGT, AST, ALT, Albumin
• FBC

Bloods monthly or at hospital appointment:
• Prothrombin ratio

NB: Capillary whole blood PR testing and venous INR can not usually be performed in the community for babies.

While PR will be measured at hospital appointments until a normal bilirubin is achieved, referral to hospital for an urgent INR is indicated if there is any concern about:
• worsening LFTs (rising bilirubin, falling albumin or an acute worsening of other liver enzymes)
• ANY signs of bleeding(e.g. excessive bruising or bleeding after blood tests)

After 1 month, blood test frequency will depend on whether the Kasai has been successful or not.

In general, blood tests should be performed at least weekly until the bilirubin is normal. After this, 3 monthly blood tests for the first year will be sufficient.

If the Kasai is unsuccessful, blood tests will be required at least monthly for the first year and will include vitamins A, D and E and coagulation.

Continued on next page
Follow – Up Patients Following Kasai Portoenterostomy, continued

Out-patient Appointments
Babies will be reviewed one week following discharge after which follow-up will depend on whether the Kasai is successful or not.

If the Kasai is successful, follow-up will be monthly for the first 2 months and 3 monthly thereafter.

For an unsuccessful Kasai, follow-up will be at least monthly until assessment for transplantation.
# Immunisations for Babies with Biliary Atresia & Other Forms of Chronic Liver Disease

## Accelerated Immunization Schedule for Children Expected to be Transplanted Before 18 months of Age

*(Prescribe both generic and brand name to avoid confusion)*

<table>
<thead>
<tr>
<th>Age</th>
<th>Immunisation</th>
<th>Date given</th>
<th>Serology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 weeks</td>
<td>DTaP/IPV (Infanrix-IPV™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hib/HepB (Comvax®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conjugate pneumococcal PCV7 (Prevenar®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meningococcal B (MenNZB™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 months</td>
<td>DTaP/IPV (Infanrix-IPV™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hib/HepB (Comvax®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conjugate pneumococcal PCV7 (Prevenar®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meningococcal B (MenNZB™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 months</td>
<td>DTaP/IPV (Infanrix-IPV™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hep B (HBvaxPRO®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conjugate pneumococcal PCV7 (Prevenar®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meningococcal B (MenNZB™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 months</td>
<td>Measles, mumps and rubella (MMR II®)*</td>
<td>Anti-HBs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Varicella (Varilrix [GSK])*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hep A (Havrix Junior®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 months</td>
<td>Meningococcal B (MenNZB™)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 months</td>
<td>DTaP/Hib (Infanrix –Hib)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hep B (HBvaxPRO®)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hep A (Havrix Junior®)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conjugate pneumococcal PCV7 (Prevenar®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measles, mumps and rubella (MMR II®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Varicella (Varilrix [GSK])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 months</td>
<td>Measles, mumps and rubella (MMR II®)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 months</td>
<td>Polysaccharide pneumococcal 23 PPV (Pneumovax® 23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meningococcal polysaccharide vaccine (Mencevax ACWY [GSK])</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months post-tx</td>
<td>Hep B (HBvaxPRO®) – 3 doses</td>
<td>Anti-HBs before and 1 month after initial series</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polysaccharide pneumococcal 23 PPV (Pneumovax® 23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 years</td>
<td>DTaP/IPV (Infanrix-IPV™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measles, mumps and rubella (MMR II®)*‡</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 years</td>
<td>Tetanus/diphtheria booster</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Consider dTap-IPV (Boostrix™)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annually</td>
<td>Influenza</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*MMR/varicella may not be given < 1 month pretx

#Full hep B series (double dose)

If HBs(−) when tested 1-2 months after initial series

‡ MMR only if pre transplant

Continued on next page
Immunisations for Babies with Biliary Atresia & Other Forms of Chronic Liver Disease, continued

- If first MMR given when child is < 12 months of age, child needs 2nd dose at 12 months, and a 3rd dose one month later.
- Mencevax ACWY and Varicella vaccines are not funded in community. Prevenar is funded for patients post transplant in the community.
- # If not given pneumococcal pre-transplant:
  - if < 24 months give 3 doses of conjugate vaccine (PCV7 – Prevenar®) at monthly intervals with polysaccharide vaccine (23PPV – Pneumovax® 23) at 2 years.
  - if > 24 months give 2 doses conjugate vaccine (PCV7 – Prevenar®) at monthly intervals followed by Pneumovax® 23.
- **MeNZB: Infants who receive their 3rd dose between 5 and 6 months of age, have the 4th at a minimum of 10 months of age. Infants who receive their 3rd dose after 6 months of age or older, have a 4th dose at a minimum of four months after the 3rd dose.
- Catchup of immunisations when there has been delay: Generally at least one month should occur between repeat doses of the multiple dose vaccines, but there is no restriction of the types of vaccine which can be given simultaneously apart from the comfort of the child.

For further information on immunisations please refer to the current Immunisation Schedule in the Immunisation Handbook 2006 or www.immune.org.nz

Management Of Cholangitis in Babies with Biliary Atresia

Cholangitis – EHBA Protocol

Cholangitis occurs most commonly in the first year after the Kasai operation, highest in the first 3 months. It occurs in up to 40-50% of patients and occurs in those who have achieved at least some bile flow. The risk is less in those patients with good bile flow compared with those with partial bile drainage. Repeated episodes of cholangitis may result in progressive cirrhosis and portal hypertension. It is considered one of the most important determinants of long term survival after a successful portoenterostomy. Prompt treatment may prevent the progression of the infection, fibrosis, and narrowing of the bile ducts.

Symptoms include fever, worsening jaundice and acholic stool. It can present with a sepsis like picture. It should be suspected if there is a temperature > 38 °C that can not be explained by other causes or if there is an abrupt increase in jaundice with increased bilirubin and/or increase in transaminases, or acholic stool. There may also be an increased WBC or leucopenia. The ESR and/or CRP may be increased. Cholangitis may be difficult to distinguish from a generalised viral illness in which a similar exacerbation in jaundice with deterioration in LFTs may occur and sometimes cholangitis may coincide with a viral infection. Blood cultures should be obtained prior to starting iv antibiotics though in our experience, it is not often that blood cultures will be positive. When blood cultures are positive it is a risk factor for late response on antibiotics and recurrence of cholangitis.

Continued on next page
Management Of Cholangitis in Babies with Biliary Atresia,
continued

Investigations should include a FBC, ESR, CRP, LFTs, bilirubin, albumin, INR/PR, glucose, urea and creatinine and electrolytes, as well as urine and blood cultures. An abdominal ultrasound should also be performed looking for dilated bile ducts, bile lakes, an assessment of portal hypertension, hepatosplenomgaly and presence of ascites.

A number of organisms have been implicated E. coli, proteus, klebsiella, enterobacter species, pseudomonas, enterococcus, and bacteroides species. Anaerobic organisms are not sole causative agents. Many episodes will have more than 1 organism isolated.

Choice of IV Antibiotics

First Line Antibiotics include:
• Amoxicillin + gentamicin
• Cefotaxime + amoxicillin

Second Line Antibiotics Include*:
• Ceftazidime + amoxicillin
• Timentin + amoxicillin
• Ceftazidime + clindamycin

Third Line Antibiotics Include:
• Meropenem + ciprofloxacin

*Second line antibiotics should be considered first line in patients with history of recurrent cholangitis and on long term suppressive antibiotic therapy where resistant organisms are possible.

Treatment duration is for 7-14 days. Shorter courses could be considered for an uncomplicated episode. Longer courses are required for episodes slow to respond, positive blood cultures or recurrent episodes.

Antibiotics may need to be changed if there is a poor clinical response after 5 days or so. A liver biopsy and ascitic tap for further bacteriological cultures may be needed at that stage.

If there are recurrent episodes of cholangitis, oral prophylactic antibiotics (i.e. cotrimoxazole, ciprofloxacin) may need to be considered.

NB: Ciprofloxacin oral suspension is not funded in the community. It is available via the DCS list from the hospital pharmacy for 6 weeks at a time.

NB: Antibiotics included in this guideline do not require ID approval from the Infectious Disease team. They are considered ID exempt for this indication.
References
