FATTY ACID OXIDATION DISORDERS (FAOD)

FAOD includes:

- Medium chain acyl co-A dehydrogenase deficiency (MCADD)
- Very long chain acyl Co-A dehydrogenase deficiency (VLCAD)
- Long chain hydroxyacyl co-A dehydrogenase deficiency (LCHAD)
- Trifunctional protein deficiency (TFP)
- Carnitine Palmitoyl Transferase Deficiency Type 1 (CPT1)
- Carnitine Palmitoyl Transferase Deficiency Type 2 (CPT2)
- Carnitine Uptake Defect (CUD)
- Glutaric Aciduria Type 2 (GA2)

What are FAOD?

FAOD are a group of autosomal recessive disorders caused by the deficiency or absence of any of the enzymes needed for beta-oxidation. Children born with this condition appear normal at birth but untreated patients may present with low blood sugar which can lead to seizures, coma and death. One type of FAOD, VLCAD (or very long chain acyl-CoA dehydrogenase deficiency) may present with cardiomyopathy and increased creatine kinase (CK) levels.

Confirmatory Testing

Please refer to the table below:

FAOD	Confirmatory Testing
Medium chain acyl co-A dehydrogenase deficiency (MCADD)	Gene Testing and Plasma Acylcarnitine
Very long chain acyl Co-A dehydrogenase deficiency (VLCAD)	Gene Testing and Plasma Acylcarnitine
Long chain hydroxyacyl co-A dehydrogenase deficiency (LCHAD)	Gene Testing
Trifunctional protein deficiency (TFP)	Gene Testing
Carnitine Palmitoyl Transferase Deficiency Type 1 (CPT1)	Gene Testing
Carnitine Palmitoyl Transferase Deficiency Type 2 (CPT2)	Gene Testing and Plasma Acylcarnitine
Carnitine Uptake Defect (CUD)	Gene Testing and Plasma Acylcarnitine
Glutaric Aciduria Type 2 (GA2)	Gene Testing

Further confirmatory testing may be required after referral to a metabolic specialist.

FATTY ACID OXIDATION DISORDERS (FAOD)

Treatment of FAOD

Treatment is through the dietary restriction of fat. VLCAD patients are treated with a special milk formula containing medium chain triglycerides. Initiation of management should be done in consultation with an attending physician/metabolic specialist.

Preliminary / Initial Management During Metabolic Crisis

Metabolic crises may be caused by illness, prolonged fasting or stressful situations such as surgery and severe infection. The goal of treatment is to reverse the catabolic state and prevent hypoglycemia.

WHAT TO DO

If unwell and cannot tolerate oral intake:

- Nothing per orem
- Ensure patient's airway is secure
- Insert IV access. Monitor glucose levels. For patients with VLCAD, collect samples for serum CK. May request for other investigations (i.e. CBC, Blood gas) as needed. May give fluid boluses if the patient requires it.
- Start D10% 0.3 NaCl at full maintenance. Assess the patient and clinically, if there is need to increase fluid, may do so up to 1.2 or 1.5X the maintenance.
- Monitor input and output strictly (q6 hours). Check for the color of urine.

If unwell and can tolerate oral intake:

- Insert oro- or nasogastric tube and start continuous feeding with a high glucose formula
- Insert IV access. Monitor glucose levels. For patients with VLCAD, collect samples for serum CK. May request for other investigations (i.e. CBC, Blood gas) as needed. May give fluid boluses if the patient requires it.
- Start D10% 0.3 NaCl at 5-10 cc/hr.
- Monitor input and output strictly (q6 hours). Check for the color of urine.

**Patients with VLCAD may have rhabdomyolysis. Monitor CK levels and hydrate adequately. If CK levels continually rise, hemodialysis may be indicated.*
**Inform the metabolic doctor on call for further guidance regarding on-going management*
**If the patient is well, coordinate with a metabolic specialist regarding further management.*

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FATTY ACID OXIDATION DISORDERS

Long chain L-3 hydroxyacyl-CoA dehydrogenase (LCHAD)

What is Long chain L-3 hydroxyacyl-CoA dehydrogenase (LCHAD) Deficiency?

Long chain L-3 hydroxyacyl-CoA dehydrogenase (LCHAD) is a component of trifunctional protein.1 Isolated LCHAD deficiency catalyzes the third step in the fatty acid oxidation spiral, converting long chain 3-hydroxyacyl-CoA esters into long chain 3-keto-CoA species by using NAD as a cofactor.[2]

CLINICAL MANIFESTATIONS

Patients exhibit moderate or severe multiorgan involvement either neonatally or during the first two years of life.[3] They may present in the first year of life with hypoketotic hypoglycemia and liver dysfunction, Reye syndrome-like symptoms, seizures, coma and death.[2] By adolescence, ophthalmologic abnormalities including loss of visual acuity, chorioretinal atrophy, progressive retinitis pigmentosa and peripheral sensorimotor polyneuropathy may be observed.[2,3,4] Up to 40% of symptomatic patients may have tachycardic arrhythmias, apneic episodes, cardiopulmonary arrest and unexplained death.[2]

PATHOPHYSIOLOGY

Since the enzyme LCHAD is part of the fatty acid oxidation, a deficiency causes a problem in the energy utilization of the body which causes the presentation of signs and symptoms as listed above.[1]

Inheritance: autosomal recessive[2]

CONFIRMATORY TESTING

Confirmatory testing is done through enzyme assays performed in cultured cells such as skin fibroblasts.[2] Gene testing may reveal the common mutation G1528C which has been identified in affected individuals. Further confirmatory testing may be required after referral to a metabolic specialist.

Overview of Disease Management

Primary goal of treatment is to avoid metabolic stress brought about by infection and long periods of fasting. Patients should be given frequent feedings, supplementation with medium chain triglycerides, an overnight infusion of cornstarch.[2,5] Initiation of management should be done in consultation with an attending physician/metabolic specialist.

Prognosis

Patients with LCHAD deficiency who present symptomatically often die during the acute episode or suffer from sudden, unexplained death and mortality occurs in approximately 38%.[2]

Preliminary / Initial Management During Metabolic Crisis

Metabolic crises may be caused by illness, prolonged fasting or stressful situations such as surgery and severe infection. The goal of treatment is to reverse the catabolic state, correct the acidosis and prevent essential amino acid deficiency.

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FATTY ACID OXIDATION DISORDERS

Long chain L-3 hydroxyacyl-CoA dehydrogenase (LCHAD)

WHAT TO DO

If unwell and cannot tolerate oral intake:

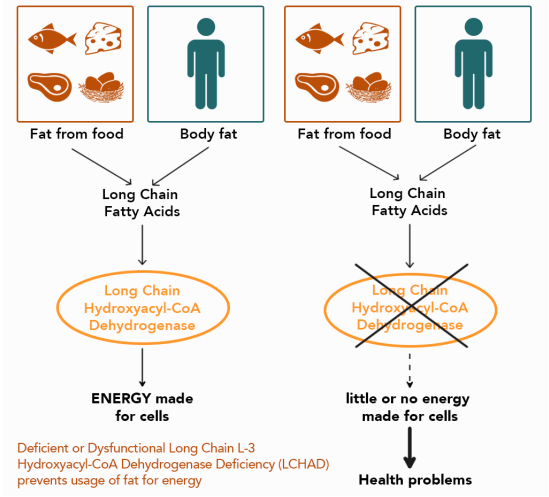
- Nothing per orem
- Ensure patient's airway is secure
- Insert IV access. Monitor glucose levels. Collect samples for urine ketones and serum creatine kinase (CK). May request for investigations (i.e. CBC, liver transaminases, blood gas, etc.) as needed.
- May give fluid boluses if the patient requires it.
- Start D10% 0.3NaCl at full maintenance. Assess the patient and clinically, if there is need to increase fluid, may do so up to 1.2 or 1.5x the maintenance.
- Monitor input and output strictly (q6 hours). Check color of urine and may request for urinalysis to check for urine myoglobin.

If unwell and can tolerate oral intake:

- Encourage regular feeding
- Insert IV access. Monitor glucose levels. Collect samples for urine ketones and serum creatine kinase (CK). May request for investigations (i.e. CBC, liver transaminases, blood gas, etc.) as needed.
- Start D10% 0.3NaCl at 5-10 cc/hr
- Monitor input and output strictly (q6 hours). Check color of urine and may request for urinalysis to check for urine myoglobin.

*Inform the metabolic doctor on call for further guidance regarding on-going management
*If the patient is well, coordinate with a metabolic specialist regarding further management

Normal breakdown of protein vs LCHAD patient's breakdown of protein



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