Lecture 8 - Hyperalimentations

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Hyperalimentations

Terms:

- TPN
- NEC
- Regional Enteritis
- Ulcerative Colitis
- Toxemia
- Sepsis
- Amino Acids
- Electrolytes
- MVI
- Insulin
- Central Line
- Aseptic Technique
- Hyperalimentation
- Giardia
- Colostomy
- Asymptomatic
- Megacolon
- Dextrose
- Intralipids
- Additives
- Trace Elements
- Peripheral Line
- Azotemia
- Hand Washing

At the end of this lecture, the Pharmacy Technician should have a basic understanding of:

1. the meaning of TPN or Hyperalimentation
2. the indications involved in the use of TPN’s
3. the Constituents of a TPN and Pharmacological reason for them
4. the importance of Aseptic Technique
5. the terms used in this section
Hyperalimentations

The enteral and parenteral infusion of a solution that contains sufficient amino acids, glucose, fatty acids, electrolytes, vitamins, and minerals to sustain life, maintain normal growth and development and provide for needed tissue repair.

Also known as TPN or Total Parenteral Nutrition

Indications:

*Pediatric* - Neonatal Congenital defects
  Short Bowel syndrome
  Necrotizing Enterocolitis in premies (NEC)
  Major trauma / burns

*Adult* - Different disease states
  Post-Operative feeding (NPO)
  Trauma/Burns

Visiting Different disease states

a. Malabsorption Syndromes

  - impaired absorption of nutrients from the small intestine

  1. *Celiac disease* - intolerance to Gluten
c    genetic

  Gluten: protein found in wheat, rye, barley
   
   promotes production of Killer lymphocytes 
    (WBC’s) that cause intestine mucosal damage
2. *Whipples disease* - uncommon
   unknown etiology
   Named after George Hoyt Whipple
   a. predominate in adult male ages 30-60
   b. organ affected (heart, lung, brain, joints, intestine, eyes
   c. small intestine severely involved
   d. disease is progressive and fatal
   e. treatment: TPN, Pen G, TCN

3. *Infection (acute)* - bacterial, viral, protozoal
   a. Giardia - infection
       - protozoa
       - named after Alfred Giardia
       - inhabit small intestine
         attach and take away nourishment
       - transmitted - fecal contaminated food
       - chlorine in treated water does not kill
       - boiling will kill cysts
       - symptoms - diarrhea, fever, cramps, etc.
       - can last up to three months

4. *Infestation (acute)*
   a. parasitic worm
       - tapeworm, hookworm
   b. transmitted by uncooked meat which contain larvae
   c. develop into mature adult in host
   d. symptoms: hunger, intestinal obstruction
example: Tissue Nematodes (Trichinosis)

Infection with the roundworm, *T. spiralis*:

*cause*

a. eating raw or inadequately cooked or processed pork products
   - contains encysted larvae (trichinae)

*ingestion of*

a. the encysted larvae will cause penetration of the duodenal and jejunal mucosa (small intestine)

b. Within 2 days, the larvae mature sexually and mate, the male dies

c. The females burrow deeper into the intestinal wall and begin to discharge living larvae by the seventh day
   - each female may produce over 1000 larvae
   - continues on for a period of six weeks then female dies

d. The minute baby larvae are carried by the lymphatic or portal circulation to the bloodstream. There they encase themselves
   - other organ infestation
     1. Diaphragm
     2. Tongue
     3. Eye
     4. Intercostal muscles
     5. Heart (Myocardium)
   - viable (alive) for several years

*Clinical Symptoms*

a. individualized (dependent on severity of infestation)

b. Many patients Asymptomatic (no symptoms)

c. After two weeks

a. retinal hemorrhage
b. pain
c. GI distress - severe diarrhea
d. muscle soreness
e. difficult breathing due to diaphragm involvement
f. high fever
g. can lead to

- meningitis
- bacterial infections
- pneumonia
- destruction of outside skeletal muscles
- myocardial failure ---> death
5. *Carbohydrate Intolerance*

a. inability to digest CHO due to lack of one or more intestinal enzymes

<table>
<thead>
<tr>
<th>Example: Lactose intolerance</th>
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<tbody>
<tr>
<td>a. 75% adults in ethnic groups</td>
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<td>b. inability to tolerate milk products</td>
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<tr>
<td>c. treatment: lactose-free diet</td>
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<td>lactase from exogenous source</td>
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example: Glucose-Galactose intolerance

a. symptoms: chronic diarrhea, bloating, abdominal gas
b. **Chronic Inflammatory Diseases of the Bowel**

1. **Regional Enteritis** (Crohn’s disease)

   a. usually involves the lower GI tract (ileum, colon)
   b. most cases begin before age 40 and peak in 20s
   c. equally in both sexes
   d. etiology unknown

**Signs and Symptoms**

- chronic diarrhea
- abdominal pain
- fever
- weight loss
- abdominal obstruction

**treatment**

- Lomotil®, Loperamide, Opium tincture, Codeine
  a. to relieve cramps and diarrhea
- Ab’s reserved for bacterial complications
- Corticosteroids in acute stages
- Immunosuppressive drugs
- TPN’s (short or long term)
- Sulfasalazine suppresses relapse
- Surgery: removal of involved area - colostomy
  95% return rate
Colostomy - Resection of dead bowel and reattachment of healthy bowel to outside opening of skin (stoma)

2. Ulcerative Colitis

   a. inflammatory, ulcerative disease of the colon
   b. affects ages 15 to 40

Symptoms:  Asymptomatic intervals

   acute attack - bloody diarrhea
             - fever
             - toxemia

Complication:  Hemorrhage
             Megacolon
             Peritonial rupture
             Sepsis
             Death

Treatment:  depends on severity

   a. relaxation, diet, lomotil, opium tincture,
      codeine, Sulfasalazine, HC enema,
      Corticosteroids, surgery: colostomy

   b. recommend prophylaxis for total involvement
      at age of 10 years (colostomy)

3. Others

   a. Pseudomembranous Entercolitis

   b. Irritable Bowel Syndrome (Spastic Colon)

   c. Neoplasm’s of Bowel

   d. Tumors of Large bowel
Constituents of a Hyperalimentation?

1. **Dextrose (Glucose)**: provides energy for body
   
a. TPN should provide at least 50% needed

   ![Dextrose ATP cycle Energy diagram](image)

   *See Tech Lectures® Section II - Diabetes Mellitus*

2. **Amino Acids**: Aminosyn®
   
   provides Nitrogen or protein
   
   helps in tissue repair and growth
   
   6.25g AA = 1g Nitrogen

3. **Electrolytes**: usually given off of lab values
   
   a. indicative of disease state
      
      necessary for physiological function

      examples:
      
      |   |  |
      |---|---|
      | K | potassium |
      | Na| sodium |
      | Cl | chloride |
      | SO4 | Sulfate |
      | PO4 | Phosphate |

4. **Additives**: usually given off of lab values

5. **MVI**: multivitamin infusion
6. **Trace Elements**: examples:
   - Zn - zinc
   - Cu - copper
   - Mn - Manganese
   - Mg - Magnesium

7. **Insulin**: For hyperglycemia (prophylaxis)
   
   a. to prevent hyperglycemia (high blood glucose) due to Dextrose infusion

8. **Intralipids**: Liposyn®
   
   given for weight gain
   
   high caloric - fat usually from soybean
   
   can be given in or along with TPN
   
   Problem: overloading syndrome
   
   a. Hyperlipidemia - fat deposits in heart, etc.

*doodle space*
How is TPN Given?

1. *Peripherally*: short term, malnutrition support in vein

2. *Centrally*: thru Subclavian artery down to heart chamber
   a. Dextrose over 20% should always be given via Centrally

Complications of TPN

1. *Mechanical*: catheter placement
   clotting of catheter
   occlusion (blockage) of catheter
   - Calcium Phosphate precipitates when combined (CaPO3)
   incompatible meds
   - Mixture of medications may cause precipitation
2. Other : Sepsis
   
a. Bacterial invasion  
b. due to preparation or insertion

Metabolic
   
a. hyperglycemia  
b. hypoglycemia (post infusion)  
   - low blood glucose

Electrolyte or Acid/Base imbalances
   
Azotemia
   
a. increased BUN (blood urea nitrogen)  
   - too much protein

Preparation of TPN
   
In the preparation of a TPN or any IV Admixture, the use of Aseptic Technique is essential

Aseptic Technique: The methodology used to ensure the safety of IV products from bacterial or viral infiltration.

[See Tech Lectures® Lecture 4 - About antibiotics]

1. Many bacterial, viral and Nosocomial (hospital borne) infections are linked to improper patient care. In some cases these links can be directly related to the:
   
a. preparation of IV Infusions
   
b. Administration of IV Infusions
2. The best method to limit these infections is to understand aseptic technique.

3. The best method to limit these infections is to use aseptic technique.

4. Hand washing should be the cornerstone of aseptic technique.
   a. proper washing very important

5. Proper use of “Laminar Flow Hood” is important.

6. Speed and efficiency should never outweigh guaranteed sterility of prepared IV preparation.

Note:

As a pharmacy technician and pharmacist for over twenty years, I have seen good and bad aseptic technique used in the Hospital Setting. The emphasis of output has over seeded the importance of aseptic technique and due to this; many patients incure infections that in some cases leaves them in life-threatening situations. As a pharmacist I always inform my technicians to think of each IV as a product that will be given to a loved one. Realizing that this IV will flow through a cherished individual’s veins hopefully will allow the Pharmacy Technician to be more careful.
Lecture 8 - Hyperalimentations Worksheet

True or False

_____ 1. MVI stands for Multivitamin infusion

_____ 2. Many bacterial, viral and Nosocomial infections are linked to improper patient care

_____ 3. A colostomy is no guarantee the problem is fixed for a patient with Crohns disease

_____ 4. A major problem with Ulcerative Colitis is the potential for Peritoneal rupture

_____ 5. Amino Acids help in Tissue repair and growth

_____ 6. A symptom of Lactase intolerance is chronic diarrhea

_____ 7. Trichonosis is caused by the eating of inadequately cooked beef

_____ 8. Insulin is often times given in a TPN to prevent potential hyperglycemia

_____ 9. If not done properly, Calcium (Ca) and Phosphate (P03) will precipitate when combined

_____ 10. Azotemia is an example of a potential complication of TPN’s

_____ 11. Liposyn® is an example of an Intralipid given for weight gain

_____ 12. Zn, Cu, Mn, Mg are example Electrolytes used in TPN’s

Complete the Answer sheet and place your answers at the following link for grading

https://form.jotform.com/60515681079964

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