Nutrition Support

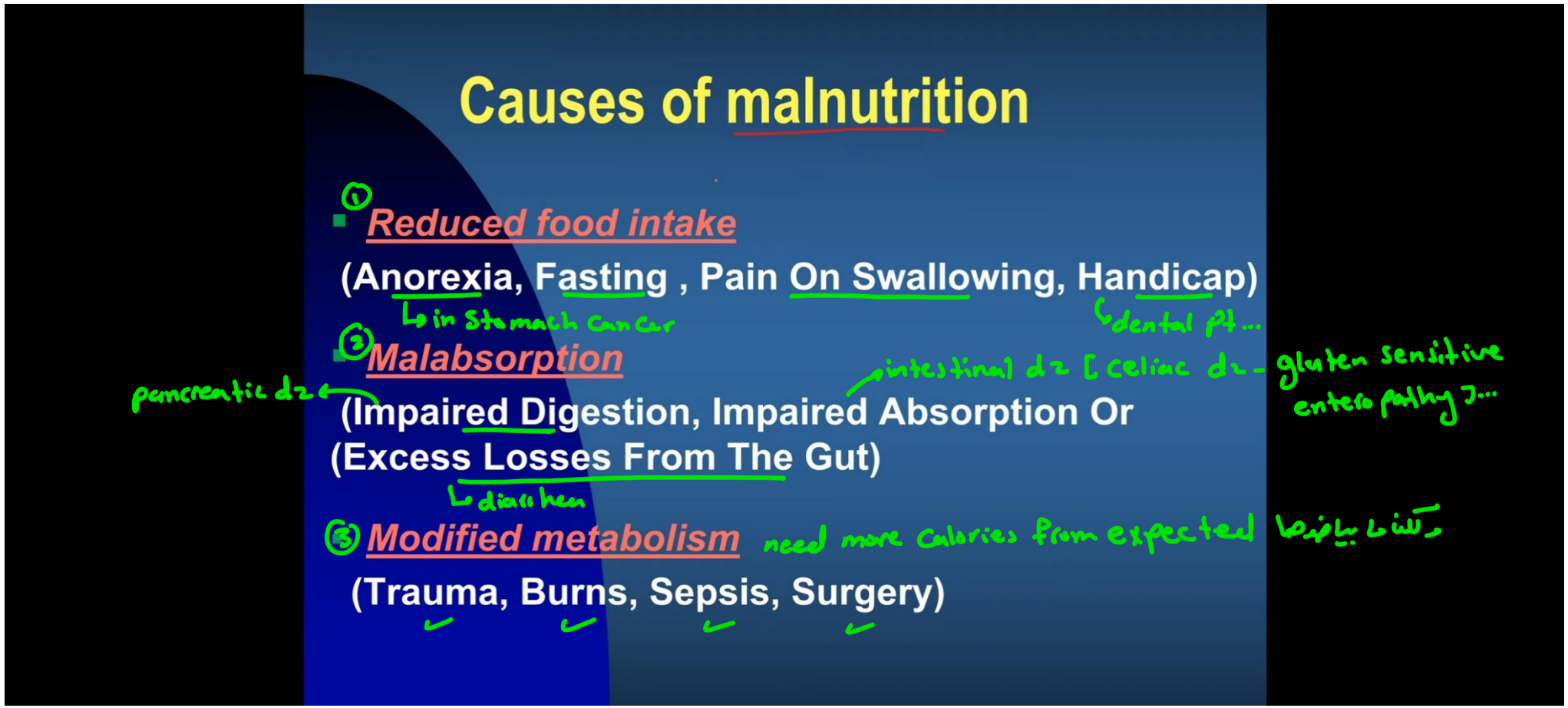


Elias arteen FRCSI
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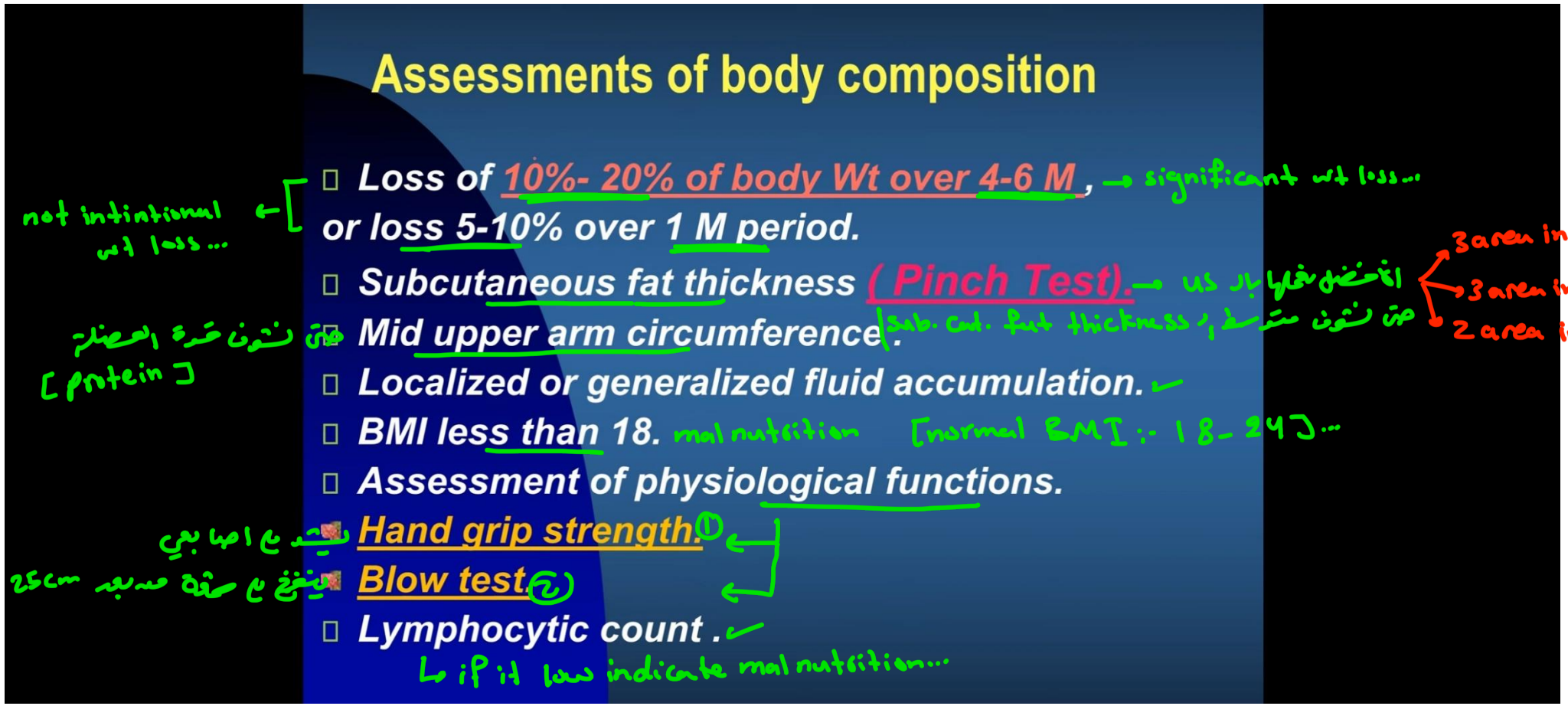
Surgical nutrition

- Weight loss is basic indicator of surgical risk.
  * ↓ wt → ↑ risk of surgical complication..
- There is *Six Fold* increase risk of complication in malnourished patient prior to surgery.
- Surgical wounds ,anastomosis are less likely to heal. (→ leak possib.) (Gun likely to heal)

*The wt loss in oldage is alarming symptom for advanced cancer...



* loss < 5% of his wt → mild wt loss...
* loss 5-10% of his wt → moderate wt loss...
* loss > 10% of his wt → severe wt loss...



Biochemical analysis

- Total body content of albumin is 350 gm.
- Rate of production is 10 Gm/day.
- Half life is 21 days.

* 30% of albumin is IV...
* 70% of albumin is EV...
* in stress - Burn - sepsis - infection - trauma → the liver decrease the albumin synthesis

Prognostic nutritional indices

if it low indicate malnutrition:-

- Serum albumin less than 30 gm / L.
- Serum transferrin less than 220 mg / L.
- Serum pre albumin less than160 mg / L.
- Failure of immune system to react to skin antigen.

half life : 7 days

half life : 2-2.5 days

more accurate than albumin

as TB test..

نتيجة كتيبة..

Nitrogen balance

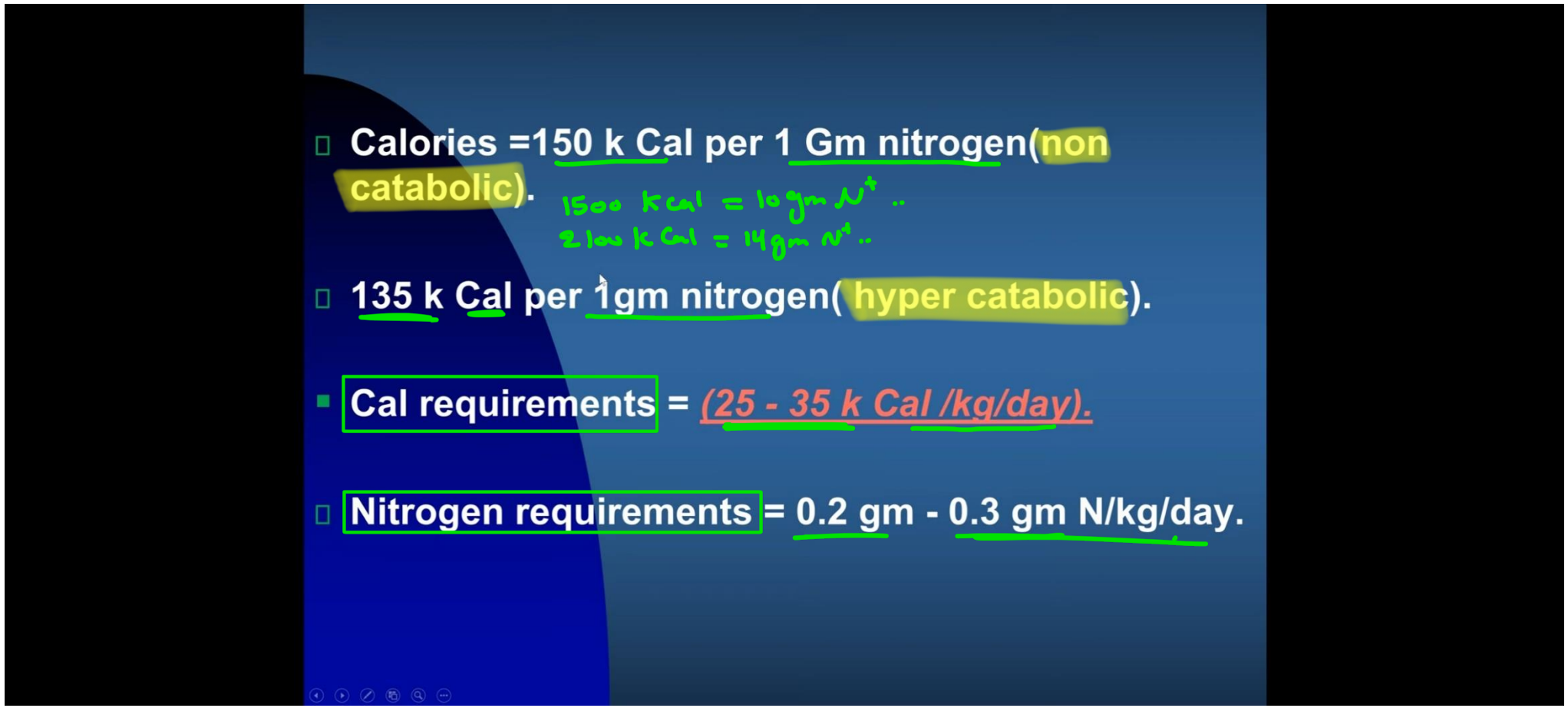
amino acid - protein

- 80% of nitrogen is lost in urine. 14gm N^+/day in the urine
- 2- 4 Gm of nitrogen is lost in stool, skin.
- Nitrogen balance = (Dietary proteins x 0.16) _ (urine nitrogen +2 gm skin + 2gm stool) .
- Urine urea nitrogen = Urine urea mmol x 28.
- *10gm N = 62.5gm proteins = 300gm muscle mass.*
- Nitrogen requirements =urinary nitrogen +20%.

17gm N^+ = 14gm + 20% need daily...

* every 1 gm N^+ = 6.25 gm protein = 30 gm Muscle mass..

Keep # daily we need 14 M. - 12 F. gm N^+ → Cure need 2gm/kg protein daily ...


Calories =150 k Cal per 1 Gm nitrogen(non catabolic).
1500 kcal = 10gm N+ ..
2100 k Cal = 14gm N+ ..
135 k Cal per 1gm nitrogen(hyper catabolic).
Cal requirements = (25 - 35 k Cal /kg/day).
Nitrogen requirements = 0.2 gm - 0.3 gm N/kg/day.

Nutrition Support - Amount

Illness severity	Nitrogen gN/kg/day	Calories kcal/kg/day
Reduced intake	0.17 [0.2] [14 gm daily]	28.6
Mod injury/sepsis	0.26	34.3
Severe injury/sepsis	0.34 [21 gm daily]	34.2 - 42.9

Frequency of malnutrition in GI surgical patients

- Hospital population — 40% has malnutrition.
- Patients undergoing GI surgery
  - mild — 50% has malnutrition.
  - moderate — 30% has malnutrition.

SO : All patient have major GIT surgery should be evaluated by dietitian 7-10 days before surgery.

ex:- cancer stomach - pancrease cancer surgery...

...وزن فرضوه تبع تغذية

Malnutrition and Outcome of major surgery

- Delayed wound healing. — الجرح تفتح lead to anastomosis leak
- Impaired immune resistance. — [↑ pneumonia - infection]
- Weak muscles.
- Apathy.
- Depression.
- Loss of morale.

Impact of Malnutrition on Survival after GI surgery



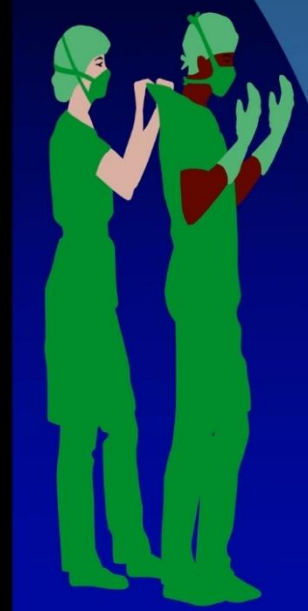
→ Peptic ulcer surgery في إهتمام

Weight loss >20%

8 x increase in post-operative mortality

Studley et al JAMA 1936

Impact of Malnutrition on Complications of GI surgery



→ *GI Surgery*

Pre-op severely malnourished

6 x increase in significant complications

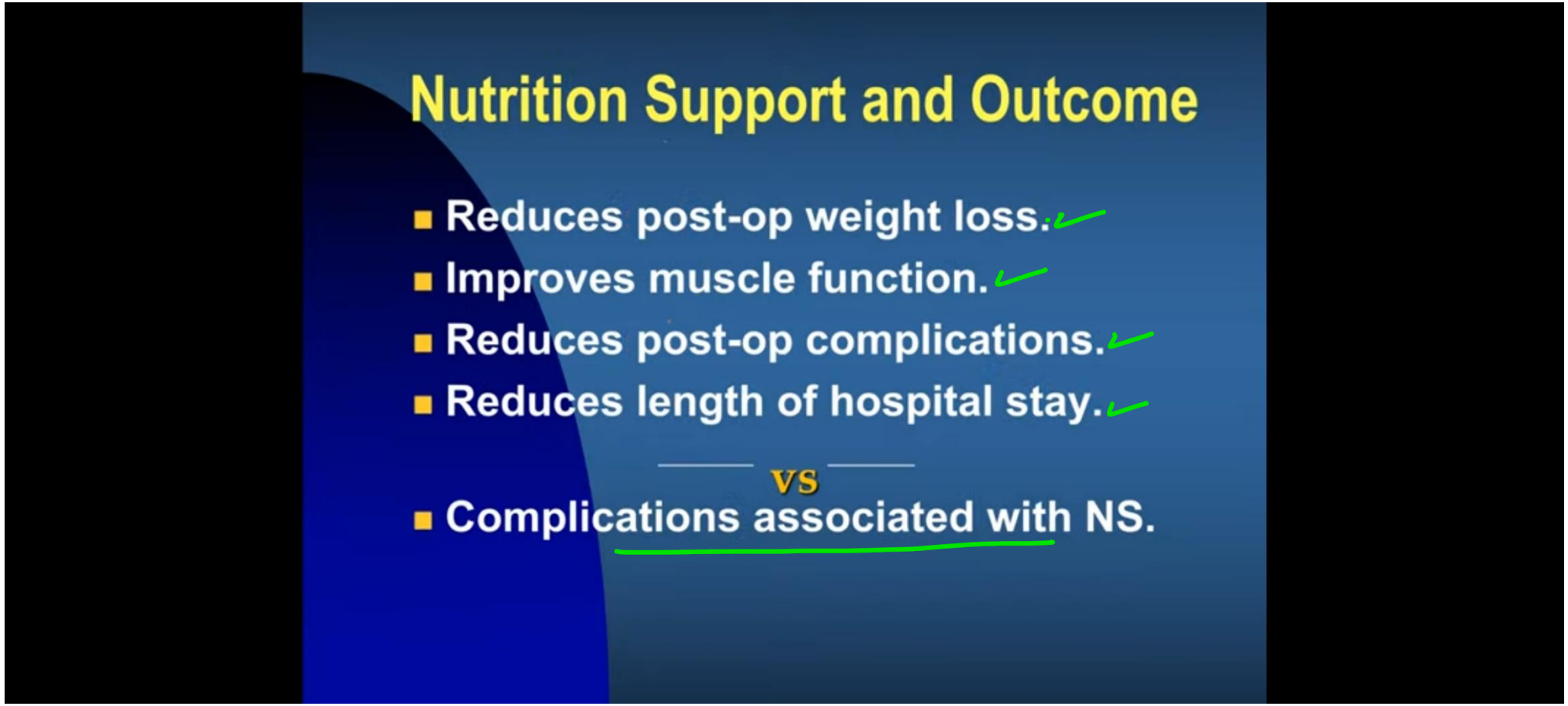
Prevention of Malnutrition

- Avoid unnecessary fasting.
- Improve hospital food.
- Reduce surgical stress.
  - Minimal access approach.
  - Optimal pain relief.
- Provide support to those at high risk .

in doing laparoscopic surgery...

epidural analgesia (not NSAIDs or opioid) to prevent the paralytic ileus

malnutrition عند - يكون متوقعين يعاني منه في المستشفى


Nutrition Support and Outcome
Reduces post-op weight loss.
Improves muscle function.
Reduces post-op complications.
Reduces length of hospital stay.
vs
Complications associated with NS.


Who
should
receive
Nutrition
Support?

Indications for Artificial NS

1. Severe anorexia . حتى راضي ياكل
2. Moderate or severe malnutrition but unable to eat sufficient orally. so give him enteral or parentral nutrition..
3. Pre-op patient with wt loss >10% BW.
4. Unable to eat or swallow . due to handicap - esophegeal obstruction..
5. Oral diet not anticipated for ≥ 10 days
6. Intestinal failure.
   - due to IBD or Short Bowel syndrome...

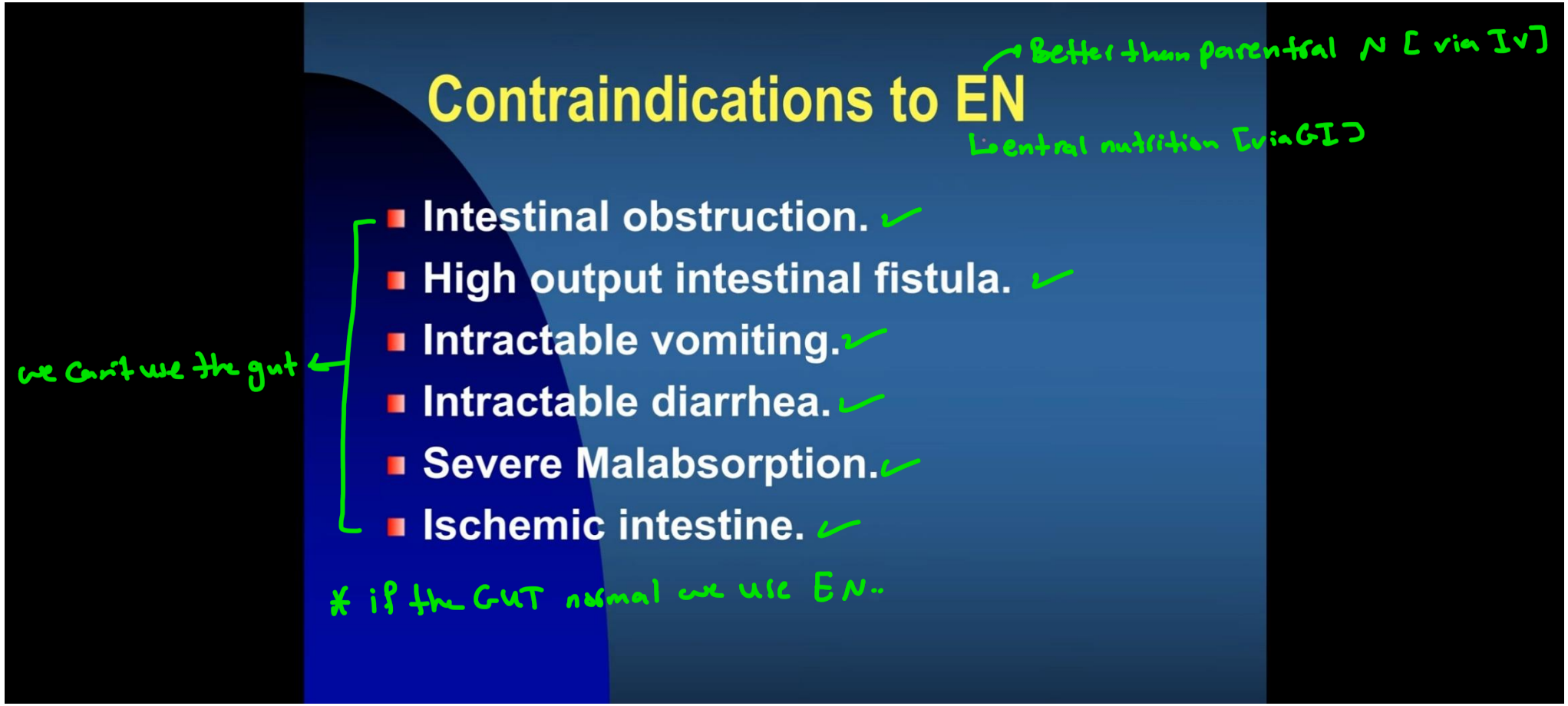
Postoperative Parenteral Nutritional Support

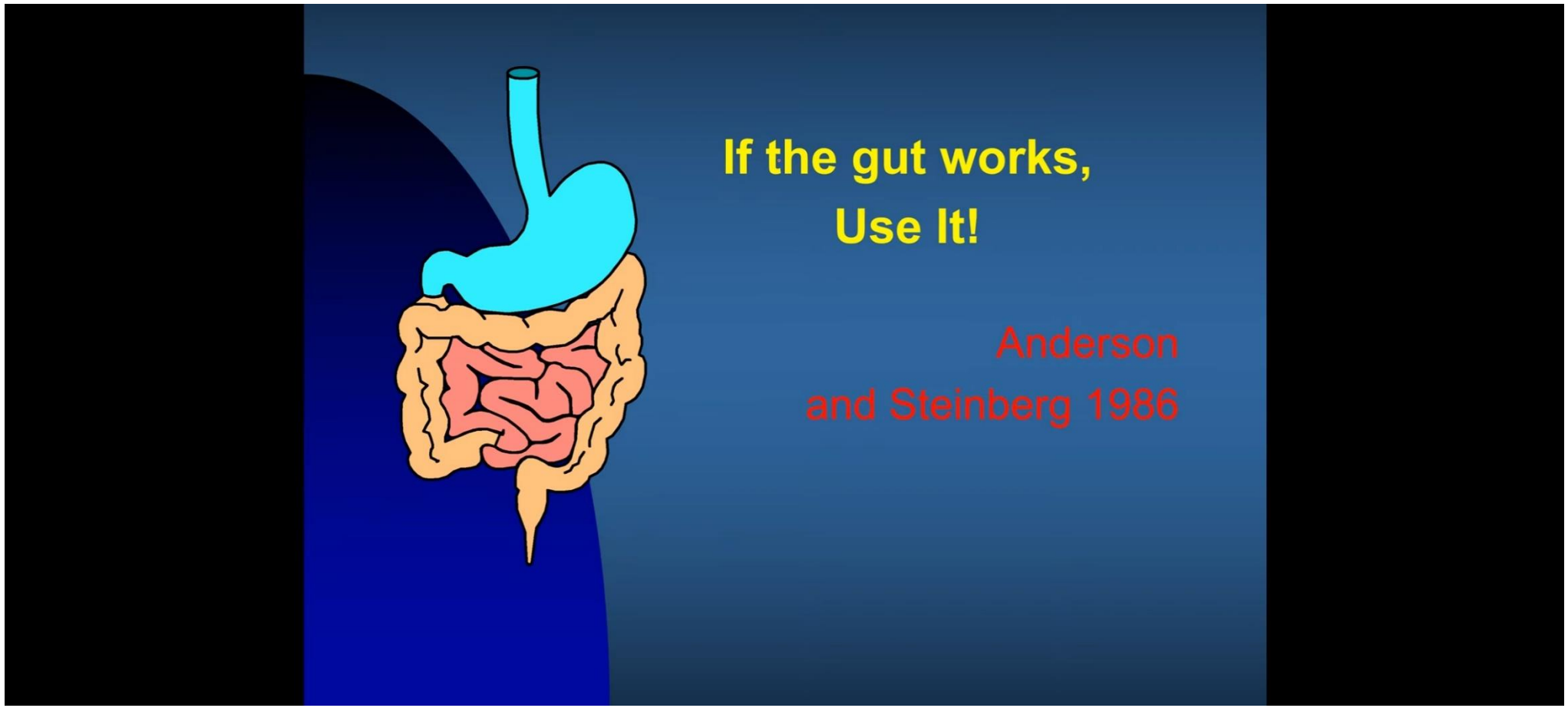
total parentral nutrition...

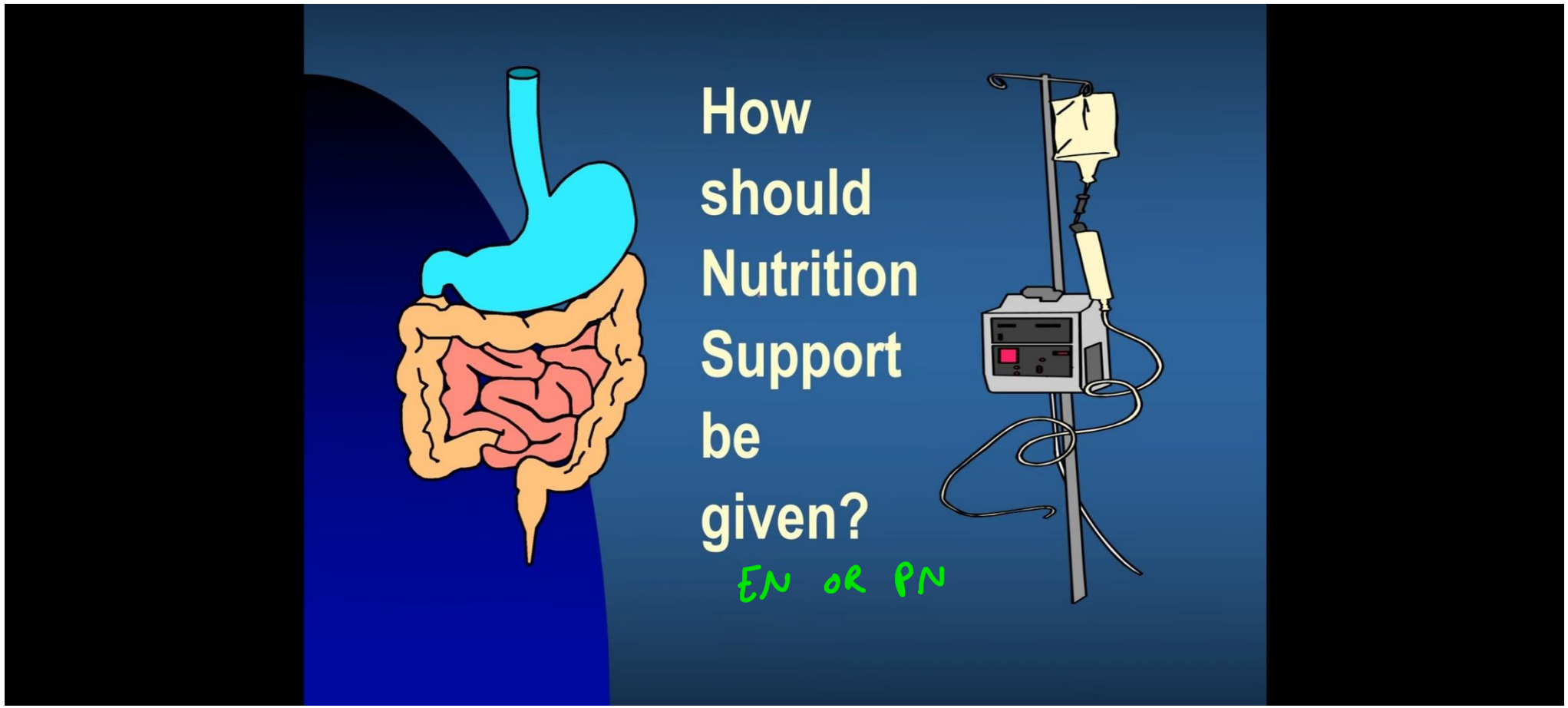
- The effect of postoperative TPN on surgical outcome (meta-analysis)
  - increased Cx by 10% with no differences in the mortality.
- Sandstorm et al, higher Cx rate in prolonged NPO (> 14 days) .

- *Postoperative nutrition support must be administered to the patients who are not expected to resume an oral diet for 7 to 10 days.*
- *Routine use of postoperative TPN is not recommended and may increase septic complication.*

اما لوكانت طالت ، وايضا تحتاج انه ياكل والمريض بعد اكثر من 10 days ما بينفع نعطيه TPN


Better than parenteral N [via IV]
Contraindications to EN
i.e enteral nutrition [via GI]
Intestinal obstruction.
High output intestinal fistula.
Intractable vomiting.
Intractable diarrhea.
Severe Malabsorption.
Ischemic intestine.
we can't use the gut
* if the GUT normal we use EN..


If the gut works,
Use It!
Anderson
and Steinberg 1986


How should Nutrition Support be given?
EN OR PN

* The gut has IgA on it's mucosa...
(in the intestine [decreased if the pt has malnutrition.]...

* In malnutrition
- ↓ mucosal IgA - ↓ mucosa associated lymphoid tissue...
- decrease the size of the enterocyte
- villous Atrophy
- Bacterial dislocation...

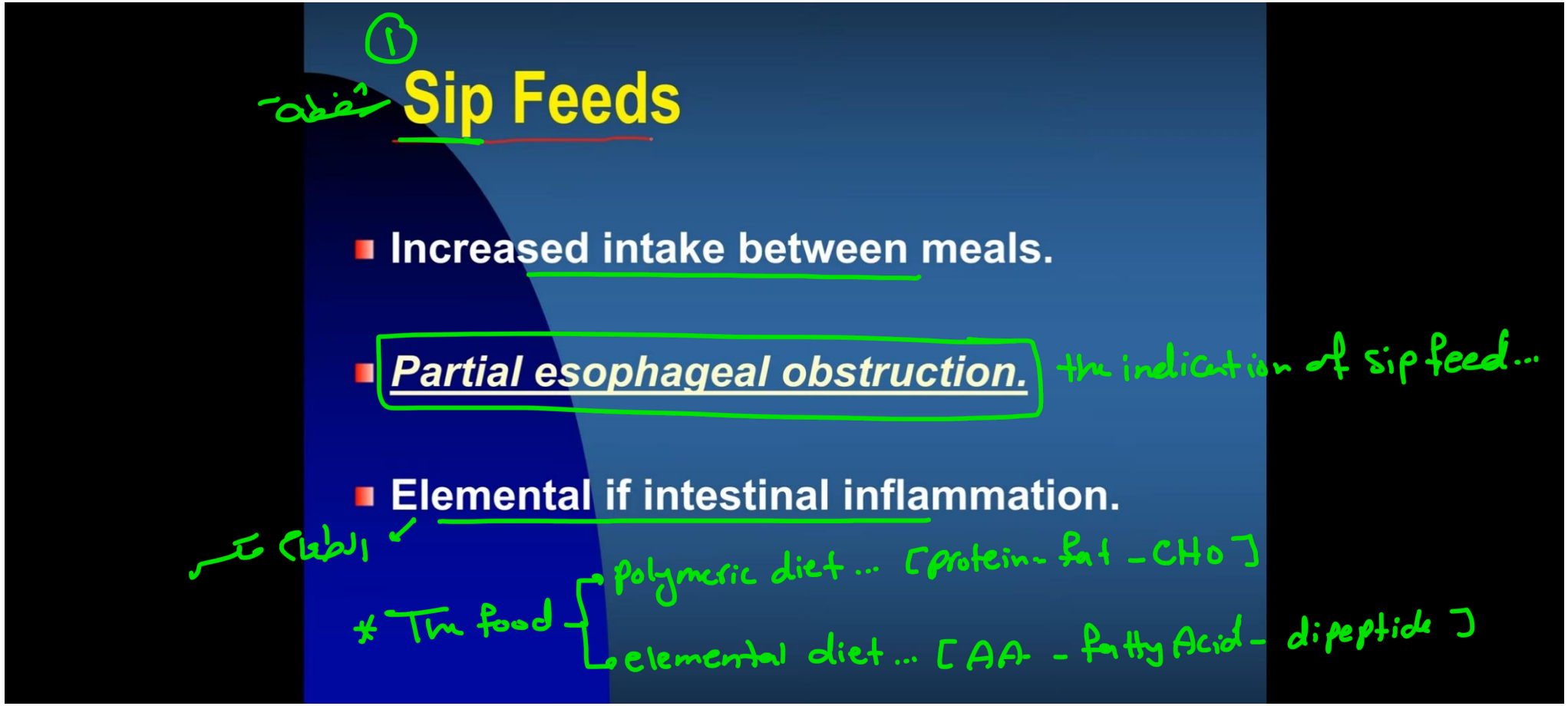
Enteral Nutrition is superior to PN with respect to

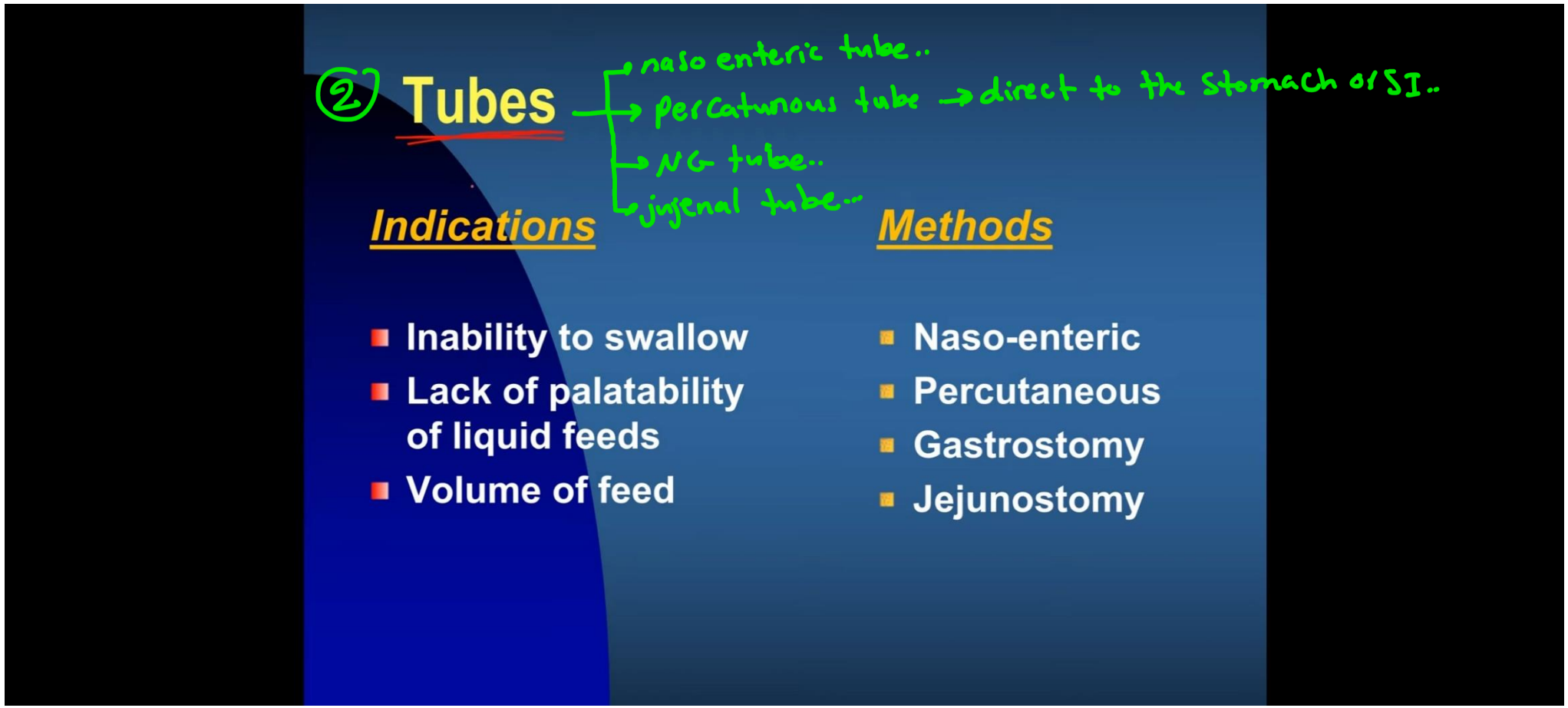
- Maintenance of intestinal structure and function. ✓
- Outcome (infectious complications). ✓
- Complications associated with NS. ✓
- Cost. ✓ PN more expensive than EN...

- ***N.B Entral Nutrition is Contraindicated in Haemdynamic Unstable Patient.***

* ICU pt unstable don't give him EN...


How
should
Enteral
Nutrition
be
administered?


1
Sip Feeds
Increased intake between meals.
Partial esophageal obstruction.
the indication of sip feed...
Elemental if intestinal inflammation.
* Tm food
polymeric diet ... [protein- fat - CHO]
elemental diet ... [AA - fatty Acid - dipeptide]


② Tubes
naso enteric tube..
percatunous tube → direct to the Stomach or SI..
NG tube..
jujenal tube..
Indications
Inability to swallow
Lack of palatability of liquid feeds
Volume of feed
Methods
Naso-enteric
Percutaneous
Gastrostomy
Jejunostomy

*The NG tube is thick tube...

jujenum or distal dudenum... ← nose tube

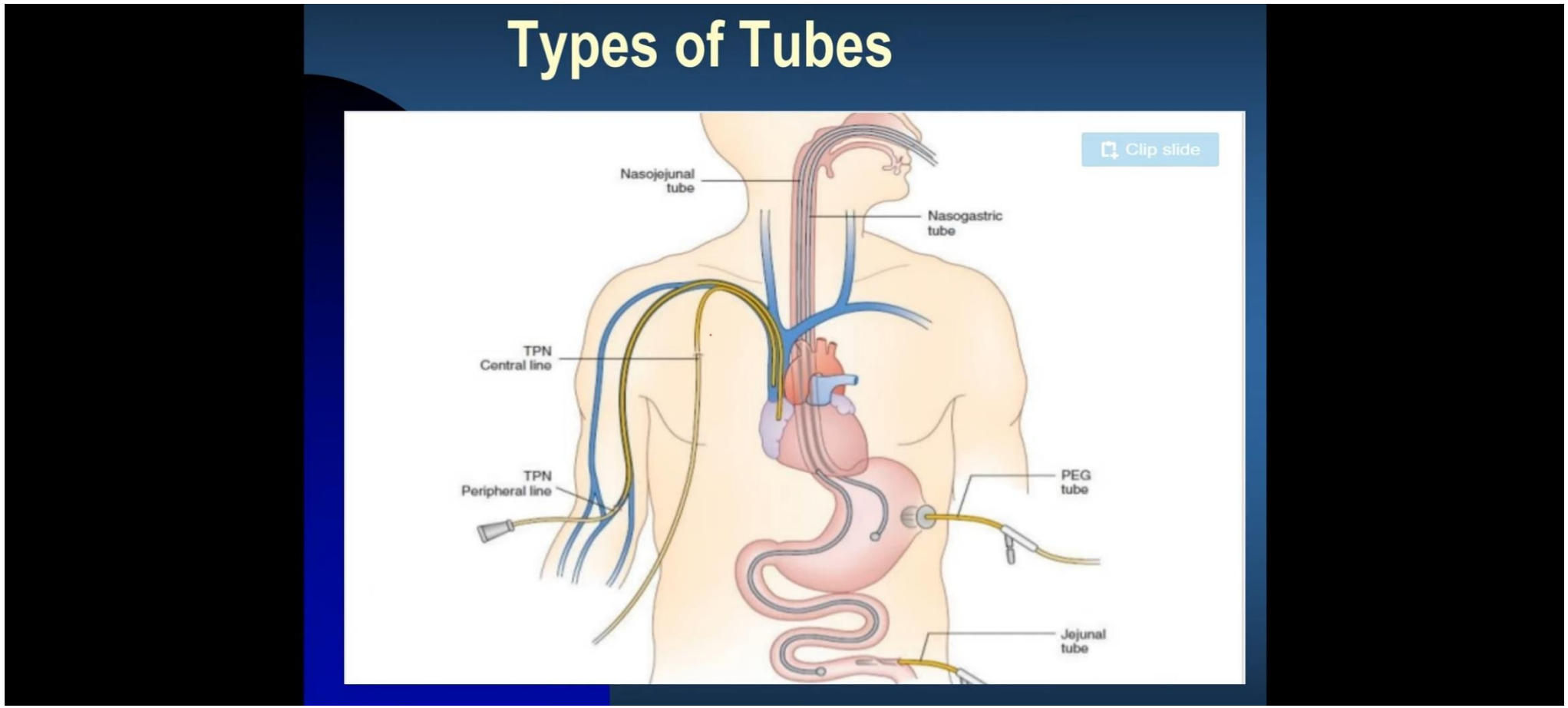
Fine Bore Nasoenteric Tube [thin]

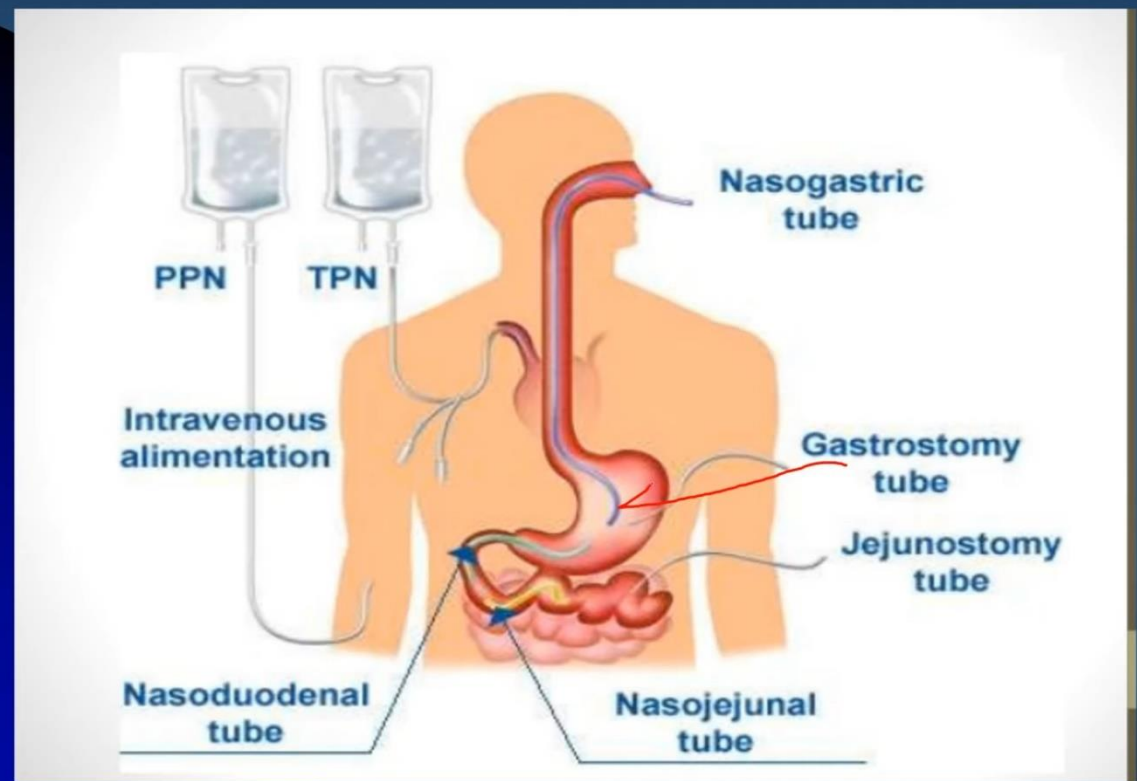
advantages of the naso enteric tube... ←

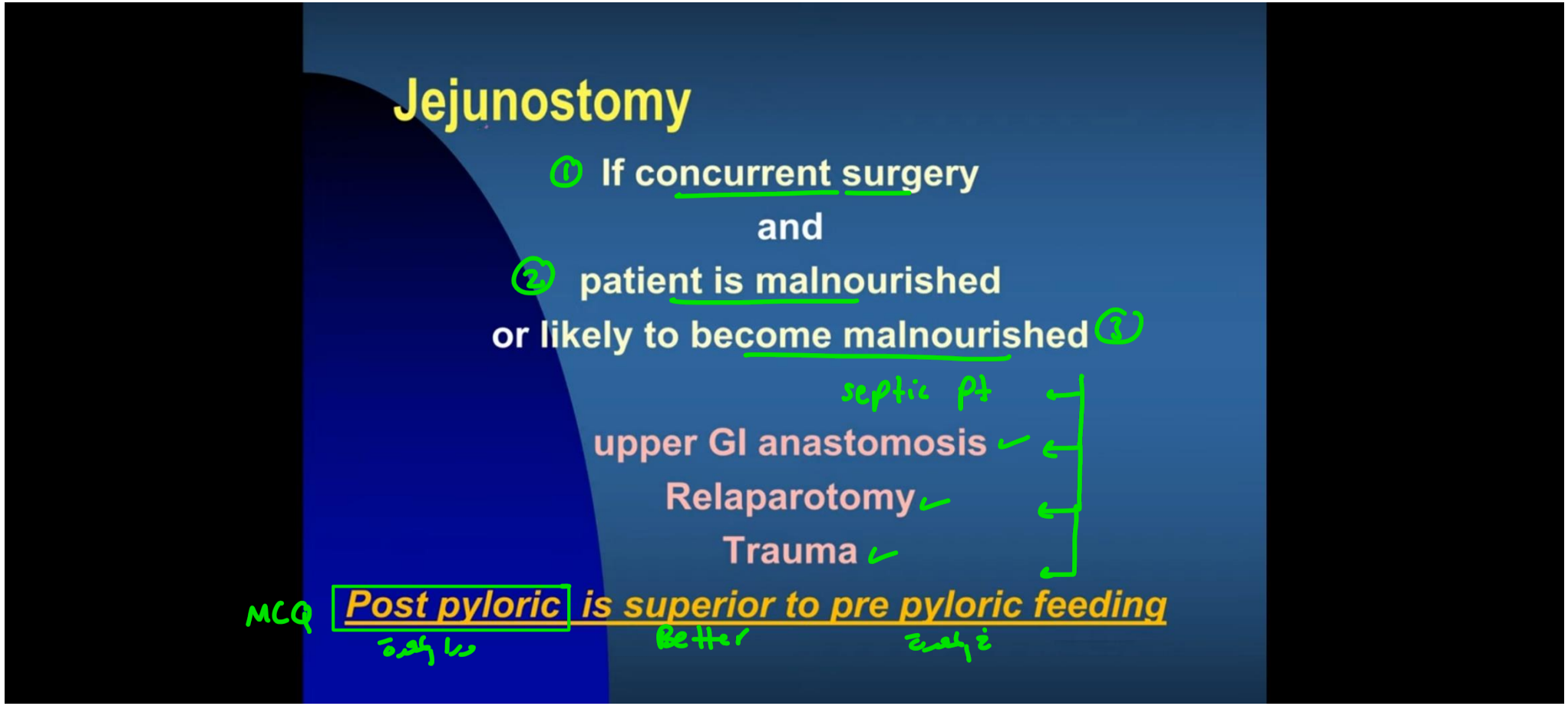
- Comfortable - tolerated ✓
- Allow feed to be given ✓
  - Independent of appetite.
  - Independent of swallowing.
  - Without muscular effort
  - Continuously ✓

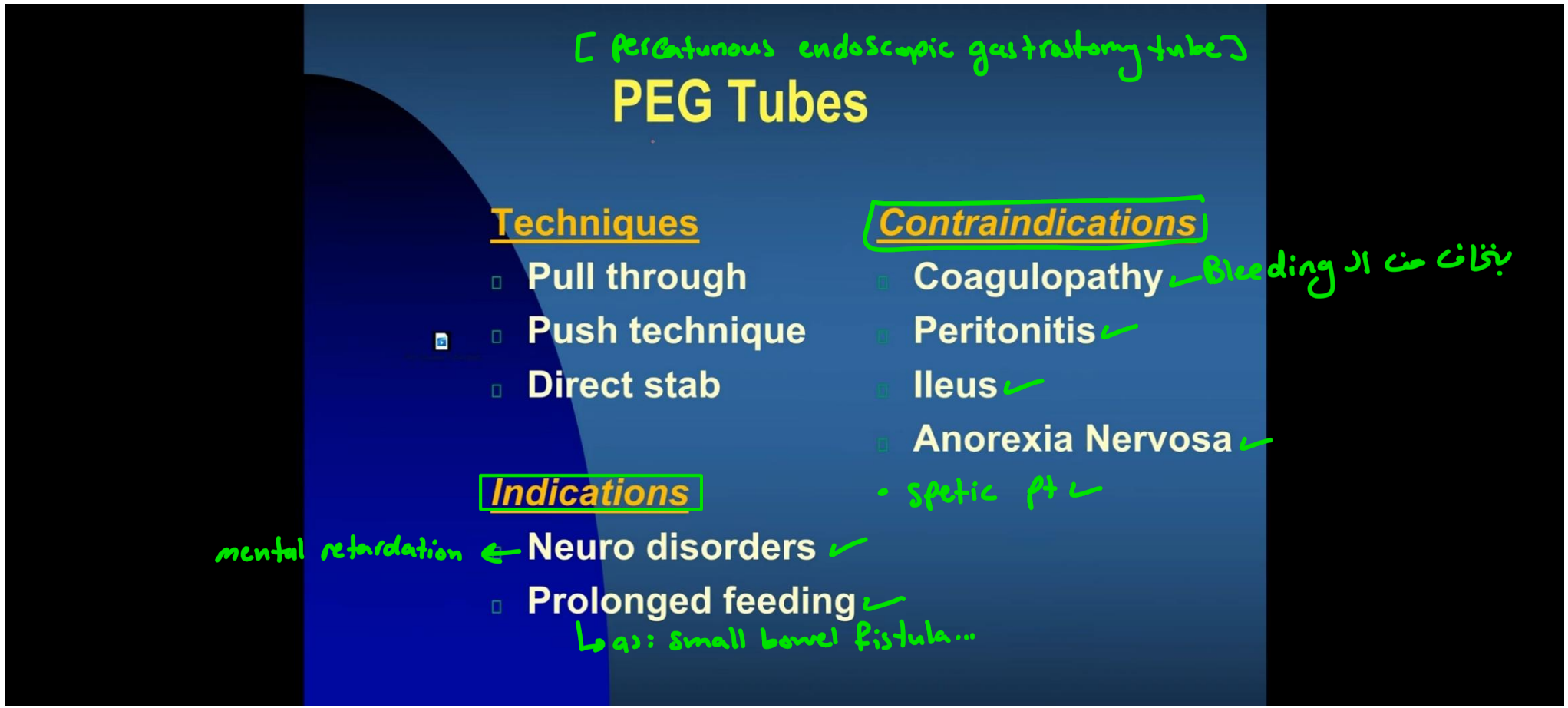


* Parentral tubes [TPN]
  - central line
  - peripheral line



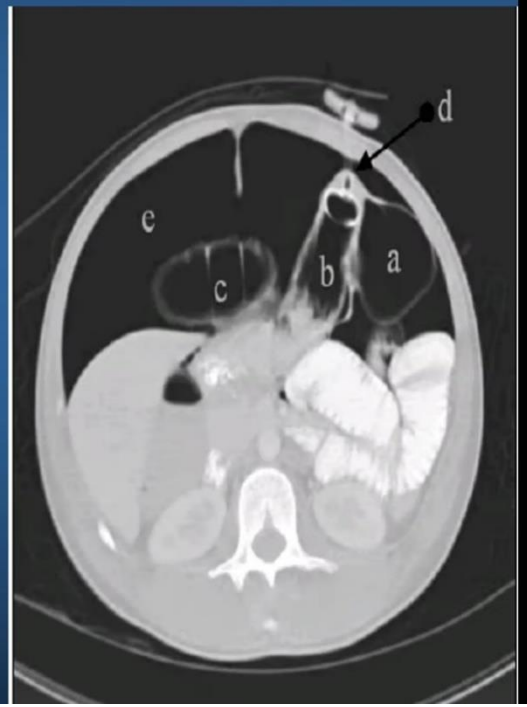

PPN
TPN
Nasogastric tube
Intravenous alimentation
Gastrostomy tube
Jejunostomy tube
Nasoduodenal tube
Nasojejunal tube


Jejunostomy
1 If concurrent surgery
and
2 patient is malnourished
or likely to become malnourished 3
septic pt
upper GI anastomosis
Relaparotomy
Trauma
MCQ Post pyloric is superior to pre pyloric feeding
Better


[percutaneous endoscopic gastrostomy tube]
PEG Tubes
Techniques
Pull through
Push technique
Direct stab
Indications
Neuro disorders
mental retardation
Prolonged feeding
e.g.: small bowel fistula...
Contraindications
Coagulopathy
Bleeding
بتخاف من ال
Peritonitis
Ileus
Anorexia Nervosa
• septic pt

PEG complication:- perforation - air under diaphragm





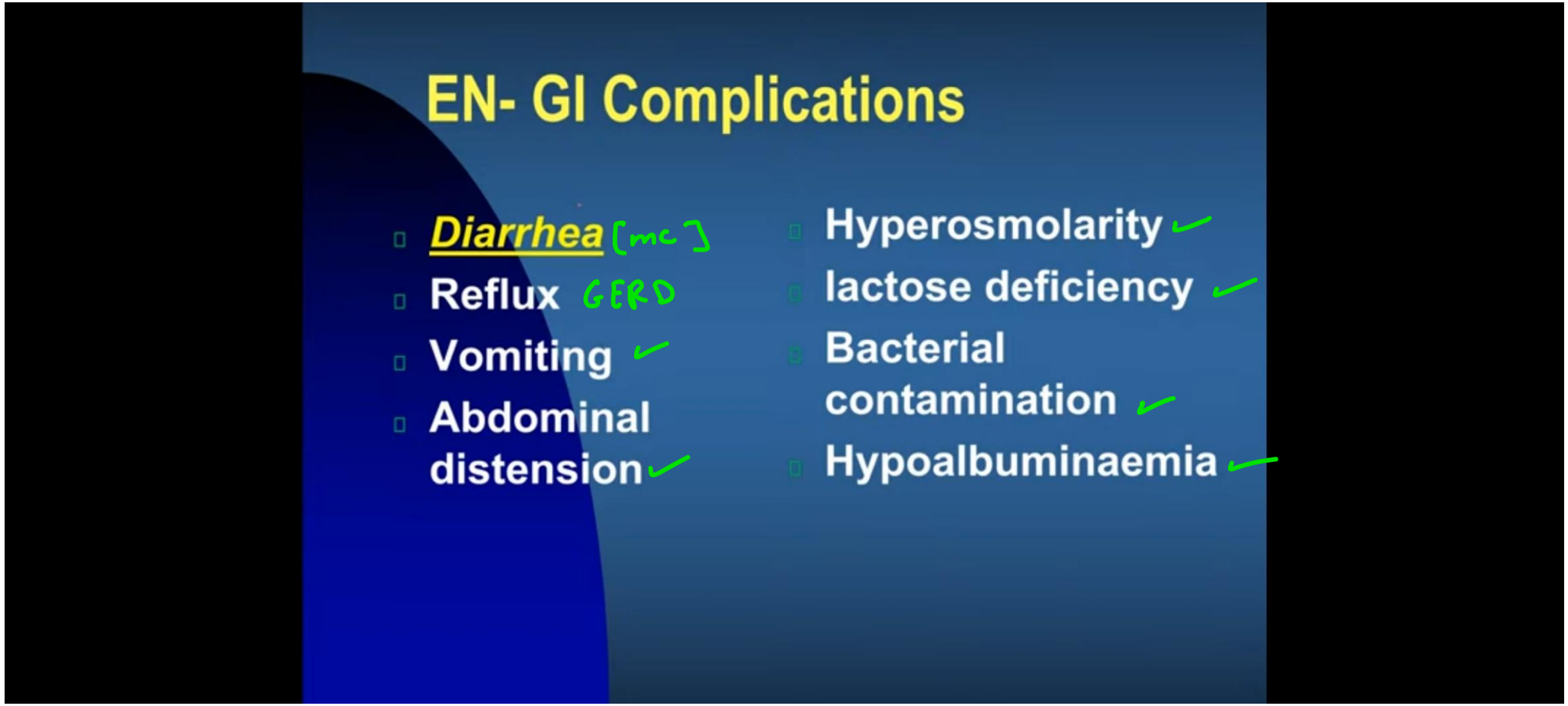
Route & Enteral Nutrition

Up to 4 weeks	More than 3-4 weeks
Pernasal fine bore tubes [naso enteric tube]	Percutaneous endoscopic gastrostomy (PEG)
Naso-gastric or naso -jejunal	Surgical gastrostomy
	Surgical jejunostomy

Complications of Enteral Nutrition

- Gastrointestinal
- Tube-related
- Metabolic




EN- GI Complications
Diarrhea [mc]
Reflux GERD
Vomiting
Abdominal distension
Hyperosmolarity
lactose deficiency
Bacterial contamination
Hypoalbuminaemia

EN- Tube-related Complications

- Malposition
- Accidental removal
- Tube obstruction
- Skin ulceration or necrosis
- Tube breakage
- IV infusion of enteral diet





Complication of Gastrostomy

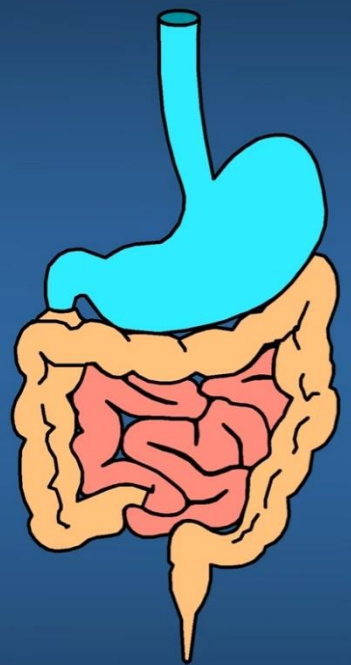
[PEG]

- Skin infections , necrotizing fasciitis.
- Leakage of gastric content to peritoneal cavity. → peritonitis
- Gastro cutaneous fistula.
- Mechanical blockage ,dislodgment.
- Diarrhea ,nausea , vomiting, bloating.
- Hyperkalemia , hyperglycemia, hypomagnesaemia.

Stomach إفراغ المحتويات to the peritoneal cavity...



How do you assess tolerance?



gastrectomy افضل من الـ

Jejunostomy

Advantages over gastrostomy

- Less stomal leakage.
- Gastric, pancreatic secretions are reduced.
- Less nausea , vomiting, bloating.
- Pulmonary aspiration is reduced.

... لهذا تنتفخ و في ما بتظهر الدوخة

* if the nutrition been distal to the dudenum [injujenum] → ↓ duodenal-pancreatic secretion

Delivery of Enteral feed

- Bolus amounts 200-400 ml at 3 - 4hour interval.
- Continuous infusion 50-125 ml hour. او [3L per day max]
- Cyclic feeding 16h feed.

یانی 8hr دیوخت آکل 16hr...

You should aspirate stomach before feed ,if aspirate more than 100ml delay feed for 2 hours.

More than 400ml in 24 hour aspirate, stop feed.

دکتلت طالبیاً یکلوا انه feeding هکذا له عادي without Aspiration...

Gastric emptying improve by

Cisapride , Erythromycin, metoclopramide. (pramine)

these drugs given to increase the gastric Motility [orally]

طعم زاكي لذلك + يحبوه المرضى...

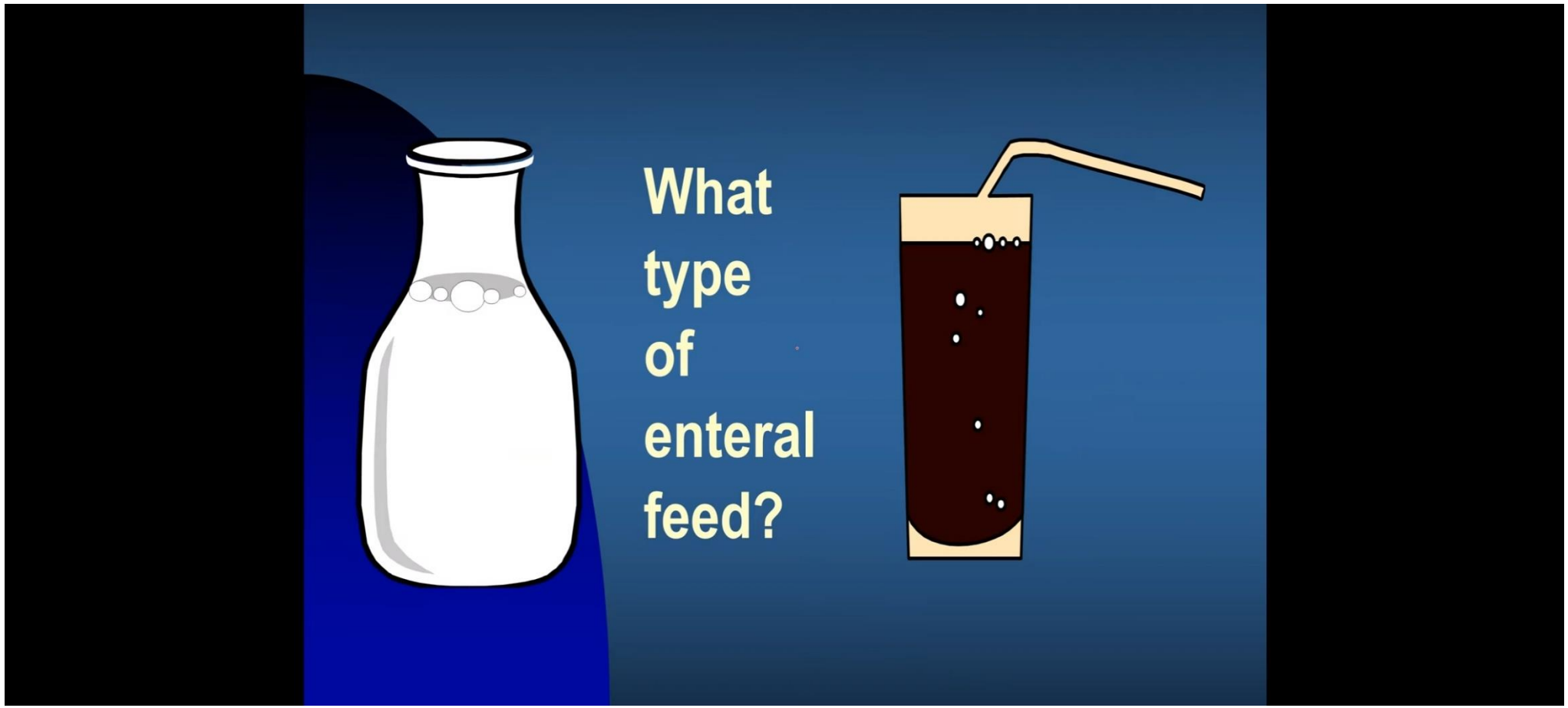
- 250 ml = 250 k calorie
- 25 gm protein → 16 gm N+
- Vitamins, trace elements

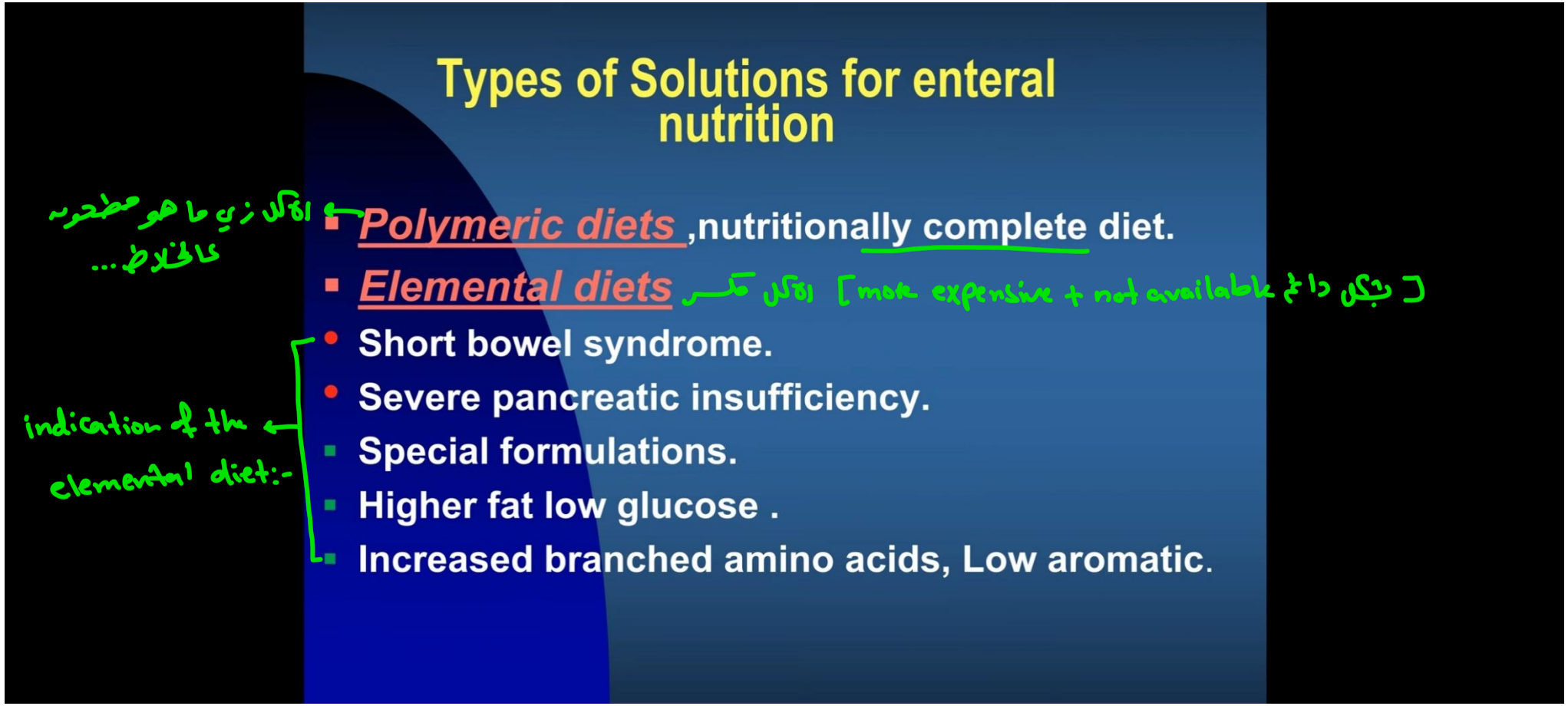
→ used in cancer pts or pts who take chemotherapy..





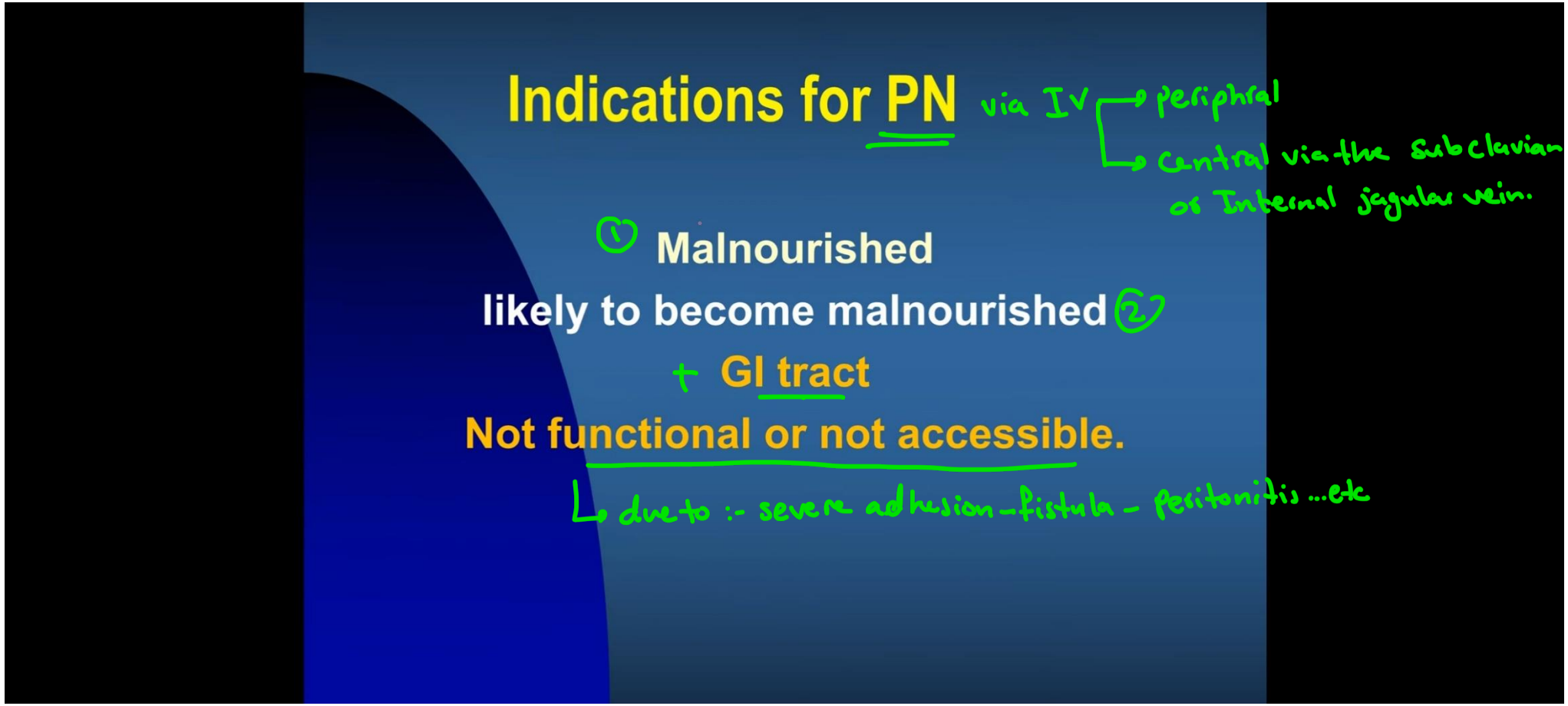



What type of enteral feed?


Types of Solutions for enteral nutrition
Polymeric diets ,nutritionally complete diet.
Elemental diets
Short bowel syndrome.
Severe pancreatic insufficiency.
Special formulations.
Higher fat low glucose .
Increased branched amino acids, Low aromatic.

When should Parenteral Nutrition be administered?




Indications for PN
via IV
peripheral
central via the subclavian or Internal jugular vein.
1 Malnourished
likely to become malnourished 2
+ GI tract
Not functional or not accessible.
due to :- severe adhesion - fistula - peritonitis ...etc

Specific Indications for PN

- Short Bowel
- Intestinal fistulae
- Prolonged ileus
- IBD

- Pancreatitis
- Sepsis
- Burns
- Multiple Trauma

[The GIT not fx]

Parenteral Nutrition



What Route ?

Parenteral Nutrition - Route

① **Peripheral** easier to apply ② **Central** as I in ICU..

Short-term (1-4 /52)

- Marginally depleted

side effects:-

① Thrombophlebitis يتخثر
② large fluid volumes
③ lack of balance

Longer term

- High requirements for fluids, or calories & nitrogen
- Internal jugular
- Subclavian
- Cut-down

→ mc complication is:- Central line sepsis. [fatal]...

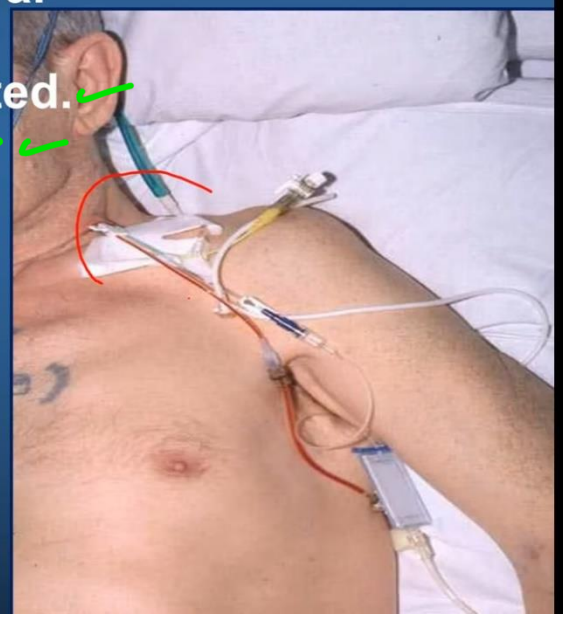
Total Parenteral Nutrition TPN

Peripheral venous access

- TPN for short time.
- Avoid complication of central line.
- Central line is contraindicated.
- Sites used.
- Central vein thromboses.
- Clotting disorders.

Disadvantages

- Limit amount of nutrients used.
- Phlebitis in 50%.



How to increase life span of PL

- Narrow gauge needle for better mixing.
- Avoid sepsis.
- Large vein, frequent change of site.
- Add heparin , small dose of hydrocortisone.
- Vasodilator as transdermal GTN.
- Solutions osmolarity less than 600 mosmol L.

Intravenous nutrition in patient in catabolic state

constituent	Amount prescribed	Example of product	volume
Nitrogen	13.5gm [14gm]	Vamin14 used	1000 ml
Glucose	250gm x4 K.cal	Dextrose 25%	1000 ml
fat	100gm 60.5 L x 9 k.cal	Interlipid 20% 1L = 200gm 2% fat	500 ml
Sodium	120mmol	Nacl 30%	1.97ml
Potassium	80mmol	Kcl 20%	8.36ml
Calcium	5mmol		
Magnesium	8mmol		
phosphate	17.5mmol		

electrolyte

14 x 6.25 protein.

* we give the pt protein to ↑ the immune response + ↑ wound healing + part of it used as a Calori...

* There is Bags free from fat ... used in wars...

Central Parenteral nutrition

[Short Shelif life] 3-4 days ... بسرعة ... fat ... لو كان فيه

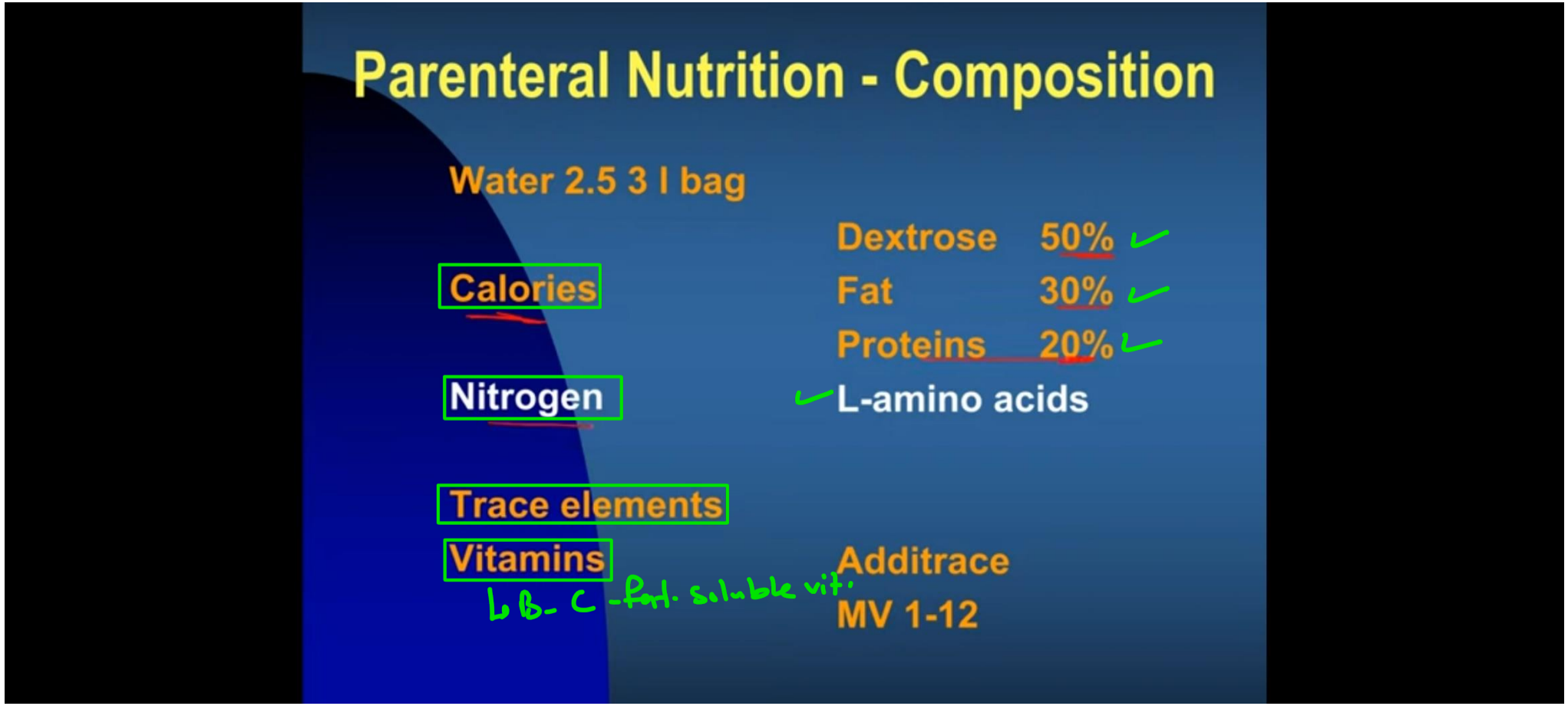


- All in one bag 2.5- 3 L bag.
- Calorie to nitrogen 150:1. [2100 : 14 per day]
- Glucose 50%. [1050 Cal.]
- Fat 30 %. Just. [630 Cal.]
- Proteins 20% [420 Cal]
- Add water soluble vitamins (solivito).
- Fat soluble vitamins(vitlipid).
- Trace elements zinc.

Parenteral Nutrition -

What composition ?



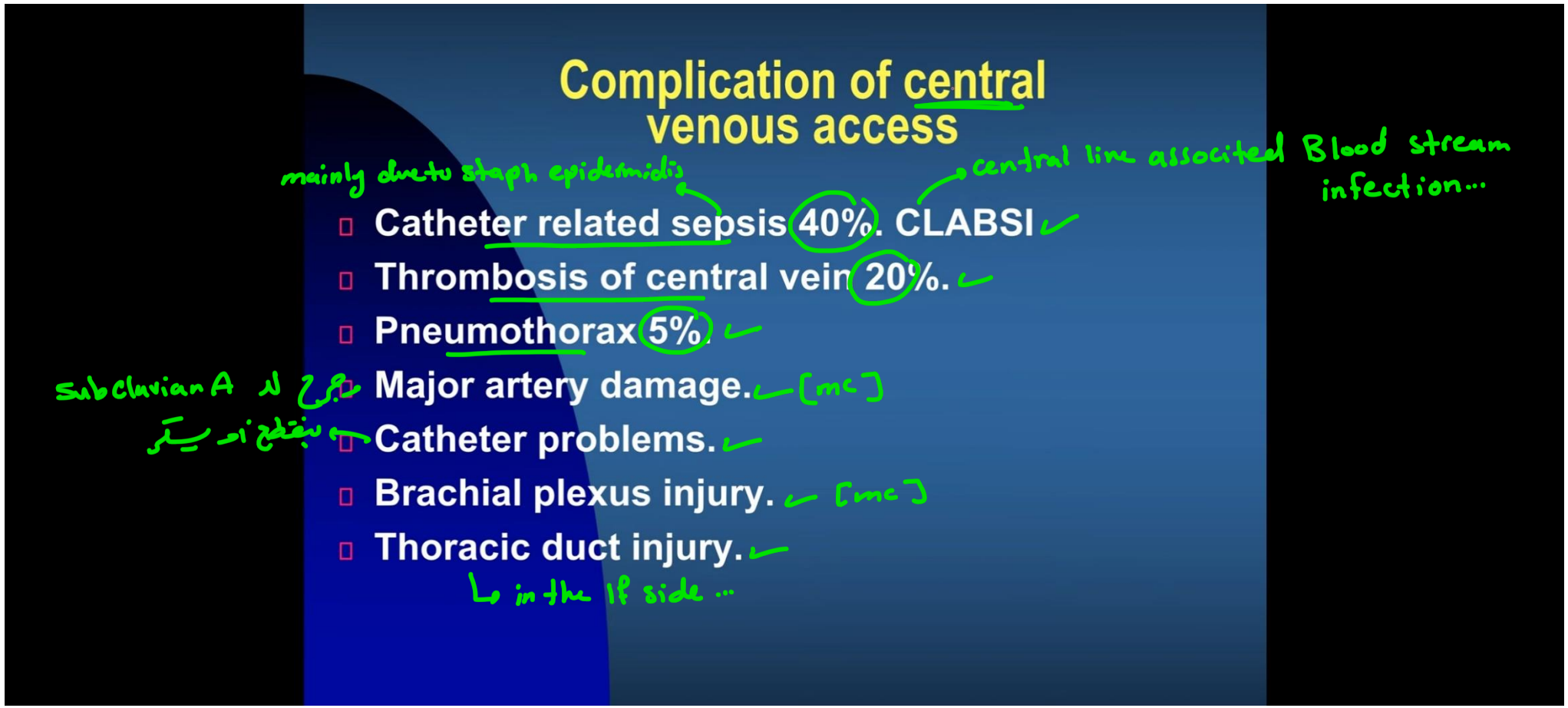

Parenteral Nutrition - Composition
Water 2.5 3 l bag
Calories
Dextrose 50%
Fat 30%
Proteins 20%
Nitrogen
L-amino acids
Trace elements
Vitamins
Additrace
MV 1-12

What about Complications?

I am dying with the help of too many physicians

Alexander the Great

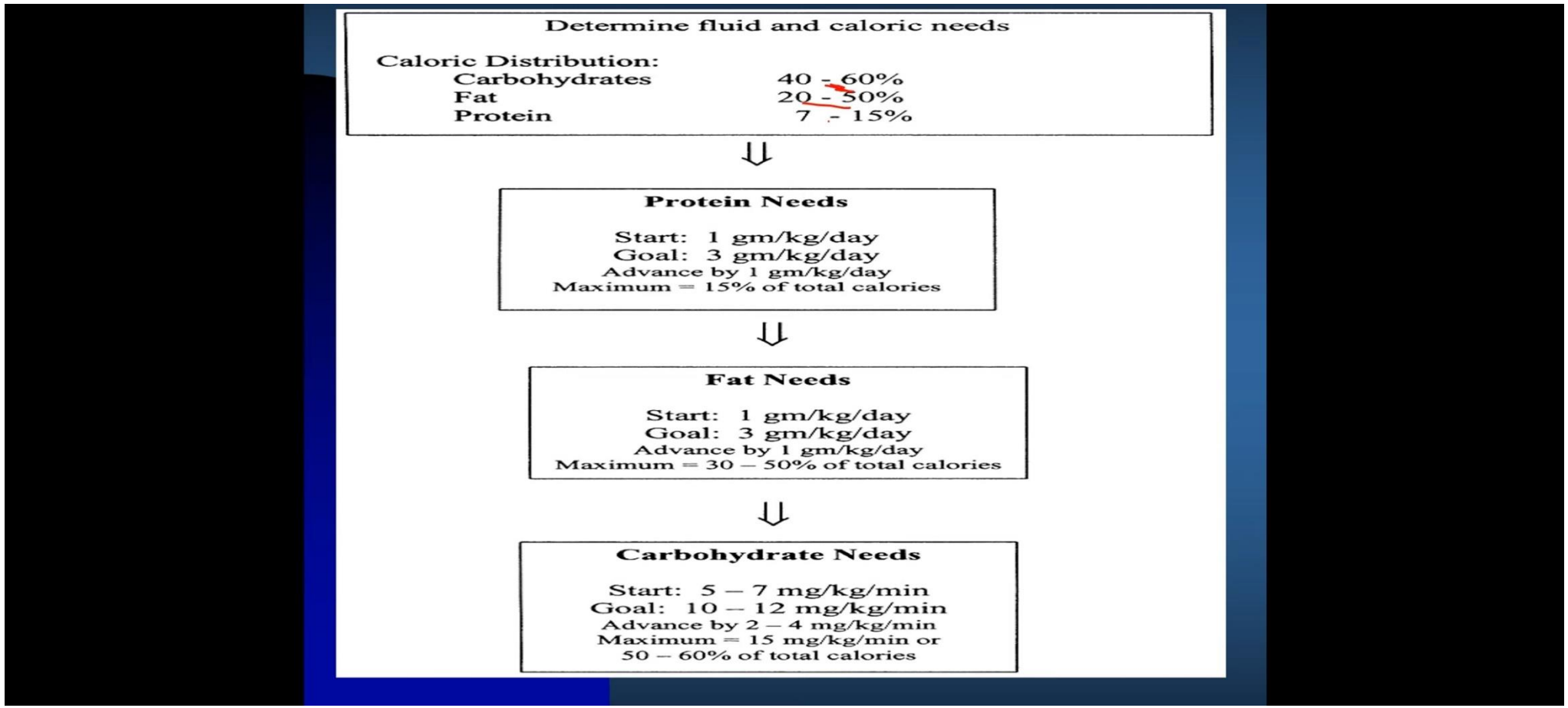



Complication of central venous access
mainly due to staph epidermidis
central line associated Blood stream infection...
Catheter related sepsis 40%. CLABSI
Thrombosis of central vein 20%.
Pneumothorax 5%.
Major artery damage. [mc]
Catheter problems.
Brachial plexus injury. [mc]
Thoracic duct injury.
to in the lt side ...

Pragmatic approach to NS

when to use the central line:-

- Nutritional support used in those *Unable* to tolerate oral diet for
  - 7-10 days (well-nourished)
  - 5-7 days (malnourished)
- Enteral nutrition Safer than Parenteral
- If post-operative Delay predictable then Enteral feeding tube inserted at operation.


Determine fluid and caloric needs
Caloric Distribution:
Carbohydrates 40 - 60%
Fat 20 - 50%
Protein 7 - 15%
Protein Needs
Start: 1 gm/kg/day
Goal: 3 gm/kg/day
Advance by 1 gm/kg/day
Maximum = 15% of total calories
Fat Needs
Start: 1 gm/kg/day
Goal: 3 gm/kg/day
Advance by 1 gm/kg/day
Maximum = 30 – 50% of total calories
Carbohydrate Needs
Start: 5 – 7 mg/kg/min
Goal: 10 – 12 mg/kg/min
Advance by 2 – 4 mg/kg/min
Maximum = 15 mg/kg/min or
50 – 60% of total calories

Bluffer's Guide to PN prescription

30-50

Fluids	30 ml/kg/day
Calories	30 kcals/kg/day
Fat	30% Total

*fluid → 2.5-3 L maintinance..

Nitrogen	Calories/150 (g/day)

Cal:; N → 150:1

Na	1-2 mmol/kg/day (1-1.5)
K	1 mmol/kg/day (0.75-1)
Cl	1 mmol/kg/day

Per 1000 kcal	
Ca	2.5
Mg	4
P	10

Nutritional pharmacology

- Nutrients given in excess of normal intake,
- modulate immune response, and function of normal cell.
- Certain amino acids,eg L- arginine,L-glutamine, branched chain amino acids.
- Essential fatty acids,n-3 linolenic,n-6 linoleic,and arachidonic acid.
- Polyribonucleotides,likepolyadenylic polyuridylic.(PAPU).