EPISODE 4: Understanding The Difference Between Tube Feeding and TPN

Transcript

I once had a patient admitted to the ICU who had a history of alcohol abuse. He was intubated which means he couldn't breathe on his own so he had a breathing tube inserted. He had ascites which is fluid retention in the abdominal area. He had bleeding esophageal varices which is when abnormal veins in the esophagus are bleeding. He needed to receive nutrition. Since he was intubated, he couldn't eat food by mouth. When a patient has bleeding esophageal varices, they often can't receive a nasogastric or orogastric feeding tube because both must go down the esophagus which in this case would cause further irritation to the esophageal varices. With ascites, he couldn't receive a g-tube. But this patient had a functional gut and most importantly needed to be fed. So how do you feed him?

[Music and Intro]

If you feel you need some more clarification between tube feeding and parenteral nutrition, you're not gonna want to miss this episode. By the end, I promise you'll never confuse the two again - at least I hope you won't. I wanted to discuss this topic for a couple reason. For one, you may get a couple questions on the RD exam that are on nutrition support and I want you to nail those questions. But also, I've heard many interns interchange tube feeding and TPN. There is a huge difference between these two different types of nutrition support. One feeds the GI tract and the other goes directly into the bloodstream. And you definitely don't want to mix them up.

So going back to the opening case study. While the patient did have a functional GI tract, it wasn't possible to place an NGT or OGT due to bleeding esophageal varices and a g-tube wasn't possible because of the ascites. The patient ended up needing TPN or Total Parenteral Nutrition in order to meet their nutritional needs. So this was really an issue of access to the GI tract.

So let's start with tube feeding. Tube feeding is the ideal feeding option and the first choice if someone can't eat. Some common reasons someone might not be able to eat is intubation like the opening case study or conditions that affect the mouth and throat such as throat cancer or esophageal cancer. Also sometimes people aren't able to safely eat after a stroke so they may need tube feeding to meet their nutritional needs. When tube feeding is needed, there are different feeding tubes that can be placed in order to reach the GI tract. An NG tube or nasogastric tube is when the tube enters the nose and ends in the stomach. Naso means nasal and gastric

meaning stomach. So if you're asked what an NGT means, it means a tube that enters the nose and ends in the stomach. A patient could also receive an OG tube or oro gastric tube. Oro meaning mouth and gastric meaning stomach. So this tube enters the mouth and ends in the stomach. This is not commonly placed in adult patients but you will see it more often in babies especially neonates. These are the two main feeding tubes that require passage through the esophagus to reach the stomach. These are also temporary feeding tubes. If someone will need a permanently feeding tube or is expected to need tube feeding for an extended period of time, a G-tube or gastrostomy tube is the preferred tube. A g-tube enters the stomach directly from the outside so it needs to be surgically placed. It goes through the belly and ends in the stomach. The nose, mouth, throat and esophagus are bypassed. All these tubes end in the stomach. The way to remember this is because the G represents gastric or stomach. To recap, an NGT enters the nose and ends in the stomach. An OGT enters the mouth and ends in the stomach and a G-tube goes directly into the stomach through the belly.

The placement of the feeding tubes just discussed can also end in the jejunum instead of the stomach. Remember the jejunum is part of the small intestine. The G in the abbreviation is replaced with a J. So let's do that. An NJ tube is a nasojejunal tube. It goes through the nose and ends in the jejunum. An OJ tube is an orojejunal tube. It goes into the mouth and ends in the jejunum. And a J-tube is a tube that goes directly into the jejunum and bypasses the stomach. So why would you need to bypass the stomach? This is not the first route of feeding but it's necessary sometimes such as when someone no longer has a stomach. The procedure when the stomach is removed is called a gastrectomy. Other reasons someone might need jejunal feeds is pancreatitis, gastroparesis and severe reflux which can cause the patient to aspirate. Aspiration is when food ends up in the lungs. Tube feeding is by far the most preferred way to feed somebody who is unable to receive nutrition directly from food.

So now that you're an expert on the different types of feeding tubes, we're gonna move on to tube feeding formula which is the liquid that goes into the tube. There are many different companies that provide tube feeding formula so I'm not gonna go into any of that but what you do need to know is that the formulas can vary significantly from each other. Standard tube feeding formula is formula that has all the nutrition a patient needs such as carbohydrate, protein, fat and the micronutrients which are vitamins and minerals. The nutrients provided are intact meaning the body will need to break down all the nutrients as it does during normal digestion and absorption. The nutrient breakdown is also similar to what we recommend from normal macronutrient distribution which is around 55-60% of calories from carbohydrate, 30% of calories from fat and 15-20% of calories from protein. The formula basically mimics a regular diet. Then there are specialized formulas. These formulas are made for patients with various medical conditions for example diabetes or kidney disease. So for patients with kidney disease, the formulas specific for patients with kidney disease contain lower

amounts of phosphorous, potassium and sodium. They also are concentrated which means that the nutrients are given in less volume. Let me give you an example. A standard formula might provide 1 calorie per milliliter. So for every milliliter the patient receives, they will get 1 calorie. A concentrated formula on the other hand may have 2 kcal/mL. So for every mL the patient receives, they'll get 2 calories. Since they get double the amount of calories, they need half the volume. That's what's meant by concentrated. People with kidney disease are commonly on a fluid restriction so the concentrated formulas help deliver enough nutrition without giving too much fluid. There are also pre-dialysis and post-dialysis formulas. The formulas for patients before they start dialysis are low in protein whereas the formulas for patients who have already started on dialysis are higher in protein. There are specialized formulas for other conditions such as diabetes. Then there are semi-elemental formulas or peptide based formulas as well as elemental formulas. The semi-elemental formulas or peptide based formulas are when the macronutrients are partially broken down. With elemental formulas, the nutrients provided are completely broken down so there is no intact protein. The formula contains individual amino acids. These formulas are for patients who have GI conditions such as short bowel syndrome. The American Society for Parenteral and Enteral Nutrition, also known as ASPEN recommends starting patients on standard, intact formulas first and then trying other formulas such as peptide based or elemental if the patient doesn't tolerate the standard formula. Lastly, there are Food Based formulas. These formulas are made from food and are increasing in popularity.

The last thing I want to cover regarding tube feeding is the feeding schedule. Commonly, if a patient's in the hospital, especially in the ICU, they are placed on a continuous feeding regimen which means that the tube feeding runs continuously throughout the day over a 24 hour period. If the patient needs to be off tube feeding for a certain amount of time for example, say the patient was on continuous feeds but their condition is improving and the team managing the patient would like to see if the patient can eat enough food on their own, you could place the patient on an intermittent feeding schedule which means that they will be off tube feeding for a period of time during a 24 hour period. Nocturnal tube feeds is an example of this. With this feeding regimen, the patient receives continuous feeds for a period of time during the night say from 8pm to 8am and then the feeding is held at 8am for the rest of the day. It restarts at 8pm. The patient might be ordered a diet during the day and their intake will be monitored to see how well the patient is eating their meals. The dietitian would assess and see if the patient is able to meet their nutritional needs from an oral diet. And lastly, bolus tube feeding is what patients typically receive when they have a g-tube. This feeding regimen is closest to how we eat as humans. We don't eat continuously. We have meals throughout the day and maybe snacks as well but we eat at certain times during the day. We're not eating every hour in a 24 hour day. Bolus feeding regimen follows the same schedule. For example, 3 times a day, a patient will give themselves a set amount of formula or a bolus of tube feeding through their tube. This is for people who have a g-tube in place and are usually on tube feeding

long term. This allows the patient to sit at the table with the rest of the family and follows the same eating pattern. It allows for more freedom to walk around and go to the store or to school or work because they aren't connected to a tube or a feeding pump.

So that was a lot and covered the different types of feeding tubes, the different tube feeding formulas and the type of feeding schedule patients may be on. Remember with all of these, the GI tract is being fed. Digestion and absorption continues to occur.

So now let's move on to TPN or Total Parenteral Nutrition. I'm gonna take a minute to first break this down. PN which is Parenteral Nutrition is the umbrella term because it means IV nutrition or that the person is fed into a vein. If the patient is receiving TPN, it means that the patient has a specific type of IV line, centrally placed, that allows the patient to receive a LOT of nutrition. TPN is also called CPN which stands for Central Parenteral Nutrition because the patient has a central line. Now for the RD exam, you need to understand the basics. It's an entry level exam but I do want to do a basic overview for you. There's also PPN or peripheral parenteral nutrition. This means that the IV is peripheral or to simplify it, it's in a smaller vein so you're limited on how much you can give the patient. It's not meant for long term use. The nutrients used in TPN and PPN are the same, they're just giving in different quantities. So what do I mean by that?

Well, the macronutrients are given in IV form. Because the GI tract is completely bypassed, digestion which is the process of breaking down larger food molecules into smaller molecules that are then absorbed from the GI tract into the bloodstream where the body can use the nutrition to make energy can't happen. So the nutrients need to be given in the form the body can readily use. The nutrients provided are dextrose, amino acids and intralipids as well as vitamins, minerals and water. I'll go over this in more detail in a minute.

With TPN or CPN, the line typically ends in the superior vena cava which is a large vessel that can handle large amounts of nutrients or a high osmolarity. With PPN or peripheral parenteral nutrition, the line enters and ends in a small vein which cannot handle a large osmolarity so you, the clinician are limited in how much you can give the patient. I want to make sure you understand the main difference between TPN and PPN. TPN delivers nutrition into a large vein that is centrally located in the body and PPN delivers nutrition into a peripheral vein such as a vein in the arm.

Now, because the nutrients provided are dextrose, amino acids and intralipids, you will need to understand how many calories per gram each provides. This may show up on the RD exam so I hope you're still with me. Dextrose is the form of carbohydrate provided in the parenteral nutrition solution which has 3.4 kcal/gm. Amino acids

which is the form of protein provided in the solution which have 4 kcal/gm and intralipids or fat have 10 kcal/gm. So if you're asked to determine how many calories 100 grams of dextrose provides, you will need to multiply 100 grams by 3.4 kcal/gm. Ok. So this is slightly different than when you calculate calories from CHO in food. When calculating calories from carbohydrates in food, there are 4 kcal per gram of carbohydrate so if someone ate 100 gram of carbohydrate, you would multiply that by 4 kcal/gram to get the calories provided by carbohydrate. Dextrose is the form of carbohydrate in parenteral nutrition which has 3.4 calories per gram. You just need to know and memorize this. Protein is easier because there's 4 kcal/gram in protein from food as well as amino acids from a parenteral nutrition solution. And fat is a little different too. There's 9 calories per gram of fat in food but when calculating intralipids in parenteral nutrition, you calculate the calories provided by using 10 kcal/gram. Again, you just have to memorize this.

Now before you start worrying, I wanted to make this is a little easier for you. So, I created a document that summarizes the information covered in this episode. I'm a visual learner and I know it will help you too especially if you're a visual learner like me. So be sure to go to the link in the show notes and get yourself a free copy of my cheatsheet because I not only want you to pass the RD exam, I really want to make sure you have a good foundational understanding of nutrition support.

Ok, the truth is, we learn best through stories so I'm gonna take a minute before wrapping up to share a story with you. Now warning, this is not a happy story but I'll never forget where I was when I first heard it and it's stuck with me since that day. This story really shows the importance of understanding the difference between tube feeding and parenteral nutrition.

A pregnant woman who was suffering from excessive vomiting and weight loss was admitted to the hospital. The physician ordered the patient to receive tube feeding until the baby was born. The nurse accidentally connected the tube feeding formula to the patients IV. The nurse realized the mistake but unfortunately the woman and her baby both passed away. Putting tube feeding formula into the blood essentially turns the blood into mud. We hear about medical errors far too often in the news and sadly this is not the only time this mistake happened. Fortunately though, changes have been made and now the tube feeding tubing has changed to prevent this from happening again. Now… the tube feeding formula connects to the feeding tube like a lock and key.

I think about this story all the time especially when I hear the term tube feeding and TPN being used incorrectly. I hope that this story reinforces why it's so important to understand the differences between tube feeding and parenteral nutrition.

I want to end on a positive note because that's what we do here. Knowledge is power. No one can take your knowledge away from you. As Benjamin Franklin said, "An investment in knowledge pays the best interest".

Don't forget to go to the link in the show notes and download your free copy comparing the differences between tube feeding and parenteral nutrition. It's one more study tool to help you through the nutrition support questions that just might pop up on the exam. Bye for now.

[Music and Outro]