

A Cuff Leak or a Leak Around the Cuff

There is a Difference



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NOTICE from the Author:

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Recently, a colleague approached me with a situation that I actually run into fairly regularly, especially with some of the *younger* RT's. A colleague of mine, one who is still a fairly 'young' RT, told me that one of his intubated patients' has a cuff leak and asked me if I would assist him with the pilot balloon repair kit. He's never actually used one and was a little uncomfortable. I'm always willing to lend a helping hand, especially to those who are still willing to learn a few things.

Being a rather "old" RT I have seen these scenarios many times before so I am already asking myself if this is an actual cuff leak or simply a leak around the cuff. Each requires prompt attention but they are very different situations. For now I decided to keep that thought to myself and see how this plays out.

When we arrived at the patient's bedside I noticed that the patient was well awake, although confused and moving his head back and forth - looking all around the room. I also noticed the unmistakable sound of air leaking from the patents' mouth with each positive pressure breath from the ventilator. I thought to myself "yup, there's a leak alright". Now I have to ask myself a very important question again; "*Is there a cuff leak or is this simply a leak around the cuff?*"

From this point there are 2 things that need to be looked at. First and foremost you must look at your patient to make sure they are stable and in no immediate danger of respiratory compromise. The second thing you should do is feel the ET tube pilot balloon. Is there still air in the pilot balloon? If the answer is "yes" then you are *not* looking at a true cuff leak. What you are more than likely looking at is a displaced ET tube, and that's exactly what I was looking at.

What happened with my colleague is something that happens more often than not, even with experienced RT's. He heard an air leak from around the ET tube and assumed that there was a cuff leak that needed to be repaired. That assumption was compounded when he added air to the pilot balloon and there was still air coming from the patients' mouth with each positive-pressure machine breath. Over the years I have even seen patients get re-intubated due to a cuff leak that was later discovered to be non-existent. So, I ask again. *Is it a true cuff leak or is it a displaced ET tube causing a leak around the cuff?*

How can we tell the difference? A true cuff leak is when an air leak causes the ET tube balloon to deflate. If you have a true cuff leak then the pilot balloon simply will not hold air. If you check the pilot balloon and it is holding air then you do not have a cuff leak. If you add 2.0cc of air to the ET tube pilot balloon and still have air leaking from around the ET tube you more than likely have a displaced ET tube. A displaced ET tube is actually far more common than a true cuff leak.

There is some risk to damaging the soft plastic of the ET tube cuff during the process of an endotracheal intubation, but once the patient is intubated, and the ET tube is secured, that risk is pretty much gone. There is nothing in the tracheal wall that can spontaneously create a leak in the cuff. However, what CAN happen is the tiny spring valve within the ET tube pilot balloon can become weakened over time. This can cause an air leak and the cuff to deflate spontaneously. In this situation a pilot balloon repair kit is a wonderful tool that works very well.

Can these situations be avoided? Well, there is no way avoid a displaced ET tube 100% of the time but there are things you can do to minimize the risk. One of the best ways to prevent a displaced ET tube is to be certain that the ET tube is in a safe position at all times. This is a little more involved than checking for tube placement at the level of the lip or teeth. There are 2 more things that you must be aware of to be certain that the ET tube is in a SAFE position.

When a patient is intubated there are several tasks that must be performed immediately to be certain that the ET tube is in the trachea and not in the esophagus.

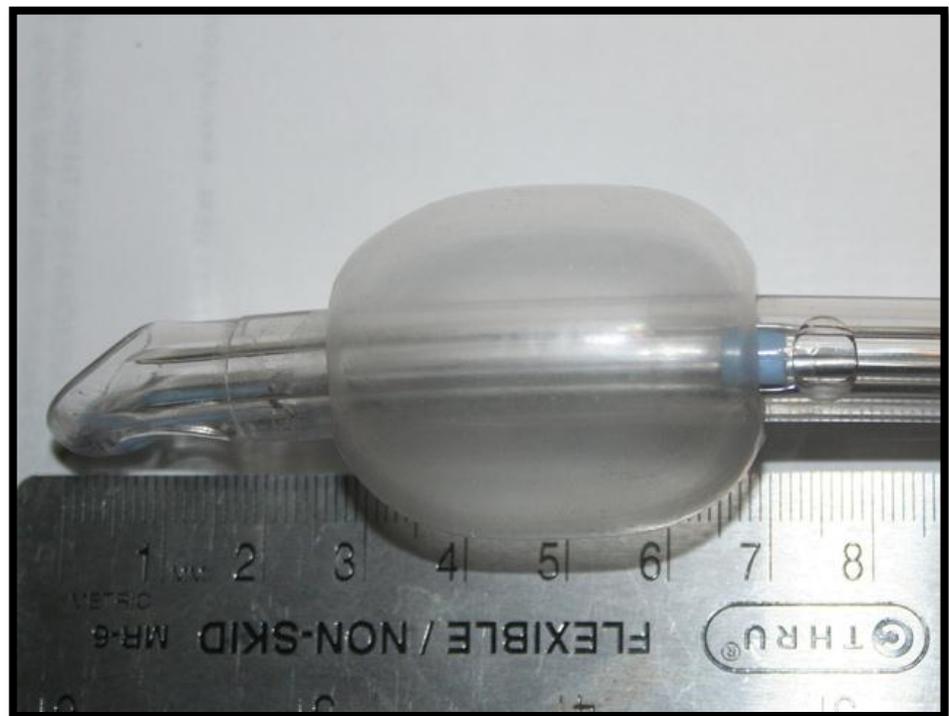
1. Visualization of the ET tube passing through the vocal cords.
2. Capnography or E_TCO₂ detection to verify tracheal intubation vs. an esophageal intubation.
3. Visualization of bilateral chest rise and fall.
4. Auscultation of bilateral lung sounds.

Once these are done and we are certain that the ET tube is in the trachea then the next step is to obtain the *golden-nugget* of tube placement verification; a STAT portable chest X-Ray. This is done for two reasons. 1- so we can document by diagnostic image that the ET tube is in the trachea. 2- so we can be certain that the ET tube is in a SAFE position within the trachea.

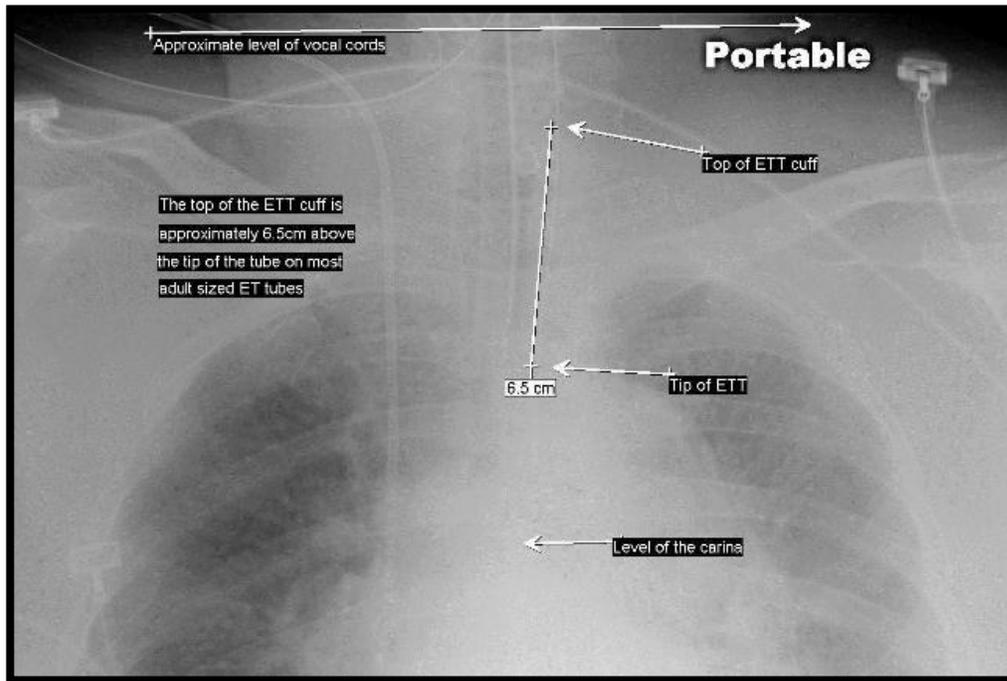
We're always told that proper ET tube placement is between 2 and 4 centimeters above the carina so many of us go by that *soft* rule. Some clinicians use the clavicular heads as a land mark for ET tube placement, and others use the aortic arch (*one of my personal favorites*) as a placement land mark. The purpose behind them is to be certain that we are ventilating both lungs and are at no risk of a right main-stem intubation. While these are all acceptable practices they are only showing us part of the picture. The tip of the ET tube in relationship to the carina, the clavicular heads, and the aortic arch can all be seen on the chest X-Ray but there are a couple of things that cannot be seen that are of equal or greater importance.

1. The vocal cords
2. The ET tube cuff
3. The distance between them

Measuring the distance between the tip of the ET tube and the carina is a very good practice but it only tells us half of what we need to know. Measuring the distance between the top of the ET tube cuff and the level of the vocal cords is also very important. It tells us if there is a risk of accidental ET tube displacement. An ET tube placed at 4.0cm above the carina may be a safe position for some patients but it is not a safe position for all patients. Consider the patients who have a shorter thorax. In these patients an ET tube placed at 4.0cm above the carina might place the ET tube cuff right at the level of the vocal cords. This



This might be okay for a patient in the operating room who is paralyzed and under general anesthesia but a patient in the ICU is a different story. They are being moved on a regular basis.



The bedding gets changed, the patients get bathed, patients get repositioned, etc... Something as simple as a pillow getting placed under the patients head to make them comfortable can easily displace the ET tube. We must keep in mind that often times when the head looks downward the ET tube can actually migrate upward. Optimally there should be at least 2.0cm between the top of

the ET tube cuff and the level of the vocal cords, but if we can't actually see these things on the X-Ray how can we safely place the tube?

Consider this. Most facilities use ET tubes from one manufacturer. Get to know your tubes. Measure them. On most adult sized ET tubes the top of the cuff is approximately 6.5 – 7.0cm above the tip of the tube. There is some variation to this so measure your ET tubes to be certain. If your facility uses a digital imaging system there is more than likely a ruler tool that will allow you to draw a line from the tip of the ET tube upward to 6.5cm above it. That line now represents the ET tube cuff. The next step is to locate the approximate level of the vocal cords. It is actually fairly simple. Draw a line (you can even eyeball this if you are comfortable with it) from shoulder to shoulder – NOT the bones, the actual top of the patients shoulder. They can usually be seen on the X-Ray. That straight line now represents the approximate level of the vocal cords. *(You can try this on yourself. While looking in the mirror use your hand and “draw” a straight line from one shoulder to the other. Stop when you get to your neck and you’ll notice that you are just about at the level of your own vocal cords).* Now you can using the systems ruler tool you can measure the distance between the top of the ET tube cuff and the approximate level of the vocal cords.

You’ll notice in the image of the ET tube above that there is also a radio opaque marker and a hole just above it. The ET tube in the image has a subglottic suction port. The marker is present so the location of the suction port can be seen on chest X-Ray. Coincidentally the marker also happens to be right at the top of the ET tube cuff. If you use these tubes at your facility then finding the top of the cuff is even easier and all you have to do now is look for the level of the vocal cords and measure the distance.

In my experience most intubated patients have a portable chest X-Ray taken every morning. At the beginning of each shift it is a good practice to view the most recent chest X-Ray and check

for ET tube placement, measuring not only the distance between the tip of the ET tube and the carina, but also the distance between the top of the cuff and the approximate level of the vocal cords. This is a very simple task, it is almost fool-proof, and it only takes a couple of minutes. It sure seems worth it to me...

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