A 50-year-old woman presenting after a motor vehicle collision

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Dr. Daniel McGillicuddy: The patient is a 50-year-old woman who was involved in a single car, high-speed motor vehicle collision. The patient was an unrestrained driver in a car without air bags who sustained severe blunt force facial trauma secondary to the steering wheel, and was brought in as a non-trauma to this community hospital. She was also intoxicated and agitated. The patient was unable to provide a past medical history, social history or any information with respect to the accident. The pre-hospital fingerstick glucose level was normal. The patient's vital signs were a heart rate of 88 beats/min, a blood pressure of 160/palpation mmHg, a respiratory rate of 24 breaths/min and an oxygen saturation of 96% on room air. The patient did not have a temperature recorded. The physical examination revealed a patient who was awake, but agitated. She was in cervical spine immobilization as well as immobilized on a spine board. The head examination revealed blunt trauma to the left orbit and mid face. She had periorbital edema on the left, bilateral massive epistaxis, and

she was actively vomiting blood. The midface was stable, the trachea was midline, and she had normal bilateral breath sounds. The heart sounds were regular, there was no jugular venous distention, and the pulses were full throughout. The abdomen was obese, soft and non-tender. The FAST examination was without free fluid. The pelvis was stable. The Glasgow Coma Score was 12 due to altered speech. The back and extremity examinations were normal.

Dr. Peter Rosen: Dr. Ban, what is your assessment of this patient?

Dr. Kevin Ban: The intoxicated, combative trauma patient presents unique challenges for the Emergency Physician (EP). The combative behavior may be secondary to any number of underlying causes, including intoxication (drug or alcohol), head injury, hypoxemia, hypovolemic shock or underlying medical conditions (diabetes with hypoglycemia). The most important priority for the EP is to obtain immediate and definitive control of the patient's airway to facilitate treatment and diagnosis of the severely injured patient. There is controversy as to whether or not to paralyze these patients or to sedate them without additional neuromuscular blockade as is usually done in a rapid sequence intubation (RSI).

Dr. Rosen: Dr. Davis, what is your opinion regarding intubation with sedation alone versus a RSI with neuromuscular blockade?

Dr. Daniel Davis: This is going to be a tough airway, and I'm a bit reluctant to paralyze someone like this. She has multiple features that raise concerns about being able to intubate her successfully: obesity, c-collar, facial trauma, blood in the airway. It is reasonable to consider ketamine in this patient, which might allow an attempt to inspect the

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airway—perhaps even with a laryngoscope—to see what we’re dealing with.

Dr. Rosen: I have long been convinced that morbid obesity, which I define as greater than 100 lbs more than your ideal weight, is a contraindication to a surgical airway. We had a number of morbidly obese patients in San Diego when I was there in whom we found that we could intubate them orally, but when we tried to intubate them surgically the anatomy just got totally lost in the ocean of fat that surrounded their trachea. If this patient had not been morbidly obese, I probably would have reached immediately for a knife to control the airway after giving whatever drug you would want to give to try and get some chemical restraint on the patient. Do you feel as strongly about not doing surgical airways in morbidly obese patients as I do, or have you been more successful?

Dr. Davis: I can’t say that I’ve had to do many cricothyrotomies on obese patients, so I can’t speak from personal experience, but our air medical experience and teaching emphasizes that cricothyrotomy is a tactile rather than a visual procedure when performed while the patient is still perfusing. In some sense, the cadaver labs that we use for training are counterproductive in that they teach what to look for in a patient with no bleeding, and in most cases, little fat. The most important lesson is that you should be willing to cut sooner rather than later, but to expect significant bleeding. The less sure you are of the anatomy, the bigger the initial incision should be. This allows you to dissect down quickly to structures that are recognizable by feel rather than appearance. You can often palpate structures that might not have been palpable through the skin. I feel confident that a cricothyrotomy is feasible, even with morbid obesity.

This particular patient is awake with clear evidence of nasal trauma, so I’d like to suggest that perhaps she has a major nose bleed, and that we should try to stop the bleeding with packing or a RhinoRocket. We could even insert a Foley catheter, inflate the balloon, and retract to tamponade the nasopharyngeal vessels. While inserting something into the nose with a potential cribriform plate fracture may be a relative contraindication, I would contend that this may address the airway issue, and obviate the need for a more risky procedure, such as RSI and intubation.

Dr. Rosen: I think that is a very good suggestion, and I think that the danger of putting anything in the nose when there is potential for cribriform plate fracture is more dependent on the diameter of the tube that you’re putting in. Epistaxis control is a very good suggestion, and I personally would not hesitate to put a Foley catheter in both nostrils to try and get control of what is undoubtedly a

posterior bleed before you worry about attacking the airway, which then might be more amenable to a videoscope. Dr. Sanchez have you any experience with controlling nasal bleeding in a trauma patient?

Dr. Leon Sanchez: Not to the degree that this patient seemed to present. In the case that Dr. McGillicuddy is describing, it seems like the amount of blood was prohibitive to doing any procedure that required the visualization of the cords.

Dr. Rosen: I think that’s the usual case, most patients with facial injuries have initial fairly vigorous bleeds, but are almost stopped or trickling by the time they get to the emergency department (ED). That unfortunately was not Dr. McGillicuddy’s luck with a patient who was having major hemorrhage from the nose. Were there any other concerns that this bleeding may not have been from the nasal site?

Dr. McGillicuddy: She clearly had massive epistaxis bilaterally, however it was difficult to assess if she had a secondary source of bleeding due to a primary stomach or pulmonary process. I felt that the blood she was vomiting was most likely due to swallowed blood from the epistaxis.

Dr. Rosen: Did you have any concerns that this might be esophageal variceal bleeding because I’ve seen some of those patients hemorrhage with what looked like arterial blood?

Dr. McGillicuddy: In all honesty it didn’t cross my mind at that time, as the patient had just been involved in a major motor vehicle crash, and had signs of midface injury. Looking back on the situation now, I think it is right to include other possible causes of bleeding as premature diagnostic anchoring to trauma as the sole cause of bleeding could have led us down the wrong diagnostic pathway.

Dr. Daniel Davis: I’m going to ask a provocative question: Would anyone—not knowing anything about her c-spine or brain—allow her to assume an upright position to avoid choking or aspirating on her blood? Just as we learned in Boy Scouts that we should have someone with a nosebleed sit up and lean forward, should we attempt the same despite the risk to her neck? It may be a clinical judgment that is worth the small risk of exacerbating a spinal injury to avoid a dangerous procedure.

Dr. Rosen: Again I think it’s rare for central facial injuries to have cervical spine injuries when the force is directly transmitted through the face without any torque on the neck. I think that you can stabilize the cervical spine as you sit a patient upright, and I think that would’ve been my preferred approach to try and manage this patient’s airway:

to try and prop her up with the neck stabilized, leaning the patient forward, and suctioning while she's in that position, and sliding a nasotracheal tube down her by getting on the gurney and standing up behind her. I've done that several times, and think it works quite well. It's a little bit scary because it's a blind procedure, and we have become very accustomed to seeing what we're doing, but with this much hemorrhage in the airway I'm not sure that any of the videoscopes are going to work well, and it's probably going to be a blind procedure anyway. That's a very good question, and I think the answer is that we have to temper our routine practice for the individual patient variations that we see. There are times when we have to take the approach that we consider suboptimal because it's the only one that's going to work in that particular situation.

Dr. Richard Wolfe: Agreeing completely with the care needed for the c-spine, I would add that for the head theoretically sitting them upright is actually a good thing because it decreases intracranial pressure.

Dr. Rosen: Dr. Ban, you mentioned the difficulty of stabilizing the airway in patients who are combative. Do you have any suggestions for the group?

Dr. Kevin Ban: Rapid tranquilization of a combative patient may be necessary in order to manage the patient more effectively. One can temporize the patient's clinical status by using haloperidol as a sedative agent. While this is a safe approach that will not depress the patient's respiratory drive, there has been recent discussion about QT prolongation by haloperidol, as with droperidol, in susceptible patients leading to Torsades Des Pointes. An ECG tracing demonstrating a normal QT interval can allay this concern, but it may be difficult to obtain if the patient's clinical status does not permit such monitoring. There have been recent case reports suggesting the use of haloperidol in severe brain injured patients may lead to neuroleptic malignant syndrome, but there have not been any conclusive studies that have shown this to be true.

Another option is to use ketamine to sedate the patient. Ketamine will provide adequate sedation and control without contributing to worsening hypoxemia or hypotension in the trauma patient. In the past, there was concern ketamine might increase the patient's intracranial pressure, but there is scant evidence in the literature to support this conclusion [1]. One should be careful when using opioids to sedate intoxicated patients since there may be a synergistic effect that depresses the patient's respirations leading to worsening hypoxemia and hypotension.

Dr. Rosen: What did you do Dr. McGillicuddy?

Dr. McGillicuddy: I decided to get control of the nasal bleeding to better assess the airway. I therefore decided to

nasally pack the patient regardless of what the possible injuries were. I placed a bilateral posterior packing in an attempt to gain control of the bleeding, and to allow me better visualization of the airway. At that the same time I placed a page up to the OR to see if I could have an anesthesiologist bring a videoscope to the ED. At this hospital they don't have any sort of rescue airways in the ED with the exception of a non-intubating laryngeal mask airway (LMA). So I called the operating room and asked them to bring down the glidescope with the thought of doing an oral, awake intubation. I was also obtaining the cricothyrotomy kit, and preparing the neck for a possible surgical airway. The packing of the nares did slow the bleeding, but I still felt that visualization of the airway would be nearly impossible with the patient in a supine fashion due to the extent of bleeding. Therefore, I did what already had been discussed, which was to get her off the backboard and sit her up to 40° to see if I could obtain more optimal intubating conditions. The anesthesiologist and I attempted an oral awake intubation, and were unable to gain adequate visualization. Therefore we proceeded with RSI with the patient sitting up at 40°, and I prepared the neck for cricothyrotomy. The anesthesiologist and I were able to intubate the patient via direct laryngoscopy (DL), so cricothyrotomy was not performed. She was going to be a difficult cricothyrotomy as she had no visual or palpable landmarks.

Dr. Rosen: I have been involved in a number of cases of difficult airways in obese patients. One should do everything possible to surgically stay out of the neck of a morbidly obese patient. I think it's a contraindication. I think ketamine would have been a big assist in this case, and I think perhaps retrospectively, and I compliment you on getting this patient intubated as you did, but retrospectively perhaps posterior packings would have been useful in this patient. When you see that amount of massive bleeding in a nose I think it's rare to be anterior, so anterior packs just tend to push the blood posteriorly which appears nice. You no longer see the hemorrhage, but then it's not so nice when you have to go into the posterior airway for an intubation. Dr. Sakles, do you think the glidescope works better than the c-scope when you have massive bleeding like this?

Dr. John Sakles: I don't think I have enough experience to know how they deal with bleeding. They definitely perform worse with blood than without the presence of blood. In fact I just did an analysis of about 900 intubations at our hospital the last two years. The success rate of the glidescope over direct laryngoscopy was substantially higher if you had a c-collar on. It was like 90+% with the glidescope and about 75% with DL. However, if you had a c-collar and blood in your airway the success rate of

glidescope dropped to about DL which was about 75%. So if you only have a c-collar on the glidescope is much more effective than direct laryngoscopy. If you throw in blood into the mix, it reduces the effectiveness of the glidescope to about the same level as DL. So you certainly are not going to be as successful in the presence of blood, but I think it's worth a try because the success rate is still reasonable. About 75% on your first pass.

Dr. Rosen: What about the other scope you were showing me recently. I thought it was called a c-scope.

Dr. Sakles: It's the c-mac. I imagine it would function about the same as the glidescope. I just don't have enough data on it yet to know that. One of the problems is the camera is more distal on the c-mac than the glidescope and it might be more subject to contamination from blood and secretions because it's close to the tip of the blade. At this point I would probably say they are about comparable in their ability to withstand contamination from blood.

Dr. Sanchez: How about using a bougie as a primary adjunct for bloody airways because then if you can see the cords you can just pass the tube, but if you can't you can just use the bougie as it was meant to be used, as a blind intubating tool?

Dr. Rosen: I don't know why it wouldn't work as it is used as a rescue device, because the nice thing about the bougie is that you can feel it clicking it's way down past the tracheal rings. So I don't see any reason why you can't try that, but obviously anything you can do to minimize the amount of blood in the airway including using double suction devices and patient positioning, I think, is worth trying.

Dr. Wolfe: When we discussed this case at our M&M conference, the other sort of airway that was brought up as a possibility was a retrograde. Notably when you are scared of going to a cricothyrotomy when you have a small mouth and the visualization to try and get a guide wire in. Now, clearly with this neck it might be difficult to even get a wire there, but I would assume going midline you could get it to the trachea. What would you think about that approach?

Dr. Sakles: I think the most reasonable rescue device for a situation like this as well as the previous case is an intubating LMA. We've got a set of intubating LMAs that probably cost a few hundred dollars to maintain. There are three different sizes of intubating LMAs and they've probably got us out of more difficult situations than any other device, because the intubating LMA allows you to get an airway when you can't see anything. Whether it's because of anatomy, vomit, blood, whatever it is. It's one of the true blind devices that work incredibly well. If you put the intubating LMA in there, and you blindly put a tube in; you have a 95% chance of that tube going into the

trachea. We've done in this last year and half, probably about 8 or 10 intubating LMAs as a rescue device. I'm pretty confident that if an intubating LMA had not been available, a lot of those patients would've gotten a cricothyrotomy. Therefore the intubating LMA is what I would go to first. Retrograde intubation I've done in the cadaver lab, but I've never done one in real life, and I don't know if I'd be comfortable doing it in a situation like this.

Dr. Wolfe: I've done about 20 in the real setting. At a point when we were looking at studying that in Denver years ago and despite the literature we found that it would go well about two-thirds of the time, but one-third of the time it would really get caught up at the cords or it would be very hard to retrieve the wire.

Dr. Kenny Bramwell: My experience with retrograde intubation is admittedly confined to a fair amount of cadaver experience, and I found this to be an interesting exercise anatomically, but overwhelmingly frustrating in about half of the cadaver patients. I would think that in someone who is morbidly obese that if you were to go through the trouble of finding the cricothyroid membrane, just finishing the surgical airway would be an easier way to go rather than trying to manipulate the wire.

Dr. Rosen: Another possibility if you can sedate the patient adequately, and ketamine would be a good way to do that, would be to digitally intubate the patient. That's a procedure you don't want to do on a patient who still has muscle power with which to bite you, but in an unconscious patient it works reasonably well. Given the magnitude of facial trauma, if the mandible were broken, then you should take advantage of that, you can increase the visibility of the airway very successfully by lifting on the tongue and pulling the tongue forward. Then you completely open up the airway and frequently may visualize an airway that was heretofore totally obstructed.

Dr. Davis: With regard to use of an over-the-wire cricothyrotomy kit, we should remember that an open approach can still be taken. The kit contains a short blade, and a regular scalpel may also be used to incise the skin, allowing better palpation and identification of airway structures. It's also worth remembering that the suction catheter should be placed as far upstream toward the source of bleeding or fluid to keep the peri-laryngeal structures clear. In this case, placing the suction tip behind the uvula and pointing upward might work well, while a near-drowning may require insertion of the suction tip into the esophagus.

Dr. Rosen: Very good point. Dr. McGillicuddy, there was another interesting aspect to this case that perhaps you could share with us before we finish today.

Dr. McGillicuddy: After we were able to get the patient successfully intubated, the patient clearly needed to be transferred to a trauma center. An aero-medical service had been called. I sent the patient to who was hemodynamically stable for a CT scan while we were awaiting aero-medical response. The CT scan showed a retrobulbar hematoma as well as multiple facial fractures. The head CT scan showed no intracranial bleeding. The Chest and Abdominal CT scans had not been processed. As she had a retrobulbar hemorrhage on CT, and I was unable to assess the visual acuity, I reassessed the eye which had become proptotic as well as having a fixed and dilatated left pupil. I made a quick call to the radiologist who stated that there was no intracranial injury to explain this finding on the CT scan

except for the retrobulbar hematoma. I, therefore, performed a lateral canthotomy on the patient to relieve the retrobulbar hematoma as the patient was going to have a long ambulance ride to the trauma center as the aero-medical service was not flying due to inclement weather.

Conflict of interest None.

Reference

1. Himmelseher S, Durieux ME (2005) Revising a dogma: ketamine for patients with neurological injury? *Anesth Analg* 101:524–534