

Anesthesia for Non-obstetric Surgery During Pregnancy

2017

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Dr. Alan Jay Schwartz: Hello. This is Alan Jay Schwartz, Editor-in-Chief of the American Society of Anesthesiologists' 2017 *Refresher Courses in Anesthesiology*, the latest research and educational findings. The focus of the *Refresher Courses in Anesthesiology*'s CME program and the modules featured is to educate learners on current developments in the science and clinical practice of the specialty of anesthesiology. Returning for a second year, we will be speaking directly with individual authors to learn about their expertise, perspective and insight regarding the featured module.

Today, we're pleased to present the following one-on-one conversation with fellow RCA editor Dr. Amanda Burden and author Dr. Yaakov Beilin. They will be highlighting the module titled "Anesthesia for Non-obstetric Surgery During Pregnancy."

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Dr. Amanda Burden: Hello, and welcome. I am Amanda Burden. I am Associate Professor of Anesthesiology, Director of Clinical Skills and Simulation for Cooper Medical School of Rowan University, and I am here this morning as part of the ASA Refresher Course lecture series with Dr. Jake Beilin, who is Professor of Anesthesiology and Obstetrics, Gynecology and Reproductive Sciences, as well as Director of Obstetric Anesthesia at the Icahn School of

Medicine at Mount Sinai. And he's going to talk with us today about anesthesia for non-obstetric surgery during pregnancy.

Dr. Beilin's topic is extremely important for us, as his lecture itself describes several aspects of anesthesia for non-obstetric surgery during pregnancy, including the physiology of pregnancy and its implications for our purposes; understanding the concepts of what a teratogen is; the risks to the mother and the fetus for a pregnant woman who presents for non-obstetric surgery; and then, of course, helping us formulate a plan. So, I really encourage everyone to read his full lecture. It is excellent and very helpful, and very timely.

The topic itself is of tremendous interest to all of us as ASA members, as there are many surgeries for non-obstetric procedures during pregnancy. In fact, there are about 4 million deliveries per year in the United States and there are about 80,000 anesthetics to pregnant women per year, and many are going to have surgery either performed before the pregnancy is recognized or after the pregnancy is recognized. Dr. Beilin's lecture is very helpful, and he's going to discuss how we address these issues and how we care for the pregnant woman and for the unborn fetus.

Dr. Beilin, welcome, and thank you so much for doing this for us.

Dr. Yaakov Beilin: Okay. Good morning, everybody. So, Dr. Burden, you're correct: having surgery while pregnant is quite common, with about 80,000 patients per year presenting to the operating room while pregnant.

There are many misconceptions in regard to caring for these patients. First of all, the patients themselves are always concerned about their baby. And what mother is not? They're concerned that – in particular, that the anesthetic may cause birth defects; and they're, of course, concerned about whether or not they'll lose their baby. But I would say the concern about birth defects seems

to be the greatest one that I hear in the holding area, even before we go into the operating room, because patients have spent the last nine months being very good about what they ingest. They know that anything they eat goes to the baby, and now they're about to get an anesthetic. So, they're concerned about birth defects in particular, and a little bit about whether or not they'll lose the baby.

Other MDs are also concerned, especially about birth defects. I find that quite fascinating, and we're going to get into that a little bit later, because birth defects are one of the things that you probably don't have to worry about at all, because the anesthetic agents—and we're going to discuss this later—are not teratogenic; do not cause birth defects. But other MDs—and when I talk about other MDs I mean non-anesthesiologists—I've heard them also voice that same concern.

And then the anesthesiologists also have concerns. I will frequently get a call from one of my colleagues because they're caring for a patient that is pregnant, and in particular they want to know if they can use specific drugs. What drugs can I use, can I avoid, do I need to avoid, and what monitors do I need to use? So, the patient who presents – when the anesthesiologist is confronted with a patient who's pregnant, everybody gets very concerned, and for good reason, because this is one of the only times that the anesthesiologist actually has to have two patients in mind. They have to be concerned about both the mother and the fetus. Usually when we anesthetize the patient, we're only worried about one person. This is one of the very rare situations where we have to worry about both.

And when it comes to the baby, everybody's concerned about birth defects. And birth defects, in particular the concern that the medication or that what will happen during the process will be teratogenic, and that is, that it will increase the risk of congenital defects. This is really something that obviously you have

to be concerned about; but the good news is that none of our anesthetics are teratogenic—cause birth defects. We really can take that off the table. So, when the mother asks you, “Is this going to cause a problem for my baby; will it cause birth defects?” you really can be very confident in telling them, “No, it will not.” The only medications that are somewhat controversial that the anesthesiologists need to be aware about, is midazolam or your benzodiazepines, and maybe nitrous oxide. Those are the ones that everybody’s always concerned about, and we’re going to now discuss those two medications.

So, all medications have an FDA category in terms of how safe they are during pregnancy, and they’re categorized as A, B, C, D and X. I like to think of it as the ASA classification 1-5, where 1 is a perfectly healthy patient and class 5 is a patient that is moribund. Same thing here: a Class A drug would be perfectly safe; B, C and D are getting riskier; and X would be absolutely contraindicated. None of our medications are Class X drugs, and the benzodiazepines, or midazolam and diazepam, are Class D.

And a Class D drug—the way it’s worded is that it’s – a medication should only be used if the benefits outweigh the risk, because there’s some suggestion that the medication could cause a birth defect. And that’s where midazolam and diazepam live. And that suggestion came from the – I believe either the ’70s or the ’80s, where there was some thought that patients that took diazepam, that their babies had a higher incidence of cleft lip and cleft palate. Now, that may or may not be true. It’s hard to refute old data. But that’s why it got a Class D classification.

So, if you want to be perfectly safe, 100% careful, then you would avoid midazolam and diazepam during your anesthetic agent during your anesthetic technique. But I always tell people that if the patient is exceedingly anxious, anxiety is not good for the mother, is not good for the baby either, because that increases catecholamines, and giving a small dose of midazolam is highly

unlikely to cause any problem whatsoever. Nonetheless, the better part of valor is to simply avoid it.

Nitrous oxide is also a medication that people are concerned about. There, it's important to realize there is absolutely no data to suggest that it's a problem in humans. Nitrous oxide – the reason people are concerned about it is that it inhibits methionine synthetase, and methionine synthetase is necessary in the DNA pathway for the creation of thymidine. So, there is this very, I'm going to use the word theoretical, concern that nitrous oxide can inhibit the development of thymidine, which of course is part of DNA. But it's very theoretical. There's no data that nitrous oxide causes birth defects to a greater degree than any other drug, and nitrous oxide really is safe during pregnancy.

As a matter of fact, nitrous oxide, though, doesn't have one of those FDA classifications of A, B, C, D and X because it's classified as a medical gas, not as a medication. So, it doesn't even get that classification. Nonetheless, nitrous oxide has always been something people are concerned about; but it's really something that is safe to use during your anesthetic if you really need to use it. I think we're moving away from giving nitrous oxide nowadays for lots of other reasons. But again, from a teratogenic perspective, it's not an issue.

And we really can say that quite confidently, because at the end of the day most of our data, our good data, is from studies that compared women who were pregnant and required surgery with women who were pregnant but did not require surgery, and there's no difference in the incidence of congenital defects between those two groups. And most patients in these studies that had surgery while pregnant received nitrous oxide. So, again, most women who received anesthesia received nitrous oxide, and there was no higher incidence of congenital defects in those women that had surgery and those women that did not have surgery. So, congenital defects is really not an issue.

The other thing that patients are concerned about, although it's not as much as being concerned about congenital defects, is whether or not they'll lose their baby. And actually, in that regard, they're probably right: they do need to be concerned about that a little bit. Because the one thing that has been shown is that women that have surgery while pregnant have a higher incidence of fetal loss or miscarriage or preterm labor than women that didn't have surgery.

And we don't know the reason for that. We don't know if it's related to the surgery itself, or to the anesthetic, or to the whole perioperative period. Nobody's been able to definitively prove what the reason for the increase in fetal loss is. It's probably related to the surgery itself, because we know that it's greater in abdominal or pelvic surgery than in peripheral surgery; but even that, we can't say confidently. Nonetheless, there is not a lot that the anesthesiologists can do about this, because none of our anesthetics cause preterm labor and none of our anesthetics can really prevent preterm labor either.

But when you're counseling the patient in the preoperative period, I think it's important to have this discussion with the patient to let them know that preterm labor is a possibility. Especially now when many of our patients go home shortly after surgery, they may go into labor at home, because this risk occurs for up to seven days. And especially if they were earlier in pregnancy, perhaps only the second trimester, labor pain isn't what women necessarily expect. It's not abdominal pain. It can sometimes be back pain. So, you don't want women to ignore any symptoms. If they should develop any sign at all that they're going into labor, it's important for them to know to come back to the hospital, because maybe they can receive a tocolytic agent from their obstetrician and in this way prevent labor from progressing any further.

So, those are the, you know, two things that patients are concerned about. And actually, it dovetails well with our anesthesiologists as well, because, again, the

anesthesiologists always want to know what drugs to give and what drugs not to give. So, I sort of advise my anesthesiology colleagues not to use the benzodiazepines. I think that's just prudence, since it's a Class D drug. Nitrous oxide is safe in terms of birth defects, so they can use that.

The other thing anesthesiologists are also concerned about is what monitors that they should use. It's interesting: suddenly they're caring for a pregnant patient, everybody wants to use as many monitors as possible. People suddenly think that they need to use arterial lines, they need to use central lines, and the answer is that, absolutely not. Really, you want to monitor the mother in the same way you would monitor the mother if they weren't pregnant. There's no need to get fancy at this point. The patients don't need arterial lines; they don't need central lines, for sure, unless the surgery itself dictates the need for it. So, if you were caring for this mother and she wasn't pregnant, but you would place an a-line, then go ahead and place it. But if you wouldn't place it when she was not pregnant, then I wouldn't place it for these cases either. It's just not necessary.

The best way to manage these patients, like any good anesthetic, is with preparation. So, before you even get into the OR, you want to make sure that everybody is on the same page, meaning the obstetricians; yourself, the anesthesiologists; the nurses; and the patients. Because you want to have a plan for this patient. You want to make sure that you know what you're going to do and what to expect.

So, one of the other things that always comes up is whether or not the baby should have fetal heart rate monitoring during the procedure. And there's no straight answer to that. Because first of all, it has to be a procedure where you can monitor fetal heart rate. So, if you're doing abdominal surgery, you probably won't be able to do fetal heart rate monitoring anyway.

And then the question is, how far pregnant is the mother? So, if the baby is in the first trimester, again, you won't be able to do it because you simply can't technically monitor a baby when – the baby's fetal heart rate. So, the only time that we begin to consider it is toward the end of the second trimester, and certainly when the baby is already viable. But it's important to realize it's really the obstetricians that need to be monitoring the baby during the procedure, and it's not the anesthesiologist. So, the obstetricians need to be available to come into the operating room to monitor the baby during the procedure.

And then everybody has to know what the plan is going to be if any change in the fetal heart rate is noted. Are the obstetricians going to deliver that baby during the procedure if they notice a problem with the fetal heart rate, or are they not going to deliver the baby? It's important to have a plan ahead of time.

And along with that, if you are going to deliver the baby, you obviously need to have prepared in that operating room the ability to do a cesarean delivery. You need the surgical tools to do that. But you also need a baby bassinet so that the baby can be resuscitated if needed; and also, the pediatricians need to be aware that there might be a delivery in a different part of the hospital that they're used to. So, again, it all comes with planning ahead of time, that everybody knows what they're going to do. Are we going to do fetal heart rate monitoring? Are we not? If we do the fetal heart rate monitoring, are we going to deliver the baby if there's a problem, or are we not?

So, if we're not going to deliver the baby anyway, there are those that will argue that it's not necessary to do fetal heart rate monitoring. And that decision still has to be decided together between the anesthesiologists and the obstetricians, because fetal heart rate monitoring is probably the best monitor of fetal well-being. And when you're anesthetizing the mother—we're going to get into this in just a minute—the key thing for the anesthesiologist is to maintain a normal physiologic milieu. You want to maintain blood pressure. You want to

maintain oxygenation. And if there's a change in the fetal heart rate, it might tune in the anesthesiologist that there's something that he can improve in his anesthetic.

And there's one case report out there of a patient that was having eye surgery, and during the eye surgery the mother was asleep and tracheally intubated, and during the eye surgery they noticed that the baby's heartbeat decreased. The anesthesiologist checked the endotracheal tube, noticed that there was a main stem intubation, was able to pull back the tube, and then the fetal heart rate improved. So, even though they didn't deliver the baby, they still were able to use that fetal heart rate monitor as a tool to better direct the anesthesiologist about his or her anesthetic.

So, again, fetal heart rate monitoring—once the baby is viable and the obstetricians would intercede and do a cesarean delivery, then it certainly makes sense to do so; again, with the plan of having the tools available and pediatricians available. If the baby is not yet viable, probably fewer people will do the monitoring, but it still might make sense in certain scenarios because, again, the anesthesiologist may be tuned in to the fact that there's now a problem with the baby, and maybe he or she can improve things to the mother that will improve things to the baby.

When it comes to anesthetizing the mother, the real key thing is maintaining that normal physiologic milieu. It's maintaining oxygenation. It's maintaining a normocarbida—normal CO₂ level. And it's maintaining a normal blood pressure. That's really what's key, because that's what's going to optimize uteroplacental blood flow. So, when thinking about the anesthetic that you're going to use, there's no real right answer whether you should do a general anesthetic or a regional anesthetic. Because what you need to do, as I mentioned earlier, is maintain that physiologic milieu. And if you're comfortable at doing so with a regional anesthetic, whether it's a spinal or

epidural, or whether it's some sort of nerve block, then that's the way you should anesthetize the patient.

On the other hand, if you're not comfortable – the anesthesiologist isn't comfortable with these techniques, and the best way that that anesthesiologist is comfortable maintaining that normal physiologic milieu is with a general anesthetic, then they should proceed with a general anesthetic. Because there's no data at all that the type of anesthetic that you choose leads to a better outcome. The type of anesthetic is in no way associated with preterm labor, as I discussed earlier. So, therefore, the anesthesiologist should really choose the one that they're most comfortable with.

That being said, everything else being equal—the anesthesiologist is very comfortable with performing a general anesthetic or very comfortable performing a spinal anesthetic—then it's probably best to perform a regional anesthetic or a spinal anesthetic. And the reason for that is twofold. Number one, you do give the least amount of drugs to the mother when doing a spinal anesthetic. So, it's always best to give as little as possible. That's number one.

But number two is, you get to avoid the problems with the airway. So, airway concerns are always a big concern for all anesthesiologists, but especially in the pregnant woman. The pregnant woman is known to be potentially more difficult to intubate than the non-pregnant woman. Also, they tend to desaturate quicker because they have a smaller functional residual capacity, or FRC, and they're also at risk for aspiration. So, if you can avoid a general anesthetic, then you're going to avoid the whole issue with the airway. So, again, everything else being equal, you may decide to proceed with a regional anesthetic than with a general anesthetic, just so you can avoid the airway.

But really, everything else has to be equal. Because if the mother, for example, is a very anxious mother, and the patient is going to be anxious during the

procedure and they're going to need sedatives, well, if you start doing a spinal anesthetic and then on – you add on top of that sedative agents, then you're really not gaining anything. Because now the mother's sedated, now the mother is at risk for aspiration anyway, and that's when you would want to go ahead with the general anesthetic. And that's where I mean, everything else has to be equal. The mother has to be accepting of having a regional anesthetic, and the anesthesiologist has to be comfortable with that technique.

Dr. Amanda Burden: Dr. Beilin, that was so helpful. I really appreciate the advice that you provided about how to properly approach the parturient who is coming to us for anesthesia, non-obstetric surgery and care. Is there a time when anesthesia and surgery should be avoided at all costs except for during an emergency?

Dr. Yaakov Beilin: I think we can all agree that no elective surgery should ever be done for a mother who is pregnant. There's just no reason to be doing it. You should certainly wait until the pregnancy is over and the baby is delivered. So, all of these cases are for emergencies. If possible, and you can wait some time, then you would probably want to avoid the first trimester to the best of your ability. During the first trimester, that's when the baby is having the most development. And therefore, if you can avoid the first trimester and make it into the second trimester, that might be the best advice.

Also, the third trimester is likely to have the highest incidence of preterm labor. So, people like to avoid the third trimester if possible as well. So, if you do have a little bit of luxury of delaying the case, then you probably want to delay it into the second trimester, but you wouldn't wait until the third trimester. Also, once you get to the third trimester, that's when the issues that I discussed earlier, with the airway and the oxygen desaturation, begin to increase even more so. So, if possible, you want to sort of do it during the second trimester.

That's probably the sweet spot. But we don't usually have that luxury because, as I mentioned earlier, they're really almost always emergent procedures.

Dr. Amanda Burden: I wonder if you could shed some light on a topic of some controversy. In 2016, the United States Food and Drug Administration issued a warning – a consideration about anesthetics in pregnancy and about anesthetics as they relate to the fetus in childhood. If you could talk about that a bit, that would be very helpful.

Dr. Yaakov Beilin: Sure. So, in 2016 the FDA came out with an advisory that cautioned healthcare providers that repeated or lengthy exposure to general anesthetic and sedative agents may affect the development of a child's brain, and they wanted the package insert to be updated to reflect these concerns. This was somewhat of a surprise, this advisory, because until now the concern about the development of children's brains was only related to children having surgery, not when the mother is having surgery and the mother is pregnant. So, it was a little bit of a surprise that when this advisory came out, not only did it address the pediatric patient, but it also addressed the mother who is pregnant.

And it's important to realize that there are absolutely no studies in humans that have addressed the concern of development of the fetal brain when the mother is anesthetized. In the pediatric patient there are some studies, and we're not going to get into that in this podcast – in this lecture. But in terms of development of the fetal brain, there really are no human studies. So, this did come out as a little bit of a surprise.

The American College of Ob/Gyn, along with the ASA and the pediatric associations as well, responded to this advisory, again, by emphasizing that all the studies to date have not been in the human model but have been in the animal model, and they're not recommending any change at this point in terms of the care of the pregnant patient. And they really did emphasize that it's important

not to avoid giving anesthesia to the pregnant mother who needs the surgery. The data is just too preliminary; although it is unclear at this point how this advisory is going to affect the anesthetic practice.

Dr. Amanda Burden: Thank you so much for that information, Dr. Beilin, and thank you so much for your lecture and for joining us on this podcast to help all of us as we prepare our patients for their procedures, and to help us as we gain in understanding of how to discuss these issues with our non-anesthesiologist colleagues—our obstetricians, our surgeons and our nurses, as well as the patient and her family. Your lecture has been extremely helpful and very interesting and informative. Thank you so much.

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Dr. Yaakov Beilin: Thank you.

Dr. Alan Jay Schwartz: Thank you for joining us today and participating in this insightful conversation with this month's featured author. Be sure to join us for next month's one-on-one author interview. To purchase the full subscription of the 2017 *Refresher Courses in Anesthesiology* program, please visit www.asahq.org, click on the Shop ASA link, and search for RCA.

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