

Corey S. Scher · Anna Clebone
Sanford M. Miller · J. David Roccaforte
Levon M. Capan *Editors*

You're Wrong, I'm Right

Dueling Authors Reexamine Classic
Teachings in Anesthesia

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To all of my hearts, Lisa, Ryan, Danielle, Oliver, and Dakota

—Corey S. Scher

To my wonderful husband, Keith Ruskin

—Anna Clebone

To my wife, Marcia, who has stood with me for 61 years

—Sanford M. Miller

Preface

Our journals are designed for critical readers to determine whether the best freshly published papers will become essential for practice or not. As anesthesiologists work more hours, with fewer resources and sicker patients than ever before, it is truly a challenge to maintain currency. For many, reading on the subject of anesthesia does not take priority while juggling a personal and professional life. Investing in print copies or gaining Internet access to journals in our field is low on the to-do list.

Anesthesiologists love to talk to fellow anesthesiologists about cases. Even the most dour clinicians will come to life when another anesthesiologist says, “You will never believe what happened to me in the operating room last week.” It is readily transparent that many clinicians are holding onto clinical paradigms that were learned in residency that are, at a minimum, now controversial and sometimes no longer true.

There has been a veritable explosion over the last 20 years of high-quality research in anesthesiology, pain medicine, and critical care. The merit of each journal is quantitatively determined by its “Impact Factor”—the frequency that its articles are cited in other papers or reports. The impact of anesthesiology and its related fields has soared by over 65 % in the past 5 years. Fully overwhelming evidence now influences the clinical care of patients in our field and is the reason for this gain. Despite new statistical measures, project design, and editorial approval, many clinicians are holding onto practice parameters that are outdated or irrelevant. The process of practice change involves 3 steps. With the introduction of a new practice parameter, the provider goes through: (1) denial, (2) understanding that there is controversy, and (3) after more time than should be needed, acceptance.

The editors of this book made a bold attempt at creating a book that is targeted at every clinician in the field, whether they stay current or not. We present 126 cases, broken down by subspecialty, where the author has a “split personality.” After a case is presented, the author forcefully represents 2 adversarial positions: a pro stance and a con stance. In each case, the authors speak freely, having checked their academic title at the door. During a freewheeling discussion, the case authors alternate between talking off the cuff and presenting current evidence. The book is meant as an easy read that can be opened up at any page. Each case is only a few pages long and can capture the attention of the reader for as long as needed. This is not meant to be a reference book. Simply stated, the cases are meant to be entertaining and a “fun read.”

In almost every clinical arena, concepts that we thought were written in stone are on the road to becoming myths. Examples include the utility of cricoid pressure, the use of normal saline, left uterine displacement, and the neurotoxicity of inhaled anesthetics in young children. These are just the tip of the iceberg of controversial topics recently debated in our high-impact journals. Large database analyses on an increasingly large number of topics demand a change in practice.

Another objective of this book is to help the reader take a small step toward currency. The informal presentation of topics is what we believe is the most accessible way to convey new information to a large number of readers. This is how information is most frequently shared in the “real world” both inside and outside of medicine. We believe that this book accomplishes

this goal of information sharing, and that most of the cases in the book address the most relevant controversies in anesthesiology today.

The pro-con approach offers advantages over other methods of teaching. These cases can be presented to residents in a manner similar to the Socratic method. In our experience, residents do prefer to be taught using a case-based method. Long intervals exist in the operating room during which minimal activity occurs, although vigilance must still be maintained. Case-based discussions are a perfect way to spend this time. This book is essentially a library for a teacher who is looking for high-quality case-based topics.

The enthusiasm of the authors of each case was the most satisfying aspect of this book. The quality of each case demonstrates that sentiment. Each case author is to be commended for the wisdom and skillful writing contributed to these cases. While we are grateful for everyone involved in getting this work to print, we will be most grateful if the readers simply enjoy this book and use it as a road to currency and an important mode of teaching anesthesia.

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Part I

General

Should Recent Clinical Trials Change Perioperative Management in Patients with Cardiac Risk Factors?

1

Corey S. Scher

Case

A 75-year-old man with a known history of an ischemic cardiomyopathy presents for resection of a presumed malignant liver tumor. He had 2 cardiac stents placed in the last year and a half. His medications include spironolactone, lisinopril, pioglitazone, and atorvastatin. He also takes 81 mg aspirin per day. A recent cardiac catheterization showed that his stents were wide open and there was evidence of diffuse, cardiac arterial disease not amenable to stenting or surgery. His ejection fraction is 32 %, and there is diastolic dysfunction on his echocardiogram.

Question

What is the best plan for anesthetic management in a patient with multiple cardiac risk factors?

CON: I think I have all of the information I need to go ahead with a general anesthetic, a preoperative thoracic epidural and an awake arterial line before induction. I will use pulse pressure variation (PPV) to determine fluid status and use either hetastarch or albumin if he ends up on the steep portion of the Starling curve where it is essential to give fluids. A PPV >13 % means that stroke volume is changing with inspiration and expiration; these oscillations imply a decrease in preload. It follows that a patient with PPV of >13 % will be fluid responsive [1]. I would not hydrate to a PPV less than 13 % as there is a risk of fluid overload and congestive heart failure. I would go lightly on the crystalloids and be a bit heavy-handed on blood products or colloid to improve stroke volume. In addition, I will get a colleague to help me out with a trans-esophageal echocardiogram (TEE).

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PRO: I think that your plan is more than reasonable; I am curious how this plan evolved. I think there is more that you can offer the patient to improve his care based on essential clinical trials. To begin with, I think the patient would have benefited if he had been on a statin. The CARE trial (Cholesterol And Recurrent Events) clearly showed that lowering low-density lipoproteins (LDL) with a statin lowered the risk of a cardiac event in patients with documented cardiac disease [2]. It is essential to note that this was not an anesthesia study but simply a study on the value of statins on both lipids and heart disease. There were fewer myocardial infarctions in the statin group compared to placebo. Statin use led to a lower incidence of infarction and stroke when interventions such as stents or surgery were chosen. More and more proof exists over time that taking perioperative statins is protective against complications [2]. While the relative success of the CARE trial was attributed to lowering LDL and its associated plaque formation, it is possible that the statin might have impacted the amount of inflammation in the coronary arteries.

CON: Every patient should be managed on a case-by-case approach. Although the CARE trial is interesting, I would not delay the case for preoperative management of his lipoproteins. If he reported good exercise tolerance and general function, I would go ahead today. The cancer surgery will certainly be more beneficial to this patient's survival. The evidence for giving statins at the time of surgery is muddled, as the study is old and cardiac stents are a clearer prophylactic paradigm than statins.

PRO: I think you should also add a beta-blocker to your patient's regimen. The POISE trial (Perioperative Ischemic Evaluation) [3] was a randomized controlled trial exploring the impact of perioperative beta-blockers on cardiac death, non-fatal myocardial infarctions, and non-fatal cardiac arrest. In the trial, metoprolol was found to decrease the risk of non-fatal myocardial infarction, while making the risk of stroke and mortality higher [3]. I have been using

beta-blockers for years and have never seen a case of stroke due to hypoperfusion, but I only use beta-blockers in patients with persistent hypertension and not in cases of hypovolemia. I titrate my dose carefully. An individual evaluation should be performed for each patient to determine the risk–benefit ratio of using beta-blockade. I would clearly use it in this case.

PRO: I do like that the patient is on spironolactone.

CON: Why is that a factor? You would have to make up a reason to convince me.

PRO: There is good evidence for aldosterone inhibitors in patients with systolic heart failure [4].

CON: However, the evidence from patients with *heart failure and a preserved ejection fraction* (HFpEF), such as yours, is limited. In patients with HFpEF, the function of spironolactone was considered [5]. The outcomes of patients hospitalized for HFpEF who received spironolactone were compared to those who did not. The post-hospital mortality rate and readmissions at 1 year were analyzed. With a multivariate survival analysis, 1212 patients with HFpEF with a mean age of 79 years were studied. The majority had hypertensive heart disease (50.7 %). For patients with HFpEF, the administration of spironolactone was associated with an increase in all-cause readmission, perhaps due to the higher rate of hyperkalemia.

PRO: The Aldo-DHF randomized controlled trial, the Treatment of Preserved Cardiac Function Heart Failure with an Aldosterone Antagonist trial [4] and its echocardiography sub-study showed improvements in echocardiographic measures of diastolic function in patients on spironolactone. In the first of these trials, hospitalization for heart failure was significantly reduced with spironolactone therapy; there was no difference in the primary outcome of cardiovascular death. In patients who are at high risk, there may be a reduction in cardiovascular mortality. The final word is not yet in, but the evidence is increasing in favor of using spironolactone for stable heart failure patients.

CON: Sounds like the cost–benefit is evolving in favor of blocking aldosterone, even with the risk of hyperkalemia.

How do I avoid fluid overload, though? I do not want to overload this patient. I will titrate normal saline boluses based on pulse pressure variation.

PRO: Fluid administration is a loaded topic. It makes no sense to give normal saline (NS) because these patients invariably end up with a hyperchloremic metabolic acidosis, which is associated with increased morbidity and mortality [6].

I will also say, from all that I have read in the last 2 years, colloids aren't great either.

CON: So what have you been reading that made you come to that conclusion? In my mind, it is clear that less volume is needed and the patients look better after colloid resuscitation.

PRO: Let us not confuse opinions with facts. Finally there are some strong data that there is very little place for colloid resuscitation. In a fairly recent meta-analysis by Perel et al. [7], the author states, “There is no evidence from randomized controlled trials that resuscitation with colloids reduces the risk of death, compared to resuscitation with crystalloids, in patients with trauma, burns or following surgery. Furthermore, the use of hydroxyethyl starch might increase mortality. As colloids are not associated with an improvement in survival and are considerably more expensive than crystalloids, it is hard to see how their continued use in clinical practice can be justified” [7]. Enough said on this issue, as thousands of patients were included in the 78 trials analyzed.

CON: I am starting to agree, as I have not seen any randomized controlled trials with strong data for colloids. I am now second-guessing my clinical practice.

There is something else that is bugging me. While colloids appear to not be useful, is there a difference between crystalloids?

PRO: Actually that is an essential question. Balanced salt solutions such as plasmalyte, lactated Ringers, and Normosol-R are superior to normal saline for resuscitation. I am going to go on record declaring that normal saline no longer has a place in modern medicine. Simply stated, the title of a paper in *Anesthesia and Analgesia* in 2013 by McCluskey et al. [6] says it all, “Hyperchloremia after noncardiac surgery is independently associated with increased morbidity and mortality: a propensity-matched cohort study.” The stuff is outright toxic. After a liter, you start to go down the wrong path. I cannot think of a case where it would be advantageous. Some are scared to give balanced salt solutions, with their small amounts of potassium, to renal failure patients; I have found that in clinical practice this is a nonissue. For resuscitation, hypertonic saline, 5–7 %, is increasingly used, because it is hyperoncotic and can be used as a volume expander. Hypertonic saline draws fluid into the intravascular space, and very little is needed to get the job done. Although a concern, hypernatremia is only rarely seen after a 100 cc infusion. A single 100 cc bag of 5 % saline can bridge a patient to transfusion when blood is not available or is not ready. Still, caution must be exercised, as hypernatremia can be associated with significant morbidity or even mortality.

CON: I have resuscitated hundreds of patients over 30 years with normal saline and have never had a problem.

PRO: Maybe you just don't follow up well with how your patients do postoperatively.

CON: I'll meet you in the alley after I finish this liver segment resection. Do you have any more pearls of wisdom for that case, Sir Professor?

PRO: In liver lobe resections, with the excellent surgical team that we have, we place 1 large-bore IV and a blood pressure cuff. A thoracic epidural is placed under fluoroscopic guidance.

CON: No arterial line?! And with no central line, how do you measure central venous pressure (CVP)? The surgeons always want the CVP on the low side to prevent engorgement of the liver while they are cutting it. The arterial line is also essential in a potential hemorrhage.

PRO: Simply stated, the CVP does not correlate with filling of the heart as determined by TEE. If you give a small dose of phenylephrine to any patient, the CVP will increase with no change in filling pressures [8].

Massicotte et al. published a paper that is conclusive for my practice [8]. In it, they ask, "do right ventricular end-diastolic volume (RVEDV) and intrathoracic blood volume (ITBV) by TEE represent cardiac preload better than central venous pressure (CVP) and pulmonary capillary wedge pressure (PCWP)?" Left ventricular end-diastolic volume (LVEDV) is the real measure of cardiac preload, and LVEDV was compared to these other measures.

It was demonstrated that a variety of factors, like the use of positive end-expiratory pressure (PEEP) and vasopressors, had a significant impact on CVP but a small effect on LVEDV (true cardiac preload). When the CVP is high, it is inconceivable that you could lower it with any technique other than phlebotomy—which you would never want to do in a liver resection [8]. Simply stated, maybe, and I emphasize maybe, CVP could be valuable in trending. If a central vein is very distensible, adding volume may not increase CVP and if the vein used, by nature, is not distensible, small changes in volume may increase the CVP significantly without any impact on preload.

And how would you manage this patient's diabetes?

PRO: There are many of us who practice anesthesia and do not know what to look for in postoperative visits. If it is not in our anesthesiology journals, it does not mean it does not exist.

The patient is on pioglitazone, an oral agent for diabetes. "Optimal Glucose Management in the Perioperative Period" is an excellent paper [9] from the surgical literature on a topic that I was "soft" on. In the past I would not cancel a case for a blood sugar of 200. In fact, these borderline glucose levels only climb as the case proceeds. Hyperglycemia is defined as glucose greater than 189 mg/dl. Factors contributing to poor control include "counterregulatory hormones, hepatic insulin resistance, decreased insulin-stimulated glucose uptake, use of dextrose-containing intravenous fluids, and enteral and parenteral nutrition" [9]. Hyperglycemia in the perioperative period is associated with increased morbidity and decreased survival. Both morbidity and mortality around the time of surgery are decreased by ideal glucose management. I now measure glucose with a venous sample and send it off to the laboratory with a request for immediate results or obtain an arterial or venous blood gas, which gives you a response within minutes. I would now characterize my behavior surrounding hyperglycemia as "intense."

CON: Would you go through this "intense" therapy for a glucose of 200?

PRO: With surgical stimulation and the accompanying cortisol release, the glucose only goes up, and yes, anything above 180 receives intense insulin therapy. There has to be a line somewhere, that is the trigger point. There are so many pros and cons in what appears to be a routine case. Let us look at some of them after consulting our colleagues in our department.

CON: We need to chat more. I am ready to go into the operating room. Despite the impressive database you have in your mind, I will do this case just like I always have.

Summary

These papers might change the way you practice. Staying current is essential as so much of the literature from the time that I was a resident is simply not true anymore. Although not every study will stand the test of time, it is worth

examining and discussing the latest literature with your colleagues, for the ultimate benefit of the patients you care for every day.

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Should Real-Time Ultrasound Guidance Be Routinely Used for Central Venous Catheter Placement?

2

James Leonard

Case

A cardiac anesthesia fellow on his first day had just intubated a 67-year-old male undergoing an on-pump 2-vessel coronary artery bypass grafting. The patient had a history of peripheral vascular disease, type 2 diabetes, hypertension, and recent non-ST-segment elevation myocardial infarction (NSTEMI). The fellow had just finished positioning and prepping the patient for a right internal jugular central venous catheter (CVC) placement when his attending walked back into the room and noticed the ultrasound equipment next to the patient's head.

"Wait a second, why do you have this in the room?" the attending asked.

"Ultrasound-guided central line placement was done by everyone at the residency program I was trained at," the fellow replied.

"I've been placing central lines for 30 years, have never used ultrasound, and have never had a complication. If you know your landmarks, you should be able to insert the catheter successfully every time without the use of ultrasound."

Question

Should real-time ultrasound guidance be routinely used for central venous catheter placement?

PRO: The overwhelming majority of central venous catheters (CVCs) are placed in 1 of 3 locations: the internal jugular (IJ), subclavian, or femoral veins using either the landmark technique or the real-time ultrasound-guided technique.

While there are many techniques utilizing landmarks for IJ cannulation, the most commonly described method relies on directing the needle between the medial and lateral heads of the sternocleidomastoid muscle, lateral to the carotid artery, and advancing the needle toward the ipsilateral nipple in order to cannulate the vein. For subclavian vein cannulation, the patient is positioned in Trendelenburg, the shoulders are extended, and the needle is inserted 1 cm lateral to the middle third of the clavicle. The needle is walked under the clavicle, directed toward the sternal notch, and slowly advanced until cannulation occurs. For femoral vein cannulation, the femoral artery is palpated and the needle is directed medially to the arterial pulsation 1–2 cm below the inguinal ligament until cannulation occurs.

Ultrasound-guided techniques have been described for IJ, subclavian, and femoral vein CVC placement. Based upon available evidence, ultrasound guidance for IJ CVC placement is the most strongly supported of the 3 sites. Meta-analyses of randomized trials including both adults and infants demonstrated the following benefits of ultrasound guidance versus the landmark technique: a significantly higher rate of successful placement in both adults and infants (99 versus 78 %), a reduction in failed IJ cannulation on the first attempt (33 versus 57 %), fewer total numbers of attempts in adults and infants (1.5–2 fewer mean needle passes), and a reduction in complications, including arterial puncture, in both adults and infants (from 16 to 5 % and from 30 to 6 %, respectively) [1, 2].

CON: The cardiac anesthesia attending allowed the fellow to proceed with ultrasound-guided right IJ CVC placement. Upon ultrasound examination of the right IJ vein, significant intravascular clot was found. Examination of the left IJ revealed a similar level of clot.

"We should attempt a right subclavian line placement," the attending remarked to the fellow. "Should we use ultrasound for that as well?"

Evidence in support of ultrasound guidance is decidedly less robust for femoral and subclavian CVC placement

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