VTE Prophylaxis in Aesthetic Surgery Patients

Editor’s Note: Felmont F. Eaves, III, MD, Chair of the ASAPS Patient Safety Steering Committee, and V. Leroy Young, MD, interview David Green, MD, PhD, Professor, Division of Hematology/Oncology, The Feinberg School of Medicine, Northwestern University, Chicago, IL, about venous thromboembolism (VTE) prophylaxis in aesthetic surgery patients. This article is the second article in the ASAPS VTE prophylaxis patient safety campaign.

Dr. Young: Dr. Green, how do you assess risk for venous thromboembolism (VTE) and how do you decide what to recommend for prophylaxis?

Dr. Green: I follow the evidence-based guidelines of the Seventh American College of Chest Physician’s (ACCP) Conference on Antithrombotic and Thrombolytic Therapy. These provide the levels of risk associated with deep vein thrombosis (DVT) and pulmonary embolism (PE), suggesting prevention strategies at each risk level (Table 1). The lowest risk would be minor surgery in a patient younger than 40 years with no other risk factors.

Dr. Young: According to those guidelines, what category do you think most plastic surgery patients would fall under?

Dr. Green: I would say “general surgery” probably comes closest, but, obviously, plastic surgery procedures vary greatly, from relatively minor surgeries to major operations under general anesthesia. So there is a lot of variability.

Dr. Young: When we were planning this interview, we were unable to find a definition in the literature for minor surgery, although this term is frequently used. Could you define a minor versus a major procedure?

Dr. Green: I would use several characteristics. First, minor procedures are usually done on an outpatient basis. Second, duration is usually less than one hour. Third, the anesthesia is usually regional as opposed to general. Usually, the patients are ambulatory immediately following the procedure, which is very important in terms of VTE prevention.

Dr. Eaves: In terms of major surgeries, there is a tremendous difference between an operation that may last 1 or 2 hours, with minimal blood loss, compared with an operation that may last 8, 10, or even 12 hours. We generally assume the more extensive the procedure, or if more body areas are treated, the greater the risk.

Dr. Green: Yes, I would definitely agree with that. There are 2 factors: one is the type of operation and the other is the patient undergoing that operation. In terms of the patient, we have to consider a whole range of risk factors. For example, it is very important that surgeons obtain an adequate history from the patient, especially a history of previous VTE. A patient might neglect to mention that 5 years ago, he or she had a DVT. That bit of history puts that patient at higher risk when undergoing an operative procedure. Of course, screening should also include evaluation of family history in terms of VTE events.

Dr. Young: Would you agree with the estimate that about 60% of DVTs are asymptomatic?

Dr. Green: At least that, and maybe even more.

Dr. Young: It is clear that if you do not administer any prophylaxis, 20% or 30% of patients undergoing a surgical procedure will have a DVT (Table 1). So, one can assume that some plastic surgery patients, particularly those who have undergone multiple surgeries, have had asymptomatic DVT. Once you have a DVT, you are at a dramatically increased risk of a subsequent DVT or PE. So, how do we factor into this risk equation the fact that people who have undergone previous surgeries may not
Dr. Green: Multiple procedures performed within the same or preceding month do increase the risk. However, after a month, one can assume the patient is back at his or her baseline risk level.

Dr. Young: So, you’re saying that if we plan lengthy procedures—specifically, procedures that last longer than 2 hours—we should space them more than a month apart.

Dr. Green: Yes.

Dr. Eaves: This patient will be under general anesthesia. Would there be any reason not to use intermittent pneumatic compression?

Dr. Green: I would recommend that she stop the oral contraceptives at least 1 week before the procedure. I would then consider her at low risk based on the factors you mentioned and because she should be able to ambulate soon after the operation. In such a low-risk patient, nonpharmacologic prophylaxis such as compression stockings or boots would be appropriate.

Dr. Eaves: This patient will be under general anesthesia. Would there be any reason not to use intermittent pneumatic compression?

Dr. Green: The guidelines (Table 1) recommend no specific prophylaxis, just an early, aggressive mobilization.
But I agree that use of a pneumatic compression device or compression hose should be implemented during the surgery.

**Dr. Young:** As a follow-up question, many of our patients are on hormone replacement therapy, estrogen, and in some cases, growth hormone or testosterone. There is some evidence in the literature that if you have been on hormonal therapy for more than a year, your risk drops back down to baseline. Do you feel that is true?

**Dr. Green:** I think the data definitely show that the highest risk is within the first month of starting hormonal therapies. After the first month or so, if no thrombotic episode has occurred, the risk is less. But the risk is not down to baseline; it still persists. A patient I saw today in clinic, after 12 years of being on estrogen for postmenopausal symptoms, had a massive pulmonary embolism that required a thrombectomy. So even if the patient has been on such a treatment for years, she is still at risk.

We recognize that most VTE is multifactorial. There are many risk factors, including the current use of oral contraceptives or hormonal replacement therapy. There may be other drugs the patient is taking that add additional risk. Aging and weight gain are also risk factors. In addition, patients may have thrombophilic mutations that do not manifest when they are younger, but make their first appearance when the patient is older. So I consider any patient on hormonal therapy a high-risk patient.

**Dr. Eaves:** Would you say that, as a general rule, it is reasonable for a woman to stop all hormone replacement therapy before major surgery, even after she has been taking it for 2 or 3 years?

**Dr. Green:** I think in the perioperative period the patient should be off hormone therapy. I am not aware of data that specify a precise time period, such as a week, so this remains a matter of the surgeon’s personal judgment.

**Dr. Eaves:** Some of the risk factors for DVT and PE are unidentified or fairly rare. When a patient walks through the door, what factors other than a prior history of VTE should trigger the plastic surgeon to call the primary hematologist and request a preoperative evaluation?

**Dr. Green:** If the patient has evidence of organ impairment—for example, liver, kidney, or heart failure—then that patient is at higher risk. If the patient has a coagulopathy or bleeding tendency, that is an important consideration because we might have to think twice about the kind of prophylaxis to use in such a patient. Those are some of the situations for which hematology consultation might be helpful.

**Dr. Young:** Would a creatine clearance of less than 30 mL per minute, such as we often see in some of our older patients, be a trigger for getting a hematologist evaluation?

**Dr. Green:** Yes, absolutely.

**Dr. Young:** What types of liver function tests should we be keyed into, in terms of seeking that consultation?

**Dr. Green:** I think the most obvious one is the prothrombin time. If a patient has a prolonged prothrombin time, then the patient is at risk for bleeding and you would want to get a consult. However, I want to emphasize that the history is more important than laboratory tests. If you find out the patient has been abusing alcohol, you might want to get a consultation because that patient is likely to bleed more with a surgical procedure.

**Dr. Young:** Some of the patients we see, particularly those who have had gastric bypass procedures with malabsorptive components, frequently have multiple vitamin deficiencies and are also anemic or have low albumens. Would any of these factors be red flags?

**Dr. Green:** Again, I think the prothrombin time would be most informative. If it is prolonged, the patient may have vitamin-K deficiency and would need supplementation before surgery.

**Dr. Eaves:** Focusing on chemoprophylaxis, how would you compare a low-molecular-weight heparin (LMWH) with the low-dose unfractionated heparin (LDUH)?

**Dr. Green:** I think there are abundant clinical trials that have compared LDUH with LMWH, generally to the advantage of LMWH. In comparable dosing, LMWH is more effective than LDUH, and if you give lower doses of LMWH so that the efficacy is the same,
you have less bleeding with LMWH. So I think, on those two counts, the LMWH is more advantageous than LDUH. There are a number of pharmacologic reasons for that, one of the most important being that usually I give the LDUH by subcutaneous injection; the absorption is erratic, only 30% or 40% is actually bioavailable to protect the nt. In contrast, 90% of LMWH is bioavailable, so you definitely get much better efficacy.

Dr. Eaves: Is the type of heparin an important consideration with regard to the possibility of heparin-induced thrombocytopenia?

Dr. Green: I think it is. Although heparin-induced thrombocytopenia is much less frequent with subcutaneous unfractionated heparin than intravenous unfractionated heparin, nevertheless its frequency is still higher than with LMWH. So, that is another advantage of the LMWH. Incidentally, referring to LMWH, there are 3 products available in the United States, and two of them are specifically licensed for the prevention of VTE in abdominal surgery: enoxaparin (Lovenox, Sanofi-Aventis, Bridgewater, NJ) and dalteparin (Fragmin, Eisai Inc., Teaneck, NJ). So you do have a choice of products for prophylaxis using LMWH.

Dr. Eaves: Are there differences in how these products should be used?

Dr. Green: There are some differences. Enoxaparin can be given once or twice a day, depending on how intense you want the prophylaxis. Dalteparin is once-a-day dosing. So if you want to give a low dose to a low or moderate risk patient, you could administer 40 mg enoxaparin once a day or 2500 units dalteparin once a day. If you want to increase intensity, you could give 30 mg twice a day of enoxaparin or 5000 units of dalteparin once a day.

Dr. Young: In procedures in which there are large undermined areas or dead space where there has been a lot of dissection, one of our worries is that we will have bleeding into that space. It is usually hematoma or increased bleeding during the procedure that ultimately necessitates transfusion. My question is: do you start prophylaxis before the procedure or after surgery?

Dr. Green: I usually start chemoprophylaxis after surgery. Although enoxaparin is usually given 2 hours before abdominal surgery, I consider administering 40 mg of enoxaparin 2 hours before surgery a bit risky. Especially in the situation you described, I think it definitely could lead to bleeding. Another alternative in a very high risk patient would be to administer 5000 units of dalteparin the evening before surgery. In fact, that is the FDA-approved dosing for dalteparin in such a high-risk patient: 5000 units the evening before surgery, nothing on the day of surgery, and then 24 hours after the surgery continue with 5000 units once daily.

Dr. Young: Let’s compare fondaparinux (Arixtra, Organon Sanofi-Synthlabo LLC, West Orange, NJ) and LMWH. One regimen is to start fondaparinux 6 to 8 hours after surgery. Supposedly there is only a very small (maybe 1% or 2%) difference in the incidence of DVT/PE between administering it before surgery versus starting 6 to 8 hours after surgery. Do you agree with that?

Dr. Green: No, I do not agree with administering it either before or even 6 to 8 hours after surgery. Fondaparinux is an ultra LMWH approved for prophylaxis. A recent study presented in December at the American Society of Hematology meeting showed that if it was given 6 to 8 hours after surgery, there was more bleeding than if it was administered 24 hours after surgery, and there was no difference in efficacy. This was in orthopedic patients who had hip or knee replacement. Based on that information, although I don’t have specific data for aesthetic surgery patients, I would suggest that fondaparinux be given the day after surgery. The usual dose is 2.5 mg subcutaneously, but it is important to weight-adjust this agent. If the patient weighs more than 100 kg, I would administer 5 mg; for a smaller patient, 2.5 mg would be the maximum.

Dr. Young: So the general recommendation, as I understand it, is that you would start Lovenox 12 hours after surgery, and wait even longer for Arixtra.

Dr. Green: I think that the day after surgery works best, and usually it fits in with the nursing schedule. Six AM, the day after surgery, is a good time to start.

Dr. Eaves: We have always been told that most DVTs probably occur intraoperatively and at that point may be small, and that it is over the next couple of days that the continued limited mobility or other risk factors may cause them to propagate. Do you agree with this and, if
so, would you say that this means there is a window of opportunity before initiating chemoprophylaxis after surgery is completed?

**Dr. Green:** I agree that thromboses begin intraoperatively and then grow postoperatively. If we start prophylaxis the morning after surgery, it is usually within that window of opportunity. This has been studied by Hull et al. They found that giving half the usual dose of LMWH 6 to 8 hours after hip arthroplasty was safe and effective. You need to keep in mind that if you administer prophylaxis too soon after surgery, the patient can develop a bleeding problem.

**Dr. Young:** Let’s say we have a patient classified in the moderate- to high-risk category; intraoperative prophylaxis would be sequential compression devices, pillows under the knees, and starting one of these agents the day after surgery. My question is: once you start this prophylaxis, how long do you continue it? Some of the data suggest that it ought to be continued for a month, but some physicians recommend stopping once the patient is fully ambulatory. So once we start down the road of using chemoprophylaxis, how do we determine the cut-off point?

**Dr. Green:** In the orthopedic hip fracture patients, giving prophylaxis for 30 to 35 days was definitely more effective than just giving it for 7 to 10 days, and there was no significant increase in bleeding risk. So if we use that as our model, the very highest risk patients should probably be on prophylaxis for a month. I think you have to also look at patient characteristics. If you are dealing with a paraplegic or tetraplegic spinal cord–injured patient who has had plastic surgery for a pressure sore, that patient should probably stay on anticoagulants throughout the entire hospital stay and probably be on anticoagulants during the interval between the various procedures to close that defect. For other patients undergoing different plastic surgery procedures, it may be that after a week or so the patient is fully ambulatory, and in that situation may not need prophylaxis for 30 to 35 days.

I think we have to step back and define what is high risk and what is highest risk in these patients. The ACCP conference defines those at high risk as patients older than 60 years or patients aged 40 to 60 years who have additional risk factors such as previous VTE, cancer, or some coagulopathy. The highest risk patients are those with multiple risk factors, including cancer, prior VTE, and major trauma. These categories are helpful in defining the intensity and duration of the prophylaxis.

**Dr. Young:** If we use the criteria you just mentioned to define moderate or higher risk, use intraoperative sequential compression, place pillows under the knees, and start Lovenox or Arixtra the next day, would you consider these the first steps in adequate perioperative prophylaxis?

**Dr. Green:** Yes, I would definitely use intermittent compression during the operation and for the first day after surgery, and initiate anticoagulant prophylaxis the morning following surgery.

**Dr. Eaves:** Obviously, there is an art to this. There are so many potential scenarios that there is no way to have definitive data applicable to each one. But in general, then, would you say that prophylaxis should continue until the risk of an acute intraoperative event has been mitigated and then until the patient is fully ambulatory, whether it is the first postoperative day, 5 days, or 10 days following surgery?

**Dr. Green:** I would agree with that.

**Dr. Eaves:** This is very helpful. As surgeons, although we would like an algorithm that gives us easy answers, it is clearly not that easy.

**Dr. Green:** I would like to clarify a couple of points about prophylaxis. First, compression devices alone after the first day are definitely not as effective as chemopreventatives such as LMWH or fondaparinux. Second, in comparing fondaparinux with LMWH, the Pegasus study of prophylaxis in abdominal surgery found that incidence of VTE by venography was 4.6% with fondaparinux and 6.1% with dalteparin. That was not a statistically significant difference. The bleeding rate with fondaparinux was 3.4% versus 2.4% with dalteparin—again, not statistically significant. But the general idea is that fondaparinux is likely to be a little more effective but probably causes a little more bleeding.

**Dr. Young:** In a 2006 ACS newsletter, Dr. Joseph Caprini discussed the Apollo study in which sequential compression alone was compared with sequential com-
pression plus fondaparinux. The study claimed that the combination resulted in a 70% reduction in VTE; does that seem reasonable to you?

**Dr. Green:** Yes, results were 5.3% with the compression and 1.7% with the fondaparinux plus the compression. There have been studies that show that there is really no difference between anticoagulant plus compression versus anticoagulant alone. In other words, adding compression to anticoagulants really doesn’t add anything, but if you look at it the other way, compression alone versus anticoagulant alone, the anticoagulant is definitely better. Another factor shown by the Apollo trial was that bleeding was 1.6% with fondaparinux versus 0.2% with compression. So, every time you use an anticoagulant you are going to increase the risk of bleeding; there is no question about it. However, the risk is still very low, and the Consensus Conference\(^1\) indicates that data from meta-analyses and placebo-controlled randomized trials have demonstrated little or no increase in the rates of clinically important bleeding with prophylactic doses of LMWH. They come out very strongly for the use of the anticoagulant. Even though there may be some bleeding, it is usually not clinically important bleeding.

**Dr. Young:** One of the problems that surgeons are concerned about regarding the use of anticoagulants is that there may be bleeding that will ultimately lead to a blood transfusion.

**Dr. Green:** Pulmonary embolism is potentially a lethal factor. Nobody likes the idea of transfusion, but we have to recognize that transfusions today are so much safer than they were in the past because of the extensive processing of blood to remove or kill infectious agents. So, in the balance, you can better tolerate some bleeding than you could tolerate a massive PE.

**Dr. Eaves:** When should the plastic surgeon suspect a VTE has occurred, and how do we educate patients on the signs and symptoms? Second, what are the best and most expeditious diagnostic techniques?

**Dr. Green:** Some of the companies that make the LMWHs have produced brochures for patients that tell them what the risk factors are, what questions to ask to get reassurance about their own risks, and so on. I think there are a fair number of good patient education materials available that surgeons can stock in their offices and keep in their waiting rooms so that patients become aware of this problem. As far as postoperative evaluation and diagnosis, your first question should be, “Is there anything going on with this patient that is out of the ordinary?” Are the vital signs stable? Does the patient have an unexplained tachycardia? Does the patient have unexplained fever? Tachycardia and fever are the typical early signs of PE. You see these early signs before you get chest pain, shortness of breath, or coughing, which are later signs. Similarly with DVT, the earliest sign may be some discomfort in the patient’s legs. The patient may say, “My leg feels funny.” You don’t get swelling until the patient is in an upright position, and then you can start to see some swelling, but swelling is a late sign; the vein is completely obstructed before you get actual swelling.

**Dr. Eaves:** I would like to address the point at which you are suspicious of DVT early on, before it progresses further. What about the postsurgical patient who comes in after being at home for 7 or 8 days, and the leg has been hurting for 2 days? Now it is swelling. You decide to have the patient go to the emergency room. Is it appropriate to treat while you are in the process of evaluation? Should you administer an injection of LMWH while you are waiting?

**Dr. Green:** I would administer an injection of LMWH as soon as I saw a patient who came back 7 or 8 days after an operation with a swollen leg. I would presume that patient has a DVT. Then I would do an ultrasound to confirm my suspicion. But I would not wait for the diagnostic test. My suspicions would be sufficiently high that I would treat the patient.

**Dr. Eaves:** So, you’re saying that if you suspected DVT and were sending the patient to the emergency room to get evaluated, it would be appropriate to go ahead and preventively administer 30 or 40 mg subcutaneously. Is that correct?

**Dr. Green:** No, that is not correct. Thirty or 40 mg is a prophylactic dose. What you need to administer is a therapeutic dose. The therapeutic dose for enoxaparin is either 1 mg per kg, twice a day, or 1.5 mg per kg, once a day. I usually use the 1.5 mg per kg in the smaller patients, but in the larger patients, I will treat twice a day with the 1 mg per kg. Alternatively, you could give
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Dr. Young: I was curious about why you chose ultrasound, with its potential unreliability, when you were suspicious, instead of the spiral CT. Can you elaborate on that?

Dr. Green: If you are looking for a PE you would do a spiral CT of the chest, but if you are looking for DVT in the legs, you usually would start with an ultrasound.

Dr. Eaves: Assume you have a patient who comes in with some leg swelling. You are clinically suspicious and administer LMWH. The patient goes to the emergency room, has an ultrasound, and there is nothing proximal to the popliteal veins and calf. What is the next step in the work-up? Would it be an angiogram?

Dr. Green: You can use the Wells score, a clinical scoring system in which you score points for the number of factors that could be associated with VTE (Table 2). Leg swelling would certainly increase the clinical score. On the other hand, if there is some other reason why the leg is swollen, such as cellulitis, then points could be subtracted from your Wells score. You can also do a laboratory test, the D-dimer, which is helpful sometimes in excluding the possibility of VTE. If you get a normal result on the D-dimer, you would be less suspicious, and coupled with a negative ultrasound examination and a low Wells score, you could say this patient probably does not have a DVT. You could repeat the ultrasound in 2 or 3 days, and if it is still negative, then you would be even more certain that the patient did not have a VTE. That strategy has been evaluated and is effective.

Dr. Young: What would trigger you to go to venography?

Dr. Green: If I had a very strong clinical suspicion but the ultrasound was negative, then I would go to venography. Or in other words, if a patient had a high Wells score and I thought that patient really had DVT but the ultrasound was negative, I would do the venogram.

Dr. Young: What about a patient with a known DVT event—for instance, a woman who had the first stage of a breast reconstruction with a plan to stage the procedure? Let’s assume she had a blood clot and a DVT, and you treated that and she took 3 to 6 months of Coumadin (Bristol-Myers Squibb, Princeton, NJ). When could you complete her reconstruction? Is there a time when the risk is as low as it is going to get?

Dr. Green: You want to avoid doing surgery within 6 months of an acute VTE. At 3 months, the risk is less, and by 6 months, the patient is probably back to her baseline risk. The risk is still higher than in someone who never had a VTE, but it would be acceptable to do surgery at that point. The longer you can wait the better it is, but certainly 6 months should be long enough.

Table 2. Clinical model for predicting pretest probability for DVT

<table>
<thead>
<tr>
<th>Clinical feature</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>Active cancer (treatment ongoing or within previous 6 months or palliative)</td>
<td>1</td>
</tr>
<tr>
<td>Paralysis, paresis, or recent plaster immobilization of the lower extremities</td>
<td>1</td>
</tr>
<tr>
<td>Recently bedridden for more than 3 days or major surgery within 4 weeks</td>
<td>1</td>
</tr>
<tr>
<td>Localized tenderness along the distribution of the deep venous system</td>
<td>1</td>
</tr>
<tr>
<td>Entire leg swollen</td>
<td>1</td>
</tr>
<tr>
<td>Calf swelling by more than 3 cm when compared with the asymptomatic leg</td>
<td>1</td>
</tr>
<tr>
<td>(measured 10 cm below tibial tuberosity)</td>
<td></td>
</tr>
<tr>
<td>Pitting edema (greater in the symptomatic leg)</td>
<td>1</td>
</tr>
<tr>
<td>Collateral superficial veins (nonvaricose)</td>
<td>1</td>
</tr>
<tr>
<td>Alternative diagnosis as likely or greater than that of DVT</td>
<td>-2</td>
</tr>
</tbody>
</table>

Pretest probability calculated from total points as follows: high $\geq 3$, moderate $1$ or $2$, low $= 1$.

In patients with symptoms in both legs, the more symptomatic leg is used.

Adapted from Wells et al., with permission.
Dr. Young: A patient with breast cancer who had prior DVT would be at the highest risk the next time she underwent surgery. Is that a patient in whom you would probably want to administer chemoprophylaxis before surgery; is that correct?

Dr. Green: Not immediately before surgery; giving anticoagulants before surgery is more problematic. As I mentioned earlier, the guideline for using dalteparin is to administer it the night before surgery.

Dr. Young: I am trying to understand what the best management for that patient will be 3 months later when she undergoes the next stage of breast reconstruction. Would it be to administer dalteparin the night before surgery, use sequential compression during the procedure, and then go back to dalteparin the day after surgery?

Dr. Green: Correct. That is the guideline that the FDA has approved for the use of dalteparin, and that is for abdominal surgery.

Dr. Eaves: What do you see as the big factors in improving patient safety with regard to VTE?

Dr. Green: Surgeon awareness of the risks of VTE in their patient population is definitely an important point. And the second point is to alert plastic surgeons that we do have anticoagulants now that have been studied extensively in surgical patients and found to be effective. These anticoagulants have a very low risk of bleeding, and usually do not cause clinically significant bleeding. And so, reluctance to administer anticoagulants in these patients should be overcome.

Dr. Young: We are frequently asked, “What is the role of temporary vena cava filters in prophylaxis?”

Dr. Green: There are some dozen temporary filters, and each one has good points and bad points. Some temporary filters are thrombogenic; some are associated with difficult placement, perforation of veins, and other problems. Most of them are effective in preventing pulmonary emboli, but they are not 100% effective, and none of them does anything for the prevention of DVT. So, I would say that we really don’t know what the role of these filters is presently. They are still experimental and unproven, and randomized control trials are lacking. In some centers in which the filters are frequently placed, good results are reported when experts insert the filters, but in other centers where there is a lack of familiarity with their use, disasters have occurred, such as filter placement in arteries or filter migration into the heart. So it is still an open question.

Dr. Young: We know that aspirin really is not an effective agent for prophylaxis. Is the same true for clopidogrel (Plavix, Sanofi-Aventis, Bridgewater, NJ)?

Dr. Green: Yes, aspirin and clopidogrel are not effective for VTE treatment or for preventing VTE, and both increase the risk of bleeding, which may be greater with clopidogrel than with aspirin. And certainly the combination of the two gives the highest bleeding risk. So, to avoid excess bleeding, I would try to wait at least 2 weeks after stopping clopidogrel before doing surgery.

Dr. Eaves: We have been thinking more and more about being aggressive with chemoprophylaxis, even preoperatively, and what is interesting is that I think we are walking away from this interview with perhaps a slightly different notion: that any additional benefit of giving prophylaxis early may not outweigh the intraoperative risk. Chemoprophylaxis is very important, but we do have that window of opportunity, and we need to take advantage of it.

References:


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