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### Utility of Coronary Angiography Before and After CABG

Cardiac surgery is one of just a few medical specialties where before and after imaging is not yet standard. Surprising this may seem; the effect on procedural outcomes is not surprising. Current strategies for intraoperative graft assessment for example, are not detecting all the defects in the grafts to implant. How can we change this practice and how can an innovative hybrid cath lab turned operating room help us do this.

You are listening to ReachMD Radio on XM160, The Channel for Medical Professionals. Welcome to a special segment, Focus on Heart Health. I'm your host, Dr. Mark Nolan Hill, Professor of Surgery and practicing general surgeon and our guest is Dr. John Byrne, Professor and Chair of Cardiac Surgery at Vanderbilt University School of Medicine. Dr. Byrne is the senior author of an article published in the Journal of the American College of Cardiology examining the role of CT angiography in coronary bypass procedures.

### DR. MARK NOLAN HILL:

Welcome, Dr. Byrne.

### DR. JOHN BYRNE:

Thank you very much for inviting me.

### DR. MARK NOLAN HILL:

Dr. Byrne, tell us about this research and why is it so important?

### DR. JOHN BYRNE:

Well, you know, it is a sort of 2 major themes in this paper and a very simple ideas. The first theme or idea is the idea of measuring what you do, keeping score or in this case using intraoperative imaging to assess the quality of the grafts we do during coronary artery bypass surgery.

**DR. MARK NOLAN HILL:**

Now, why is that important?

**DR. JOHN BYRNE:**

Well, currently in most vast majority of operating rooms today, graft assessment is somewhat crude.

**DR. MARK NOLAN HILL:**

How do you assess the grafts intraoperatively?

**DR. JOHN BYRNE:**

Visual inspection, we also used handheld Doppler devices, sometimes we use flow measurements, but I think most of the time, it's using visual inspection and palpation. Most surgeons most of the time probably use just those two.

**DR. MARK NOLAN HILL:**

And how accurate has that been?

**DR. JOHN BYRNE:**

Well, it's been accurate for years and years because most of the time, surgery is successful, but as that, which comes to surgery becomes higher risk and more complex than ever and I think it's going to get worse before it gets better, more sophisticated, a more granular method to measure graft quality is going to be necessary such as imaging; in other words, as that which comes to surgery gets more complex and more difficult, imaging is going to matter.

**DR. MARK NOLAN HILL:**

Now, how do you technically do that with the patient on the operating table?

**DR. JOHN BYRNE:**

Now we have this so called hybrid cath lab OR in my view it should be called 21st century common center OR, not a Hybrid, a Hybrid OR sounds like it is matter of space and it's really just a common center OR. In fact, this idea could have been done 25 years ago, but technology is old. We're combining 25-year-old technology with 30-year-old technology.

**DR. MARK NOLAN HILL:**

But why has not this been done?

**DR. JOHN BYRNE:**

Well, because I think the political barriers, the logistical barriers, and quite frankly, I think people just don't think it is necessary and finally there is a perceived need to do this now, and so it could have been years and years ago, but there were certain barriers, but we've been able to do it now because we have a ceiling mounted C-arm camera of sufficient quality and resolution to be able to do not only imaging, but percutaneous coronary interventions like stents and angioplasty.

**DR. MARK NOLAN HILL:**

Now, why is there a perceived need to do this?

**DR. JOHN BYRNE:**

I think it is the perceived need to do various hybrid procedures, so that's the second major theme of this paper. So, the first theme was intraoperative imaging and the second theme was, what I call, combining the tool boxes, say the tools of the interventional cardiologist, which belong in the cath lab and the tools of the surgeon, which belong in the operating room and so we're mixing the tool bag. So, you've stents and various angioplasty devices on the one hand and then the regular surgery on the other, and so since we all take care of the same patient population and you know we are all interventional cardiologists with different tools where all interventional cardiovascular procedure lists with different tools and so from time-to-time we need stents at our disposal. From time-to-time they need surgery at their disposal. But to do that, we have to bring the patient from the operating suite to the cath lab or the cath lab to the operating suite. Now, we put this all together in one suite.

**DR. MARK NOLAN HILL:**

What kind of defects have you seen?

**DR. JOHN BYRNE:**

In the paper, we reported about a 12% incidence of angiographic findings about may be 9% of them were felt required surgical revision or percutaneous intervention and the majority that were in the conduit. I thought when I first had this idea and tried to look at this, I thought we find them in the anastomosis, but the most of the time, they're in the conduit. They are in the vein graft or the body of the LIMA graft, which was somewhat surprising.

**DR. MARK NOLAN HILL:**

And you would repair right then and there?

**DR. JOHN BYRNE:**

We would repair right there on the spot; yeah, when we found the defect, we would repair it. So the idea is that the patient leaves the operating room with the most complete and ideal procedural result possible.

**DR. MARK NOLAN HILL:**

How often have you found defects that were significant?

**DR. JOHN BYRNE:**

Well, about 9% of the time. So, 9% of graft had some sort of defect that we made a judgment to repair. Now, it may be true that we could have left it alone and I acknowledge that. You know that may be there were some defects that we could have just as well left alone, but we made a judgment, you know, based on, what we thought was in the best interest of the patient at that time to repair those.

**DR. MARK NOLAN HILL:**

In those abnormalities that you found with visual inspection and Doppler and palpation, did you suspect that there would be a problem?

**DR. JOHN BYRNE:**

No, no, no, not at all, gosh, we were surprised so often, we will be looking at the heart, looking at the echo, looking at the Doppler, looking at all these things that we normally use, would not detect it, and only the angiography detected the defect. We sort of saying in the down there in the Hybrid OR if we work for <\_\_\_\_>angiogram may be harm and now because we would never have detected it using the tools that we typically use in a non-imaged capable operating room.

**DR. MARK NOLAN HILL:**

If you have just joined us, you are listening to ReachMD Radio on XM160, The Channel for Medical Professionals. I'm your host, Dr. Mark Nolan Hill and our guest is Dr. John Byrne, Professor and Chair of Cardiac Surgery at Vanderbilt University School of Medicine.

We are discussing the use of routine angiography to detect graft defects in bypass surgery. Doctor, this makes a lot of sense. How was this accepted by other cardiac surgeons?

**DR. JOHN BYRNE:**

Gosh, it is a very simple idea and most people get it; if you ask the truck driver, you'll get it. I asked my mom, she gets this. This is a very simple idea in measuring what you do and checking your work before you wrap things up and close the patient; that would make sense. I could be put in a central line; you get an x-ray before you use it. If you set a bone, you get an x-ray before you put on the cath. The simple is to reconstruct a procedure in live, we always get an x-ray to make sure that what we did was as good as we can do it and is ideal before we wrap up and close and go home, but in cardiac surgery that has not been the case.

**DR. MARK NOLAN HILL:**

But why has not it been the case when we did have the technology a number of years ago?

**DR. JOHN BYRNE:**

Well, again, I think it's logistical challenges, the political barriers, the sense that most cardiac surgeons are pretty < \_\_\_\_ > good surgeon and you know my results are pretty good and thank you very much.

**DR. MARK NOLAN HILL:**

Now, tell me what is this hybrid catheterization operating room look like physically?

**DR. JOHN BYRNE:**

Well, it is an image in the paper, in a Jack Paper that shows the hybrid OR. It is just regular operating room, but with ceiling mounted C-arm at the head of the bed beyond the anesthesiologist that is able to be brought in by using remote control and takes about 10 minutes to bring the camera in and take a picture.

**DR. MARK NOLAN HILL:**

And when exactly during the procedure do you do this?

**DR. JOHN BYRNE:**

After the end of the coronary bypass while we were wrapping things up, often with the chest open, but sometimes with the chest closed. Now the problem is if you have the chest closed, then you need to go back and revise something, then we have to reopen the chest. So, we try to do it with the chest open.

**DR. MARK NOLAN HILL:**

Now, in the room, you obviously have your surgical team and the anesthesiologist and your nurses. Do you also have the cardiologist there and the radiologist?

**DR. JOHN BYRNE:**

The cardiologist comes in to do the angiogram and certainly comes in to do any percutaneous intervention, but all our surgeons are being taught on angiographic techniques. So, the surgeons will eventually do this by themselves and of note, the Hybrid OR is in the

cath lab. It is in the cath lab, it is not in the operating room.

**DR. MARK NOLAN HILL:**

How can the operating room be in the cath lab?

**DR. JOHN BYRNE:**

Well, we had the room approved by the state of Tennessee to be an operating room. So it's an operating room; so, it has all the airflow characteristics and sterile technique and traffic patterns consistent with an operating room.

**DR. MARK NOLAN HILL:**

Are there any other operating rooms like this in the United States?

**DR. JOHN BYRNE:**

There are few other Hybrid ORs mostly in operating room suites, mostly doing endovascular work, like aortic stenting and large vessel endovascular work. I think we have a fairly unique experience with regard to the coronary work that we have been doing.

**DR. MARK NOLAN HILL:**

Now, play to double the add wicket, what do some of your colleagues perhaps in other institutions say about this? What would be their reason not to do this?

**DR. JOHN BYRNE:**

I think their main question is why? I haven't had any problems with my grafts and I don't have any concern why do I need to do that? My response to that is yeah, most times your grafts are good. Now, I'll give you a number of analogies, very simple analogy, seat belts, I've been wearing a seat belt everyday for 30 years, I have never wanted or needed my seat belts, I have driven 100s or 1000s if not millions of miles, I have never wanted or needed my seat belts, but I might need my seat belt going home tonight. You take the best in another analogy. So, imaging is like seat belts, another analogy golf. PGA tour players are amazingly great golfers, so surgeons are like PGA tour players. We have our tour card, just as PGA tour players are amazingly great golfers, I mean amazingly phenomenal athletes. So also, cardiac surgeons are really, really good surgeons. But go back to golf, you know, every once a while tiger woods can miss a fair way.

**DR. MARK NOLAN HILL:**

Yeah.

**DR. JOHN BYRNE:**

And every once in a while, you might miss a 2 foot pot, but not often, but in golf they keep score, sort of, you know, going on playing golf and not keeping score and saying "Well, I shot a 72." Down the tour, they keep score, so what I'm talking about is counting every stroke.

**DR. MARK NOLAN HILL:**

Now you mentioned before that not all of the abnormalities you might find on the imaging are clinically significant.

**DR. JOHN BYRNE:**

Yeah, I think, they're often not clinically significant at the time of surgery, but you know by just looking at the angiogram that that graft is going to go down and we know that 30% of vein grafts fail in 1 year, this is data from a large randomized study in JAMA August 2005, so you know from the literature that 30% of vein grafts and about 5% to 8% of LIMA graft fail at 1 year or hypophysis is that the reason they fail is in part due to things that can be corrected at the time of surgery, and so our followup study for this paper will be a one-and-a-half year followup to see if imaging matters in the operating room. If by correcting these defects at the time of surgery, we drop that 30% to single digit or drop the 5% or 8% LIMAs to 0.

**DR. MARK NOLAN HILL:**

Now, in general surgery, we have an added, which when you're in your general surgical training before you went into cardiac surgery, I'm sure you remember that the enemy of good is perfection. Does that apply at all here?

**DR. JOHN BYRNE:**

Well, I think, that's a legitimate potential criticism, sure, I mean that you know, I think, that's one of the criticisms people say this and I, you know, may be catheters will cause complications, you know, you try to image or in the process of imaging your graft, you damage the graft or in the process of imaging the graft you find something that you treated that you should not have treated and I think that's a legitimate potential criticism and we acknowledge that and we should look into that and determine whether that's real.

**DR. MARK NOLAN HILL:**

How do the cardiologists feel about this?

**DR. JOHN BYRNE:**

I think it is long overdue.

**DR. MARK NOLAN HILL:**

Have they been ones who have been proponents of this for many years?

**DR. JOHN BYRNE:**

I don't think so; I mean I think quite frankly most cardiologists don't really know what we do in the operating room. I think most physicians don't know what we do in the operating room. I have ventured a guess that most physicians and even cardiologists have no idea how we assess grafts intraoperatively and certainly no patients do and I dare you take some really smart people out there, so President Clinton pretty smart guy, right.

**DR. MARK NOLAN HILL:**

Hum, hum.

**DR. JOHN BYRNE:**

Probably, I bet President Clinton has no idea how they assist these grafts in the operating room. I mean, he had superb team, you know great, great, excellent, superb surgeons, great team, so President Clinton's grafts, we have no idea how they look.

**DR. MARK NOLAN HILL:**

Now, do you think, they had this approach of combining the interventional cardiologist and the cardiac surgeons in this lab that you develop in an operating room you develop. Do you think that this would become the standard of care in the future?

**DR. JOHN BYRNE:**

Well, that's what we think, I mean that's what we said in the paper. I mean, again that which comes, the surgery gets more complex and it's going to get worse, imaging is going to matter. I could be wrong you know. As I say, you know I drank the Kool Aid, but you know, I made the Kool Aid, you know so and I could be wrong, but I think intraoperative measurements of graft quality will become standard, I think, you know others angiography or some other method especially as we try to do big operations to small incisions, as we try to do a LIMA to the LAD through a small incision, imaging is going to matter. Just likely, when we started mitral valve repair. Mitral valve replacement was one thing that's fine and so you didn't need TEE echo typically and in fact one of my professors back at the Brigham, Dr. Collins, he had a sterile stethoscope where he would listen, you know, for a murmur after a mitral valve repair or then came along TEE echo now, TEE echo is the standard of care for mitral valve repair. No surgeon, no cardiac surgeon would ever imagine a world without TEE echo where you'll not do a mitral valve repair without TEE echo, no way. You certainly would never deploy a stent without a completion image. So, I think imaging is going to be like seat belts. You know, when I was a kid cars do not have seat belts, they just drove us in the back of the station wagon here in Tennessee they throw in the back of the truck. Now, you could not imagine bringing your kid to Kruger's without a child car seat, you probably get arrested.

**DR. MARK NOLAN HILL:**

I want to thank our guest, Dr. John Byrne. We've been discussing the use of routine angiography to detect graft defects in bypass



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