

Ask the Clinical Instructor

A Q&A column for those new to the cath lab

Questions are answered by:
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“We have so many different ways that we administer nitroglycerine. Which one is best?”

— RCIS Online Class Student

Yes, it can be confusing sometimes. However, as I will explain, there isn't a 'best way,' only a best way depending upon the situation.

Since we are discussing nitroglycerine (NTG), let's refresh ourselves on how it works. When NTG is administered into the body, it is converted into nitric oxide at the cellular level. Nitric oxide is a natural vasodilator. NTG dilates veins more than arteries, and as a result, venous pooling occurs, which reduces preload and cardiac output. The arterial dilation also creates a decrease in blood pressure. It can also decrease myocardial oxygen demands from the previously mentioned actions.

An important point to remember is that the effects of NTG are intended to reduce blood pressure. Accurate blood pressure readings should be obtained prior to the administration of NTG. As a general rule, NTG should not be administered if the blood pressure is less than 90 systolic.

While NTG can come in a variety of different names (Nitrostat, QuickStat, Isosorbide, etc.) we will specifically look at NTG that is commonly administered in the cath lab. NTG has specific onset of actions

and durations of use, depending upon how it is administered. As you read through the rest of the article, please reference Table 1.¹

Patients who receive NTG should have some form of a headache shortly after administration. This is due to the

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dilation of vessels in the brain, which yield the 'pounding' sensation of which many patients complain. Of note: if a patient does not get a headache after the administration of NTG, the integrity of the medication should be questioned. This can be particularly important in the acute myocardial infarction patient who takes NTG before they come to the hospital.

Integrity is also why NTG tabs are kept in a brown bottle (to protect from the light) and that the expiration date, once the bottle is opened, is so short.

In many facilities, the NTG bottle or spray is given to the patient once it has been opened, to reduce any chance of inert medications being maintained in the lab.

The routes most commonly used in the cath lab are sublingual (SL), intravenous (IV), intracoronary (IC) and less commonly, ointment and transdermal (TD).

Sublingual (SL)

The sublingual route calls for the NTG to be placed underneath the tongue. The principle behind sublingual administration is simple. When certain medications come in contact with the mucous membrane beneath the tongue, they pass through it. Because the tissues under the tongue contain a lot of capillaries, the substance moves into the capillaries and enters the venous circulation. Sublingual administration certainly has certain advantages over oral administration, one of them being the speed of absorption. Since it enters directly through the capillaries, the



NPO can often have dry mouth. This, associated with some medications that can dry the mouth, can make tablets slower to get into the system. It also can be argued that the spray is easier to administer than the tablets in the middle of a procedure. If you research the costs with your hospital pharmacy, you will find that the cost of the spray is significantly higher than the cost of the bottle of SL tabs.

Depending upon your hospital's purchasing contracts, the bottle of NTG tabs should cost you between \$2.50 and \$6.00.

Transdermal

These forms of NTG are reserved for a longer-term release of the medication. The patient will generally wear a transdermal patch for a period of time to prevent angina pain from occurring. While these are seldom applied in the cath lab, you should let the physician know if the patient has one. The physician may opt to have it removed before the case starts, in case aggressive NTG administration is needed.

When applied, most brands will look like the nicoderm (nicotine) patches. They have prescribed release ranges from 0.1 to 0.8 mg/hr.

Paste

NTG paste can be an effective way to provide the patient with NTG administration. Most of the time, the paste is used for a short-term administration to prevent angina symptoms from returning. Dosing is sometimes a pure guess. The manufacturer states that 1 gram = 1 inch. However, if you take 5 people and have them squeeze 1 inch out of the packet, it will likely result



Table 1. NTG onset of actions and durations of use

ROUTE	ONSET	DURATION
SL Aerosol	2-4 mins	30-60 minutes
IV	Immediate	n/a
SL tablets	1-3 minutes	30-60 minutes
Ointment	Within 30 mins	4-8 hours
Transdermal	Within 30 mins	8-24 hours



in 5 different amounts on the paper.

As a paramedic, 'veterans' told us not to defibrillate a patch or paste because it would explode. While not scientific (maybe it is?), one of my favorite TV shows had an experiment addressing this theory. "Mythbusters," actually made every attempt possible to detonate a NTG patch and some cream. Here were the conclusions of their tests:

[Theory] "Defibrillators can cause medical nitroglycerin chest patches to explode."

BUSTED

Using a homemade defibrillator, the build team attempted to see whether the electric shock it created was enough to cause the nitroglycerin in the patches to explode. However, the defibrillator failed to detonate the patches, as well as patches covered with pure nitroglycerin. The build team was forced to use custom made, high-power explosives in order to blow up the body [dummy].²

Intravenous (IV)

IV NTG is most commonly used for blood pressure control and aggressive management of angina pain. An IV can also be used in case of slow/no-reflow, in conjunction with a glycoprotein IIb/IIIa inhibitor to help clear out some of the residual microvascular clotting restrictions.

Dosages will usually start at 5-10 mg/min, but can be adjusted based upon the clinical needs of the patient. Higher doses may be needed in some clinical settings. Sometimes a tolerance to IV NTG can develop, particularly after extremely high doses are utilized.

This tolerance can develop in as little as 12 hours after the infusion has been started. When high doses of NTG are required, tolerance should be suspected when those dosages continue to increase during attempts to control signs and symptoms.³

Intracoronary

Intracoronary NTG is a standard procedure to open up vessels and microvasculature to better see the structure of the vessels. It is also an important tool in the battle of slow/no-reflow situations (please reference our July 2007 article at <http://cathlabdigest.com/issues/80>).

The physician will administer the NTG directly into the coronary arteries. This can be done through the guide catheter, the manifold set or any access point (i.e. stopcock). Generally, 200mcgs will be administered, but this can vary (i.e. 100 or 300) depending upon the situation at hand. Some facilities administer the 200mcg right out of the bottle (200mcg/cc), and some will dilute to 100mcg/cc (50/50 NTG and saline). Either way is correct.

Of course, it must be said that The Joint Commission National Patient Safety Goals require that all medications (any syringe or cup they are in) must be labeled PRIOR to receiving the medication on the table or in the sterile field. Just having a color-coded system does not meet the intent of those standards. Labeling, including name and concentration of the medication, is required. Many packs/kits now contain pre-labeled stickers for this purpose.

After administration of NTG, generally a drop in blood pressure will occur, as well as some possible ECG changes, and flow through the coronary arteries and microvasculature changes. While the ECG changes can be quite dramatic, they tend to be quite short in duration and certainly transient.

Finally, it wouldn't be a complete discussion of NTG unless there were a mention of its interaction with phosphodiesterase inhibitors. Viagra (sildenafil), Cialis (tadalafil) and Levitra (vardenafil) usage must be noted before NTG administration. Administering NTG to someone who has ingested any of these medications within the last 24 hours (36 hours for Cialis) can result in profound hypotension. Documented cases of death exist.

NTG is a very useful tool for combating angina. Understanding the different ways you will see it administered,

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and the differences in these usages, will help you both as a part of the team and to prepare for your registered cardiovascular invasive specialist (RCIS) exam. n

Next month, we will answer a question about hemodynamic changes seen during carotid stenting procedures.

Send your question to:
tginapp@rcisreview.com

DISCUSSION

What Do You Think?

Multiple new and ongoing questions from readers. Your responses are welcome! Answer or pose a question at cathlabdigest@aol.com

New Questions!

Safety Of Obturators

I am looking for information about using obturators in sheaths when there is going to be a delay in pulling the sheath post cath procedure. Does anyone have any information/policies for this. We are currently using arterial lines.

Thank you!

Email: jeremy.beavers@fmbhs.com

Cc: cathlabdigest@aol.com

STEMI Door-to-Balloon (D2B) Time Clock

I am hoping you could help direct me to the right person/company. Our CCL and CPEC is looking for a particular kind of clock to be placed in the CPEC and the cath lab. The time starts in the CPEC when a patient comes in with a STEMI and

References

1. *Physicians' Desk Reference*. 62nd ed. Montvale, NJ: Thomson PDR; 2008
2. Mythbusters Results. MythBusters Episode 73: "Speed Cameras." Air date: March 7, 2007. Available at: <http://mythbustersresults.com/episode73>. Accessed February 16, 2009.
3. Libby P, Bonow RO, Mann DL, Zipes DP. *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*. 8th Edition. Philadelphia: Elsevier Science; 2007, 1-2183.

is synchronized with the clock in the CCL so that everyone in the CPEC and CCL is able to see how much time is left to meet the 90-min D2B time. I've heard people talk of them, but no one can tell me what company may be contacted to receive more information. Any suggestions?

Thank you!

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Pre-Procedure Lab Values

I have been looking through the ACC Clinical Statements and Practice Guidelines and cannot find any standardized pre-procedure lab values. Can someone help?

Thank you!

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