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Protamine Test Dose: Friend And Foe

***R. Foster**, **V. Tobin** (by invitation), **P. Grady** (by invitation), **P. Syracuse** (by invitation) and **G. Pitas** (by invitation); Department of Perfusion Services and Department Cardiovascular Anesthesia (Pitas); Cleveland Clinic Foundation; Cleveland, Ohio*

Abstract

Sixty two patients (38 male; 24 female) were selected to determine the effects of protamine test dose on activated clotting times (ACT) following termination of cardiopulmonary bypass (CPB). All patients' heparin levels were managed using a heparin dose response curve. Activated clotting time levels were kept greater than 480 seconds and corrected to no greater than 540 seconds. Following CPB, a range of protamine test doses was given by the anesthesia staff. After a five minute recirculation time, a sample of blood was taken to determine the ACT. The 10 mg group (n=27) showed a reduction in ACT of 32%, the 20 mg group (n=15) a reduction of 28%, and the 30 mg group (n=20) a reduction of 50%. In 90% of cases the ACT fell below 480 seconds, in fact many, well below the accepted safety level to re-initiate CPB.

References

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2. Bull B, Huse W, Brauer F, Korpman R. Heparin therapy during extracorporeal circulation. II. The use of a dose-response curve to individualize heparin and protamine dosage. *J Thoracic Cardiovasc Surg* 1975; **69**: 685-689.

Discussion

MODERATOR HOLLINGSED: Are there any questions?

MR. JEFF RILEY (Columbus, Ohio): We teach the ACT titration curve still. Nobody uses it clinically, like you said, but what you have here is an excellent example of reverse titration with protamine. It looks like all you need in these 62 patients was about a hundred milligrams of protamine to reverse their heparin. What is your average protamine dose?

MR. FOSTER: We do make a calculation of protamine dosage based on the heparin dose response curve, then we tell anesthesia. Then they give what they want, and that is basically what happens.

Dr. Starr specifically, who is the chief in anesthesia, does give usually about half the recommended dose almost every time. They will come back near baseline or very close to baseline. Also running the Hepcon 2, we noticed that very same thing.

MR. RILEY: Did you come to the conclusion that perhaps you needed less protamine than you were giving based on the results of this?

MR. FOSTER: I have, yes. We have always thought that protamine in its own right is kind of a bad drug. We have come to the conclusion that less is more in many cases.

MR. RILEY: Is it safe to assume in these 62 patients that before you gave these test doses, the ACTs were all at 480 or higher?

MR. FOSTER: Yes. I failed to mention that. Thank you, Jeff, for reminding me. The ACT taken just prior to coming off bypass is what we use. Approximately 30 seconds before coming off bypass, we ran an ACT, and recirculation time for the post protamine test dose is five minutes.

I encourage everyone to try this. A lot of the anesthesia people and residents will say, "you know, we have only given a test dose." How many have heard that, "we have only given a test dose, so keep the suckers running," or "it is only half in." Be honest. All right. I thought so. You have ammunition to shut this thing down, I am telling you. If they do not believe you, just do like four or five patients and I guarantee you it will open their eyes. Thank you.

MR. DANIEL FITZGERALD (Winchester, Massachusetts): Thank you for sharing the information, Bob. I think your point is very well taken. We use the HMS Plus to determine our protamine dose, and I would say that our average protamine dose is between 60 and 100 milligrams. So that third group, the patients who got the 30 milligrams of protamine, that indeed is half of the total dose necessary for those individuals.

At our practice at the Brigham and Women's Hospital we do turn off the pump suckers before. If they give the test dose, they are off, we are done, and we do not use it any more.

I think what I learned today from here is that it is consistent with reversing protamine based upon heparin level, not based on ACTs, and that the ACT is not an acceptable tool to calculate protamine doses.

MR. FOSTER: Right. It is basically that heparin dose response curves give us a good guideline of where to go. I agree with you.

Direct Communications to: Robert Foster, CCP, 2745 Asplin Drive, Rocky River, OH 44116.

MR. ERIC JENKINS (Dexter, Michigan): We have started using the TEG to help us see if there is on-board heparin afterward, after protamine doses. We will run a kaolin-activated TEG and then a kaolin with heparinase and we look at the difference in the R interval. If the R interval is very extended with the kaolin as opposed to the one with heparinase, then they will give some more protamine. It is just a different way of doing it.

MR. FOSTER: Exactly. Thank you very much. Thank you, everyone. It has been a pleasure.

[Applause]