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#### DISCUSSION

DR. WATTS R. WEBB (New Orleans, Louisiana): We are indebted to Dr. Symbas and his associates for their manuscript and the definitive data on intracardiac and cardiac injuries.

In their 20 years' experience they saw about one case per year. That is about what we see, and it is nice to have this total data accumulated so we can get some actual idea of what goes on, and thereby have some true data on which to base our therapy.

We do much as they do. We ignore pellets unless they are seen at the time we have to operate for other reasons.

Our own experience with shrapnel might be considered that of two cases, one a bit of barbed wire thrown by a lawn mower and the other a coat hanger that extended into the heart. We operated to remove the hanger, although it extended outside and required nothing but very simple extraction, as with a tooth.

The bullets, we agree, should be extracted, particularly if they are intracavitary. We do not wait for them to embolize. If they are on the right side, we go ahead and cardiopulmonary bypass and it is very simple, of course, to retrieve them.

Let me give you one illustration of a bad experience. The woman had a bullet embolized to the left lung. We turned her in the right lateral position to remove the embolus from the left lung, and as we did, the

bullet fell into the right lung. I encourage you, if you turn a patient on his or her side, be sure that you get a cross table lateral before you make an incision on the upside.

The missiles protruding into the myocardium or the chambers seem to be the most difficult, and I would like to ask Dr. Symbas how he handles those.

We use echo extensively. We have not found that injection of contrast gives us any information at all. The CT scan has so much scatter that it is very difficult to know what is going on. What are your indications for operation and timing in this particular group?

Pericarditis resulting from missiles in the pericardium is also a problem. However the pericarditis and development of tamponade can be observed and followed and you can detect it and take care of it very easily, as long as you follow them by frequent echos. This problem is usually over in about 2 weeks.

The cardiac neurosis is interesting and this has been addressed in the literature. We have not seen it, and I think it relates primarily to transmission to the patient of the doctor's neurosis rather than anything intrinsic to the patient.

DR. A. L. PICONE (Closing discussion): In answer to Dr. Webb's questions, the main methodology for evaluating the patients in our series was angiocardiology.

In terms of the timing for operation in these patients, obviously, in

the early postinjury period they were operated on for their acute symptoms. That is a difficult question to answer in terms of timing, except for the acute patients.

I would like to expound a bit on the analysis of our data, and if I could have the first discussion slide, please, and the lights down.

A further insight into the management of cardiac missiles can be gained by analyzing the results of the nonintramyocardial missiles based on whether they are located in the circulatory right or left side of the heart. One hundred thirteen patients in the combined Grady Memorial and literature review series had retained missiles that were not completely intramyocardial or, in other words, were either located completely intracavitary or partially intramyocardial. These patients were subgrouped into those with bullets, shrapnel, or undefined missiles.

The group of patients with right-side retained bullets formed the only subgroup with no major complications. In 12 patients with left-sided bullets there were two strokes, one resulting in death.

Of the shrapnel subgroup, major complications of sepsis and death occurred in instances of either right- or left-sided retained missiles. Again,

in the undefined missile subgroup, one case of endocarditis from a retained right-sided missile and two nonfatal strokes from retained left-sided missiles occurred.

In the total group of 76 patients with retained right-sided missiles there was a 20% rate of minor complications as compared to a 27% rate for 37 patients with retained left-sided missiles which was not significantly different.

However, when we looked at the rate of major complications, on the right side there is a 4% rate of major complications, including the deaths, and on the left side is a 16% rate of complications, including the two deaths. This was significantly different at  $p$  is less than 0.025.

We conclude that although it appears that all left-sided missiles should be removed and right-sided missiles might be retained, we must remember that it was only the retained right-sided bullet subgroup that had no major complications. Therefore bullets retained in this position must be left in place if the bullet has not reached the heart, having first traversed the intestinal viscus. All other noncompletely intramyocardial missiles should be removed.