

permit effective surgical treatment of recurrent ventricular tachycardia. Surgical therapy of refractory ventricular tachyarrhythmias is now rational, recommended and rewarding.

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### DISCUSSION

DR. FRANK C. SPENCER (New York, New York): For at least four reasons, this report may be a major contribution with wide application.

First, in patients with coronary disease, death of arrhythmias is common. How common is simply unknown, because autopsy after sudden death cannot differentiate between an arrhythmia and an infarction. We simply do not know how many people die of something that might be prevented by a operation like this, as opposed to recurrent infarction.

Second, as Dr. Harken indicates, the current therapy for arrhythmias is unsatisfactory, including antiarrhythmic drugs, coronary bypass, or excision of aneurysm. One rather sobering and disappointing example is the data from the West Coast about successful cardiopulmonary resuscitation by laymen of someone who fibrillates on the street. On follow-up study one or two years later, a high mortality is found, probably from recurrence of the same problem, again illustrating the limitation of current forms of therapy.

Thirdly, the operative technique described by Dr. Harken provides a plausible explanation of the problem. He is mapping an electrically unstable area that is probably a mixture of scar and muscle, which would normally not be excised with a ventricular aneurysm and might not be treated by coronary bypass.

Finally, to speculate a bit, all of these patients had aneurysms, but death of arrhythmias, as mentioned earlier, may be common. With increasing use of Holter 24-hour monitoring, it is entirely conceivable that potentially malignant arrhythmias may be recognized and the patients operated upon simply for excision of the lethal myocardial scar. Hence this may not be limited surgically to the patient with aneurysm and arrhythmias.

As referred to in the manuscript, but not mentioned because of pressures of time, Cabrol in France and members of Dr. Sabiston's department at Duke have been studying a different technique, termed "encircling endocardial myotomy," again focusing upon the realization that simple excision of the area is inadequate, and one needs to get beyond the zone of excision to the endocardial scar. With all of

these new developments, only long-term evaluation of results from several institutions will make a final decision about the value of this technique. At present, with 15 patients operated upon between two and 24 months, the results are most encouraging.

I have only two questions. It made me a little nervous watching the recurrent tachycardia with the intact heart. Did you have any emboli from dislodgment of clot? Second, do you need both forms of mapping? I could not determine how much the operation was mapping and how much was cutting. Do you have to map both inside and outside, or can you simply open the aneurysm, excise it, do your mapping on the inside, excise that, and simplify your procedure?

These are minor technical points.

DR. ALDEN H. HARKEN (Closing discussion): This paper is pure clinical investigation. We are obviously still trying to learn much about arrhythmias, and this remains a tiny clinical problem.

With better methods of resuscitation and CPR, we are seeing many more of these patients. However, we are still just learning about ventricular arrhythmias. We, therefore, have been performing the epicardial maps and endocardial maps intraoperatively, recognizing that in all probability, at least right now, the epicardial maps are not of value to us, but they are done primarily so that we can learn more about these kinds of arrhythmias.

In answer to your question of the emboli, opening a normothermic, beating heart certainly did worry me. I felt that if we had adequate decompression of the ventricle, I could open the ventricle so that there would be no override, there would be no expulsion of air or clot into the aorta; in fact, we have been fortunate in that area.

As you could see in one of those slides, there was a large mural thrombus there, but we have had no incidence of long-term neurological deficit.

I believe that the problem of the magnitude of the problem is a real one. As I have stressed, this is pure clinical investigation. We are still trying to learn about the management of arrhythmias. Although these are, at least, to me, encouraging results, and we are now up to about 25 or 26 patients with similar results in the second 12 as with the first 12, I am loath to make any long-term predictions as to whether this is going to be anything of therapeutic value for many people.