Direct Surgical Treatment of Arrhythmias:

The Last Frontier in Surgical Cardiology

Camm and colleagues have described in this issue (see page 621) their interesting experience with the identification and ablation of an area of ventricular myocardium that was the origin of a malignant ventricular arrhythmia (MVA). This is the direct approach to the surgical treatment of arrhythmias in contrast to an indirect one as exemplified by coronary artery bypass and dorsal sympathectomy. The underlying disease in their patient was not known; although the patient's QRS was prolonged, and there was a structural defect in the aorta. Disabling and life threatening MVAs of ventricular origin most frequently result from the effects of coronary artery disease, but the arrhythmias do occur as the result of or associated with other disorders such as cardiomyopathies, long QT syndrome, prolapsed mitral valve, and, in a surprising number, without demonstrable cardiac pathology. Since the underlying disorders tend to involve all or large sections of the myocardium, one might expect that more than one area could also have the capacity either to fire spontaneously or to support re-entry and thus become the source of another MVA later. However, this cannot be accepted as proven or disproven until there is further surgical experience with this problem. The patient did have one episode of MVA immediately after surgery.

The determinations of the electrophysiologic characteristics of MVA before and during surgery are not always easy to make. Although elegant studies based on programmed stimulation techniques were done on the patient, the authors were still uncertain whether or not their patient had a micro reentry or focal tachycardia. In my opinion, the operative findings were more in favor of the latter.

The methods of localization in the ventricle where the MVA originates is, in many respects, similar to the ones used in finding a Kent bundle. The supraventricular tachycardia associated with a Kent bundle is the model of a re-entry tachycardia. Identifications of the Kent pathway, with only one exception, can be done by sequential determination of the epicardial activation points in a deliberate fashion without induction of the arrhythmia. In MVAs, the map must be obtained while the arrhythmia is in progress. The MVA may be so poorly tolerated that cardiopulmonary bypass will be needed for support. Paradoxically, it may be difficult to induce the arrhythmia due to the effects of the operation, anesthesia, and trauma on the heart. In fact, this became

Patients admitted with a history or diagnosis of drug overdose. The clinical observations are significantly more important. Were there more prolonged attempts at intubation by the emergency room group than by the group of anesthesiologists, and was aspiration more common with prolonged attempts at intubation? Was the use of a bag-valve-mask system more frequently associated with aspiration, and how often was this system used by emergency room physicians? The skills required to use this system are difficult to acquire, and if the procedure is inappropriately performed, it results in regurgitation and subsequent aspiration of gastric fluid. Finally, in the cardiopulmonary arrest (CAP) group, what was their state on admission to the emergency room? The mortality of 100 percent may relate to factors other than the placement of the endotracheal tube, and perhaps the data are not pertinent to intubation per se.

In spite of the questions, the article by Taryl et al demonstrates that the rate of complications in the emergency room is high and needs to be reduced and that the psychomotor skills of intubation can be learned by all medical personnel involved in the management of patients in the emergency room. Further research is necessary to ascertain why the rate of complications is so high and what steps must be taken to improve the skills and reduce the incidence of complications. While we await the answers, we must continue with ongoing training and with reassessment of our evaluation of the behavioral objectives.

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so troublesome to Guiraudon and colleagues\textsuperscript{1} that in patients with myocardial scarring due to coronary artery disease, they have merely excluded the scarred area of the heart by an endocardial incision, basing the diagnosis and localization upon the pre-operative assessment. Mapping only the epicardium also may not be relied upon to localize the origin of the arrhythmia. In the patient reported by Camm et al, the origin of the arrhythmia was found when the right ventricle was opened; for the offending area was on the ventricular septum. When one deals with a left ventricle, scarred from an infarction, this may be even more complicated in that the most severe and extensive involvement will be in the endocardial portion of the myocardium. The next problem with mapping patients with MVA is brought about by the arrhythmia itself. After one or two beats, the characteristics of the MVA may change, and moreover, sustained MVA may be difficult to initiate; but one or two beats may be relatively easy to induce. Thus, in order to obtain an accurate map, it is necessary to have the capability of analyzing one beat in the operating room. Harrison et al,\textsuperscript{2} working with Gallagher at Duke, are now using such a device in the laboratory which makes simultaneous recordings from multiple myocardial points; and then with a computer, the activation sequence of the one complex can be quickly determined. A pattern of surface electrodes and plunge intra-myocardial electrodes offer promise for more accurate intraoperative analysis of the MVA.

The authors have used cryothermia for ablation of the myocardium that causes the MVA, as advocated by Harrison and colleagues\textsuperscript{3} and Mikat and co-authors.\textsuperscript{4} A special instrument of considerable capacity is required for this purpose. Cryothermia kills the cells in the area of the freeze, but does not cause immediate disruption of the tissue. By the time the non-viable area becomes absorbed, scar tissue has grown in to effectively heal the area. This reduces to a minimum injury to surrounding myocardium. The only precaution one has to use is not to freeze the coronary arteries, since changes do occur in the wall that eventually may lead to their occlusion.\textsuperscript{5}

The report by Camm and associates is important. Although it is the report of a single case, it demonstrates that the MVA can originate from a small area of ventricular myocardium. The area can be identified and successfully ablated by the application of a modality that causes relatively little disruption of surrounding myocardium. It is hoped that a year from now Camm et al will inform us concerning the outcome in their patient.

Perhaps of greatest significance is the demonstration that other cardiac arrhythmias with the potential to cause death and disability can be corrected by the direct surgical approach, a field largely neglected in the rapid advances of cardiac surgery. The direct surgical treatment of arrhythmias could well be the last frontier in cardiology open to the surgeon.

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References


Atrial Myxomas

Triumph of Machine over Man

Not too long ago, the diagnosis of atrial myxomas resided entirely within the domain of the pathologist at autopsy. Lamenting this sad situation, Prichard in 1951 commented:

Tumors of the heart are rarely diagnosed before autopsy. There, diagnosis is either impossible or a matter of chance. Seen from the threshold of an era of even bolder cardiac surgery, these tumors present a dismal diagnostic prospect.\textsuperscript{1(p36)}

Prichard was correct in that the surgical remedy for this lesion was far superior to the diagnostic methods. In fact, in 1952 the first atrial myxoma was removed at the Johns Hopkins Hospital, and this myxoma was among the earliest to be surgically excised; however, until recently, almost all myxomas recognized before death were stumble upon at catheterization. Since angiographic study was virtually the only way to make the clinical diagnosis of myxoma, only those hemodynamically significant lesions associated with symptoms were detected.

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