

Title: EFFECT OF PREVIOUS CARDIAC SURGERY ON ESOPHAGEAL PACING CURRENT THRESHOLDS IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFTING (CABG)

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Introduction: Esophageal pacing is a fast, easy, relatively risk-free method of cardiac pacing. It is an effective method of treating bradycardia which may occur in patients receiving beta blockers, calcium entry blockers, and especially following the induction of anesthesia with high dose opioids. Esophageal pacing current threshold is affected by pulse duration, depth of insertion of the electrode into the esophagus, and interelectrode spacing.¹ Since atrial pacing can be used to augment cardiac output and increase coronary perfusion pressure, it may be useful in cardiac surgical patients with bradycardia.² This study was designed to determine if a previous cardiac operation affects pacing threshold, our hypothesis being that pericardial scar tissue might increase pacing current threshold.

Methods and Materials: With informed consent, 11 patients scheduled for CABG for the first time and 10 patients scheduled for the operation for the second time were enrolled. Patients with esophageal disease and those who were not in sinus rhythm were excluded. Monitoring of all patients included systemic and pulmonary blood pressures in addition to the surface electrocardiogram. After induction a Portex Cardioesophagoscope^R with an interelectrode distance of 10 cm. was inserted orally to a depth determined by the greatest P wave deflection on the atrial bipolar electrogram. Pacing current thresholds were determined for all patients at 2, 4, 6, 8, and 10 msec pulse duration using a pulse generator designed and built at our institution for esophageal pacing. Hotellings T² test was applied to test the null hypothesis that the two populations from which the two groups were sampled do not differ in their mean pacing thresholds at any of the five pulse durations used.

Table 1: Pacing Current Thresholds

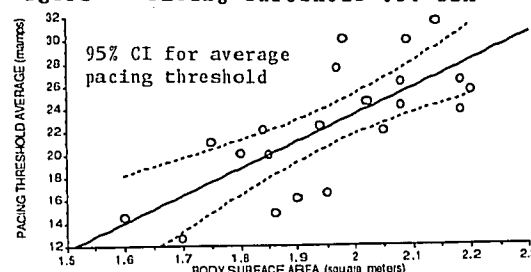
Pulse (msec)	Mean (mamps)	t	p	s
1st time	Redo			1st Redo
2	27.6	28.9	.46	.65 (7.9, 4.0)
4	24.0	25.6	.61	.55 (7.2, 4.1)
6	20.9	21.9	.45	.66 (6.2, 4.4)
8	19.5	20.2	.28	.78 (6.0, 4.1)
10	17.8	18.9	.49	.63 (6.0, 3.9)

Hotellings's T² = 7.3, F_{5,15} = 1.2, & P = 0.37.

Results: The mean age of all patients was 54 years. There was no significant difference between first time CABG

patients and redo CABG patients in extent of disease or cardiac function (Mean ejection fraction 0.47±0.10 vs. 0.45±0.12). No patient gave a history of pericarditis, cardiomyopathy, or pericardial effusion. There was no difference between pacing current thresholds for patients undergoing coronary artery bypass grafting for the first time compared to those undergoing the operation a second time (table 1); thus, all patients were subsequently grouped together for further statistical analysis. There was a positive correlation between pacing current threshold levels and body surface area (BSA) (r=0.73) (figure 1).

Figure 1: Pacing Threshold vs. BSA



Discussion: We theorized that the pacing current threshold would be higher in patients who had undergone a previous operation where the pericardium was entered. We could find no evidence that this is the case, and therefore, it was not more difficult to pace patients who had previously undergone coronary bypass surgery. We did find a positive correlation between BSA and pacing current threshold; one might empirically expect this since the pacing current must generally traverse more extracardiac tissue in a larger patient. In conclusion, we have shown the esophageal approach to be an effective, safe method of cardiac pacing. Whereas, a previous CABG operation does not influence pacing current threshold via the esophageal approach, BSA does.

References:

1. Benson DW, et al: Transesophageal Atrial Pacing Threshold: Role of Interelectrode Spacing, Pulse Width and Catheter Insertion Depth. Am J Cardiol 53: 63-67.
2. Backofen JE, Schauble JF, Rodgers M: Transesophageal Pacing for Bradycardia. Anesthesiology 61: 777-779.