Thrombocytopenia Associated with Swan-Ganz Catheterization in Patients

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Flow-directed, balloon-tipped pulmonary-artery catheters (Swan-Ganz catheters) induce thrombocytopenia as a result of increased consumption of platelets in dogs. In the present study, we examined the effects of Swan-Ganz catheters upon platelet counts in adult patients undergoing coronary-artery bypass graft operations.

Materials and Methods

Thirteen patients who underwent coronary-artery bypass grafting for coronary-artery disease were studied. The studies were approved by the University of Pennsylvania Committee on Studies Involving Man. In seven patients, Swan-Ganz catheters,§ and in six patients, central venous catheters,¶ were employed for monitoring hemodynamic performance. Six of seven patients in the Swan-Ganz catheter group and five of six in the central venous catheter group were male. Mean ages, body weights and body surface areas (±SE) were 53 ± 3.4 years, 81.8 ± 4.9 kg, and 1.95 ± 0.06 m², respectively, in the Swan-Ganz catheter group, and 57 ± 4.5 years, 83.8 ± 2.7 kg, and 1.93 ± 0.05 m², respectively in the central venous catheter group, not statistically significantly different. In both groups the catheters were introduced through right internal or external jugular veins and remained in situ for 24 hours.

Extents of disease, premedications, anesthetic methods (halothane, nitrous oxide, oxygen) and medications before, during and after anesthesia were similar in the two groups. None of the patients had postoperative complications or received platelet infusion during the period of study. The durations of cardiopulmonary bypass and the amounts of blood transfused between sampling times in the two groups were compared.

Peripheral blood platelet counts were performed in triplicate by phase-contrast microscopy of blood drawn into ethylenediamine tetraacetic acid (EDTA) from a radial artery or an antecubital vein (24 hours after the removal of the catheter) and diluted in a standard fashion. Blood samples for platelet counts and hematocrits were obtained before catheterization, an hour after catheter insertion but before surgical incision, and six, 24 and 48 hours after catheter insertion. The catheters were removed 24 hours after insertion.

Rectal temperatures were recorded at the times of blood sampling.

Statistically significant differences between platelet counts of the two patient groups at the 95 per cent confidence level were confirmed by analysis of variance. Differences between platelet counts at specific time intervals was confirmed by Tukey's test for unconfounded means.

Results

Mean (±SE) peripheral blood platelet counts (number of platelets/mm³ blood) for the two groups are shown in figure 1. An initial decrease (six hours) in both groups corresponds to the period of cardiopulmonary bypass. Platelet counts in the Swan-Ganz catheter group, but not the central venous group, continued catheter to decline such that at 24 hours the mean platelet count was 85,000 fewer (P < 0.05) than that in the latter group at the same time interval (and 117,000 [P < 0.05] less than the initial Swan-Ganz catheter control value at time 0). After removal of the Swan-Ganz catheter at 24 hours, platelet count began to rise, although platelet counts in the Swan-Ganz catheter group continue to remain significantly depressed at 48 hours.

Mean durations of cardiopulmonary bypass (±SE) were 83.6 ± 8.7 min in Swan-Ganz catheter group and 81.7 ± 10.0 min in the central venous catheter group, not significantly different.

The numbers of units of blood transfused (mean

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§ Edwards Laboratories, Santa Ana, California.

** Unopette®, Becton-Dickinson, Rutherford, New Jersey.

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Mean platelet counts (± SE) were 2.3 ± 0.36 in the Swan-Ganz catheter group and 2.7 ± 0.33 in the central venous catheter group, and statistically the same. Hematocrits and body temperatures after different intervals of time were the same in the two groups.

**DISCUSSION**

We found that insertion of a pulmonary-artery catheter was associated with increased platelet consumption, and that the phenomenon reversed on removal of the catheter. Use of cardiopulmonary bypass contributed to the early decreases of platelet counts in both groups studied, but the decrease of platelet counts in the Swan-Ganz catheter group continued throughout catheterization and after termination of cardiopulmonary bypass. After removal of the Swan-Ganz catheter, the platelet count began to increase.

Swan-Ganz and central venous catheters are fabricated from foreign materials that induce thrombus formation. That Swan-Ganz catheters reduce platelet counts more than do central venous catheters may reflect the greater surface area of the former catheter. Thrombus formation along the surface of the catheter has been observed by others in man and by us in dogs.

Although, in this study, clinical evidence of any complication associated with platelet reduction was not observed, our findings demonstrate that prolonged pulmonary arterial catheterization should be included in the differential diagnosis of thrombocytopenia.

**REFERENCES**