

TITLE: SWAN-GANZ CATHETER INDUCED THROMBOCYTOPENIA IN MAN

AUTHORS: K.A. Richman, M.D.; Y.L. Kim, M.D., Ph.D.; and B.E. Marshall, M.D., F.R.C.P.

AFFILIATION: Department of Anesthesia, Hospital of the University of Pennsylvania, 3400 Spruce Street, Philadelphia, Pennsylvania 19104

Introduction:

Flow directed, balloon-tipped pulmonary artery catheters (Swan-Ganz catheters) have been shown to induce thrombocytopenia as a result of increased platelet consumption in an animal model.¹ In the present study, we examined the effects of Swan-Ganz catheters upon platelet counts in adult patients undergoing coronary artery bypass graft surgery.

Materials and Methods:

Thirteen patients who underwent coronary artery bypass graft surgery for coronary artery disease were studied. These studies were approved by the University of Pennsylvania Committee on Studies Involving Man. In 7 patients, Swan-Ganz catheters (Edwards Laboratories, Santa Ana, California) and in 6 patients, central venous catheters (16 G, 8" polyurethane Arrow central venous catheter, Arrow International, Inc.) were passed into the right internal or external jugular vein for monitoring hemodynamic performance.

Extent of disease, premedications, anesthetic methods (halothane, nitrous oxide, oxygen) and all medications were similar in both groups. None of the patients had post-operative complications or received platelet transfusion.

Peripheral platelet counts were performed in triplicate by phase contrast microscopy in a standard fashion.² Blood samples were obtained before catheterization, one hour after catheter insertion but before surgical incision, 6, 24, and 48 hours after catheter insertion. The catheters were removed 24 hours after insertion. Hematocrits were recorded at the time of platelet sampling.

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

Results:

Mean (\pm S.E.) peripheral platelet counts (number of platelets/mm³ of blood) for the two groups are shown in figure 1. Initial platelet counts were the same. An initial drop (6 hours) in both groups corresponds with cardiopulmonary bypass. Platelet counts in the Swan-Ganz catheter group, but not the CVP group, continued to decline, and at 24 hours the mean platelet count was 83,000 fewer ($p < .05$) in the Swan-Ganz catheter group [and 117,000 ($p < .05$) less than the initial Swan-Ganz control value at time 0]. After removal of the Swan-Ganz catheter at

24 hours, platelet count began to rise, although the Swan-Ganz platelet count remained significantly depressed at 48 hours.

There was no difference in the length of cardiopulmonary bypass (mean \pm S.E.: 83.6 \pm 8.7 min for SG and 81.7 \pm 10.0 min for CVP), hematocrits, body size, or number of units of blood transfused in either group.

Discussion:

This study confirms that thrombocytopenia secondary to Swan-Ganz catheters - originally described in an animal model - is a real phenomenon in man.¹ The mechanism for this remains unclear, but the process is reversible by catheter removal. Increased platelet consumption was confirmed in the animal study, and probably involves a factor related to catheter surface. Swan-Ganz catheters are fabricated from polyvinyl chloride and are known to be thrombogenic.³ Cardiopulmonary bypass was initially important in lowering the platelet count but was not responsible for a later decline. Hemodilution was not the cause of thrombocytopenia, since hematocrits were similar in both groups.

While clinical bleeding was not a problem in our patients, and platelet counts remained above a dangerously low level, we conclude that the presence of a Swan-Ganz catheter can be the cause of a lower platelet count.

References:

1. Richman KA, Kim YL, Marshall BE: Thrombocytopenia induced by Swan-Ganz catheters. *Anesthesiology* 51:S161, 1979
2. Brecher G, Schneiderman M, Cronkite EP: The reproducibility and constancy of the platelet count. *Am J Clin Pathol* 23:15-26, 1953
3. Hoar PF, Stone JG, Wicks AE, et al: Thrombogenesis associated with Swan-Ganz catheters. *Anesthesiology* 48: 445-447, 1978

Figure 1

