

Correspondence

Impeller Centrifugal Pumps Abandoned or Fully Alive?

To the Editor:

We read the article by Dickinson TA and coworkers, comparing a roller and a centrifugal pump for extracorporeal circulation during adult surgery (1). The authors used a non-pulsatile perfusion with either a roller pump (Shiley-Stockert) or a centrifugal pump based on the nested cones constrained vortex principle (Biomedicus, Medtronic, USA). Outcome data (ICU, length of stay, complications, mortality) revealed no statistically significant differences.

Outcome after surgery is affected by very many variables. The authors chose for a design two consecutive study groups and weighed 53 preoperative risk factors for which there were no statistically significant differences between the groups. Nevertheless, we observed some interesting differences in their study groups (gender, frequency of redo operations, diabetes, obesity and chronic obstructive pulmonary disease). Therefore, their results would have been more corroborating when a randomized design with exclusion of some common risk factors had been used.

In their discussion, the authors also refer to our publication on a comparison between a roller pump and a vaned (or finned) impeller-type centrifugal pump (Sarns/3M, USA) (2). We deplore the authors' statements: "As early as 1959, impeller pumps were abandoned because they were even more hemolytic than roller pumps" and "impeller pumps have been shown to be more hemolytic than a constrained vortex pump". The authors confirm these two statements by an old publication at a time when the vaned impeller centrifugal pump was not even used and by unpublished data, respectively. The study of Hoerr and colleagues (3), cited in the publication of Dickinson and colleagues, stated that there was no difference in hemolysis and any of the other investigated hematological parameters between the Sarns vaned impeller pump and the Biomedicus constrained vortex pump. Also in numerous later studies there was no evidence of higher hemolysis rates with the Sarns impeller pump head than with the Biomedicus constrained vortex pump head (4).

In recent years impeller centrifugal pumps gained increasing clinical application since they have clear advantages over constrained vortex pumps, such as lower prime, less air to deprime the pump and so avoid air emboli passing in the arterial line, and lower maximal negative and positive pressures generated in the system (5).

The problem of finding an optimal centrifugal pump design is far from solved, as was shown in numerous presentations

on this topic at the Second World Congress of the International Society for Rotary Blood Pumps in Vienna (4).

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To the Editor:

We appreciate the comments of Dr. J.J. Driessen, L. Gevaert and L. Rondelez. We agree with them (as we stated in our paper) that our study would have been more "corroborating" if we had run randomized trials. This, however, does not necessarily construe that our methodology was bad science.

They also reminded us that some of our risk factors had large differences in frequency of occurrence and that our results (patient outcomes) would have been more confirming if we had excluded these risk factors in the data analysis. To a certain extent when using statistics, the larger the population size, the more meaningful the data. As an example, our two fold difference in the occurrence of the risk factor COPD (2% versus 4%) is not a statistically significant difference when the total number of patients is 102; however it is statistically significant for the same rate of occurrence in a sample population of 2000 patients. Over 55% of the cardiac programs in the United States use some form of risk stratification (1). This is an important reason why we feel that further studies comparing pump technologies should incorporate these easily obtainable and objective data to compare patient outcomes.

Since publication of this paper, we have studied the subset of high risk patients (defined as patients with a 15% predicted mortality) and found no statistically significant difference in patient outcomes. Again, both pump groups were statistically similar in frequency of occurrence for the 53 risk factors.

Lastly, we appreciate their attention to the fact that we erroneously misrepresented the impeller type centrifugal pump as being inferior. We thank them for showing us several advantages of the modern day impeller pump.

We appreciate the opportunity to reply to their comments.

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