Flow Visualization Study to Avoid Thrombus Formation in a Gyro Centrifugal Pump


Background
The Gyro permanently implantable (PI) pump consist of a sealless pump housing and an impeller supported with a double pivot bearing. The secondary vanes are attached to increase the secondary flow to avoid thrombus formation behind the impeller. This system has been proven to be antithrombogenic in experimental calves that survived up to 283 days with no thrombus formation. The aim of the experiment is to evaluate the critical area and to search for a more effective design for antithrombogenecity in a Gyro PI pump.

Method
Flow visualisation studies using an oil film method were performed at 5.0 L/min flow and 100 mm Hg pressure head on three types of impellers; no secondary vanes, 0.5 mm height secondary vanes, and 1.0 mm height secondary vanes. The comparison studies among these impellers were performed on the surface of impeller bottom and bottom housing.

Results
Regarding the surface on the impeller bottom, the impeller with no secondary vanes had the least stagnant area around the shaft. On the other hand, the impeller with 1.0 mm height secondary vanes had the most distinguished flow lines on the bottom housing.

Conclusion
Overall the impeller with 0.5 mm height secondary vanes (current design) appeared to create the most effective secondary flow. However, there is still a possibility for further improvement by modifying the design of the impeller bottom.

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