A new assist device for short term right ventricular support. A case report.

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Introduction: Right ventricular (RV) failure remains one of the worst scenarios in cardiac surgery. In the past various assisting devices were developed with a greater or lesser extent of success. The most recent advancement in temporary circulatory support is represented by miniaturized rotary pumps. We report on two successful implantations of a right ventricular microaxial blood pump (RVMBP) in two patients suffering from acute RV failure after undergoing emergency CABG.

Methods: The set-up of the RVBMP consists of a case containing an impeller driven by an incorporated brushless DC motor. The diameter of the pump is 6.4 mm with an inner volume of 12 mL and a maximum weight of 11 g. The RVMBP is provided with an inflow cage implanted in the right atrium and a ring-enforced outflow cannula which is anastomosed to the main pulmonary artery. At a maximum rotational speed of 32,500/min the RVMBP can deliver an output of 6 L/min. Although the artificial blood contacting surface of the RVMBP is only 65 cm² a certain degree of anticoagulation is necessary in order to prevent clot formation as shown in our own animal studies. The relief of the right ventricle was monitored by continuous hemodynamic measurements as well as regularly performed echocardiographic studies. The patients were weaned from the RVMBP by gradual reduction of pump performance over a period of 3 (Pat. 1) and 8 days (Pat. 2).

Conclusions: Our results demonstrate that this newly developed rotary blood pump is a promising device for short term support of the RV.

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Spermatogonial stem cells An update on spermatogonial stem cell banking and transplantation

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Like every other adult stem cell in the human body, spermatogonial stem cells (SSCs) have the capacity to either renew themselves or to start differentiation, i.e. spermatogenesis. Due to these properties, several options for preservation and re-establishment of the spermatogenic process exist. Prevention of sterility has become an important issue in reproductive medicine. For adult men, sterility after cancer treatment can be circumvented by banking sperm samples. For prepubertal patients, however, this is not an option, since spermatogenesis has not yet started. Currently, spermatogonial stem cell transplantation (SSCT) is considered the most promising tool for fertility restoration in pre-pubertal cancer patients. In these patients, testicular tissue could be removed and cryopreserved before starting any cancer treatment. When the boy is cured, SSCT can be applied for fertility restoration. However, before such an application can be applied, both the safety and the efficiency of the procedure have to be assured. In the mouse, we have shown that sperm obtained after SSCT were able to fertilize and produce offspring in-vivo and after assisted reproduction. However, it was also observed that fertilizing potential was lower with transplanted males compared to control mice. Moreover, the litter sizes were smaller and the fetal length and weight were significantly lower in the first-generation offspring from transplanted animals, whereas subsequent generations did not show those abnormalities. This observation may be suggestive for imprinting disorders. The efficiency of SSCT depends on the number of SSCs injected in the recipient’s tubules. Since only the SSCs can relocate to the basement membrane and initiate colonization, enriching the proportion of SSCs may improve transplantation efficiency. Although, SSCT could prove important for fertility preservation, this technique may not be without any risk. Testicular cell suspensions from cancer patients may be contaminated with cancerous cells. It is obvious that reintroduction of malignant cells into an otherwise cured patient must be omitted. Magnetic Activated Cell Sorting and Fluorescence Activated Cell Sorting are two strategies that can be used to decontaminate the cell suspension from malignant cells or to enrich the cell suspension for SSCs.

When SSCT becomes available for clinical use, efficient protocols for the cryopreservation of SSCs and testicular tissue will be of great benefit. By using a non-controlled freezing protocol, the survival rate of SSCs was higher compared with other testicular cells, which resulted in an enrichment of SSCs in the final suspension, but an important loss of functionality of spermatogonial stem cells was found after freezing and thawing. An alternative way to preserve SSCs is to freeze the whole testicular tissue instead of cell suspensions. The structure of the tissue can be well preserved and especially the spermatagonia survive. An alternative to cryopreservation could be in-vitro culture of SSCs. Recently, it was reported that mouse SSCs could be expanded in-vitro with maintenance of functionality. When this approach would be feasible with human SSCs, it may improve the efficiency of cryopreservation, either by increasing the number of SSCs before freezing or after thawing.

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Advances in bioengineering for microsurgery of male infertility

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