A beating chance for the future of heart transplantations

In Sweden there is around 60 donor hearts suitable for transplantation each year. These hearts require careful monitoring during transportation as much as before and after the transplantation. Despite the strict measures taken during with these hearts, there are cases of hearts which are labelled unfit for transplantation due to ischemic damages caused during the transport. Johan Nilsson, Professor at Thoracic Surgery (Lund University), has recently received a Vinnova grant to support his current research on a new heart preservation box. The box employs mechanisms which serve to delay or prevent ischemic damages to the heart during transportation. In this project, Johan Nilsson wants to test and determine the heart box’s effects on the preserved heart and whether it’s a favorable alternative compared to the methods currently in use.

The heart box, which is based on research conducted by Stig Steen (senior professor at Thoracic Surgery), is designed to allow oxygenation and temperature of the heart to be controlled during transportation. A pump allows for the circulation of a blood cell mixed cardioplegic solution through the coronary vessels to keep the heart ischemic and oxygenated. The solution is also hyperosmolar, which prevents edema in the heart, and is re-oxygenated by the pump. The heart box also contains a cooling system which enables the heart to be kept continuously cooled at a specific temperature, something which isn’t possible with today’s methods of heart transportation.

In previous projects the heart box has been tested in animal experiments with pigs. Pig hearts were kept in the heart box for as long as 24 hours prior to transplantation and showed negligible signs of ischemic damage after the preservation time had ended. In Johan Nilsson’s current project, 6 patients are to undergo heart transplantation with hearts preserved in the heart box. The first patient underwent their procedure around the month shift of August/September 2017 and the outcome was very positive. With the support from the Vinnova grant, Johan Nilsson can proceed to use the heart box for transplantations in an additional project involving a total of 28 patients randomized for control vs. heart box.

Johan Nilsson is hoping to observe two advantages the heart box might have over current methodology of heart transplantation. The first is the possibility of increasing the distance which the preserved heart can travel between donor and recipient, by eliminating the critical time limit of 4 hours. This could allow an increase in the exchange of suitable hearts across nations by finding better immunological matches, but also allow more time for the preparatory surgery of the recipient prior to the transplantation (especially in the more complicated cases). The second is to enable the use of donated hearts, especially from older donors, which are more susceptible to ischemic damages. The possible outcomes would be a much less concern of the travel time of the preserved heart and an increased amount of hearts available for transplantation.

How to prove that the heart box is better than current methods of heart preservation is a question that will be difficult to answer. Johan Nilsson is however positive that the benefits of the heart box
will become more apparent after his transplantation projects involving the heart box have been completed.

- Joakim Hising