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## **New Method for Re-transfusion of Shed Blood in Thoracoabdominal aortic aneurysm repair (TAAA)**

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In open surgery of thoracoabdominal aortic aneurysm the patient loses a lot of blood when clamps are replaced, this put high demands on time -efficiency in the use of cell saver and rapid infusion system. To keep the hemodynamic stable homologous blood transfusion has to be used. Transfusion of homologous blood is associated with an increase in mortality and therefore it would be beneficial to transfuse with the patient's own blood. The cell saver can autotransfuse, but requires time. In order to be able to use the patient's own blood, a modified re-transfusion setup is applied at Karolinska Hospital Solna. The aim is to lower the use of homologous blood transfusion and to keep the patients hemodynamic stable. This setup consists of left heart bypass with drainage from left atrium to a centrifugal pump and an oxygenator and return to the patient through arteria femoralis. The venous reservoir is primed but bypassed in the system with a clamp and a bridge between the drainage tubing and the centrifugal pump. Selective renal and visceral perfusion is done with oxygenated blood via roller pumps. Previous the bleeding has been managed with cell saver and homologous blood transfusion with rapid infusion system. The new way of managing the blood losses is to use the suction via the heart-lung machine, which is done by roller pumps transporting the blood from the surgical field to the venous reservoir and transfused back to the patient through vena femoralis. This way reduces the use of bank blood and keeps the hemodynamic stable and avoid sudden changes in blood pressure in critical times during the surgery.

For more information, please have a look at the attached file.

This presentation is a poster.

## **Mortality after tricuspid valve procedures: A twenty-seven years' single center experience**

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**Objective:** Better scientific support in the decision making of when to perform a tricuspid valve procedure is warranted, as the level of evidence for current recommendations is low. We here assess mortality after tricuspid valve (TV) surgery in a large single center patient cohort

**Method:** Data from 392 TV procedures in 388 adult patients performed 1989—2015 was retrospectively reviewed. Patients were grouped according to type of concomitant procedure: CABG (n=87; TV+CABG), other valve surgery (n=240; TV+valve), or isolated TV procedure with or without other minor procedure (n=65), and time-period of operation: 1989—2005 (n=173) or 2006—2015 (n=219). Reference cohorts used for comparisons underwent other valve surgeries and/or CABG during the same time-periods.

**Results:** During the latest time period, annual number of TV procedures increased 2.4-fold, mainly for TV+valve procedures (2.8-fold). Within the TV+valve group, a larger proportion of patients had mild to moderate TR (grade  $\leq 2$ ) compared to the first time-period ( $p=0.001$ ). The TV+CABG group had significantly higher mortality than both other groups during both time periods, whilst isolated TV procedure had the highest survival rates except for compared to the TV+valve group during the last time-period ( $p=0.41$ ). Survival for patients undergoing TV+valve procedures had improved significantly during the last decade ( $p=0.001$ ) and was during this period comparable to other valve operations.

**Conclusions:** With practice consistent with the current guidelines, the procedure is performed more frequently and at lower grades of regurgitation compared to the preceding time period, and survival after tricuspid valve procedure has improved.

## **Intraoperative real-time detection of ischemic preconditioning in heart**

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**Intro:** Myocardial oxygenation can be divided into three different parts: oxygen delivery by hemoglobin (Hb), oxygen storage and transport within the cardiomyocytes by myoglobin (Mb) and oxygen consumption within the cardiomyocyte mitochondria. We have developed an intraoperative spectroscopy method that may measure oxygenation levels of Hb, Mb and cytochrome c oxidase (CCO) for reproducible detection of myocardial oxygenation level. Ischemic preconditioning (IPC) is an intrinsic process where repeated short episodes of ischemia protect the myocardium. We measured the impact of IPC on myocardial oxygenation levels and compared the results against a subsequent ischemic insult.

**Objective:** We aimed to test the potential of the intraoperative NIRS measurement method in assessing myocardial oxygenation during open-heart surgery.

**Methods:** Five domestic pigs were exposed to a repeated ischemic protocol (3 min ischemia and 7 min perfusion, repeated 7 times) during CPB. Myocardial oxygen saturation levels of Hb, Mb and CCO were monitored from anterior LV wall with broadband near-infrared spectroscopy (NIRS) sensors.

**Results:** Mitochondrial saturation of CCO averaged over the last 30s of the ischemic period increased gradually over repeated ischemia in all four pigs with successful ischemic delivery. The increase was 7.2±2.9 pp (mean±std, p<0.01). Pearson's correlation coefficient for the increase was 0.87 (p<0.02).

**Discussion:** The results show the effect of IPC in the heart mitochondrial CCO oxidation level, which suggests that broadband NIRS is a feasible method to optimize the IPC protocol effectivity in clinical settings. Intraoperative NIRS measurement may be a useful online tool for assessing myocardial oxygenation during open-heart surgery.

## **Outcome of surgery on the pulmonary valve and the right ventricular outflow tract in adults is related to disease etiology**

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**Background:** Surgery on the pulmonary valve and the right ventricular outflow tract (RVOT) in adults is rare. We aimed to investigate the characteristics and outcome of these patients operated at Haukeland University Hospital during a period of 15 years.

**Materials and methods:** Patients > 18 years undergoing surgery on the RVOT, pulmonary trunk or pulmonary valve between 2004-6/2019 were identified, and pre-, per- and postoperative characteristics collected for statistical analysis.

**Results:** 29 patients, 10 female (35%), were included. Median age was 49 years (range 19-83). 45% had redo-surgery and 48% had concomitant procedures. The patient group was heterogeneous consisting adults with congenital heart defects (ACHD) (n=16), carcinoid syndrome (n=7), endocarditis (n=2), intimal sarcoma (n=2), pulmonary trunk aneurysm (n=1) and Noonan syndrome (n=1). The majority were either treated with Medtronic Freestyle prosthesis (n=18) or homograft (n=5). Six patients had subpulmonal stenosis and were treated with resection of the RVOT, four also with patch-correction. Median postoperative ICU time was 1 day (range 1-7); 30-day mortality was 0%. Three patients with carcinoid syndrome died within 90 days. At long-term follow-up, three patients had re-intervention with percutaneous pulmonary valve implantation. Estimated cumulative 5-year survival for the whole group was 79%, whereas it was 100% for ACHD patients.

**Conclusion:** Adult population undergoing surgery on the pulmonary valve or RVOT is heterogeneous. Early postoperative results were good with short ICU stay and zero mortality at 30 days. Long-term survival of ACHD patients was excellent, otherwise diverging and influenced by the complex etiology.

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### **Repair of bileaflet prolapse in Barlow syndrome: The 4-chord technique**

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**Objective:** Surgical repair of patients with Barlow's disease is challenging due to the extent of the leaflet and annular abnormalities. Several techniques have been described to repair Barlow's mitral valve including currently popular "non-resectional" approaches, which has been associated with excellent results, and includes the advantage of preserved leaflet mobility and a large surface of coaptation. We describe a simple approach to the use of neochordae to repair bileaflet prolapse in patients with Barlow syndrome and avoid systolic anterior motion.

**Methods:** A video will be presented highlighting a case of Barlow's disease with bileaflet prolapse.

**Results:** The valve is repaired with two sets of chordae to each of the anterior and posterior leaflets. The key technical consideration is the sizing of the chordae. For the anterior leaflet, chordae are sized by pulling the leading edge of the leaflet to the corresponding hinge-point on the mitral annulus. Posterior chordae are sized to be very restrictive and should result in the posterior leaflet being pulled straight down on post-operative echocardiogram. The repair is finished with a posterior annuloplasty, using the largest possible flexible band. These maneuvers ensure that the coaptation point will be as far posterior as possible, to mitigate the risk of postoperative systolic anterior motion.

**Conclusion:** Repair of Barlow's disease with four sets of artificial chordae is a straightforward, reproducible approach to this complex pathology while reducing the risk of systolic anterior motion.

## **Relapse after surgical treatment of mitral regurgitation caused by isolated annular dilatation**

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**Background:** Mitral regurgitation (MR) may be caused by annular dilatation in the setting of chronic atrial fibrillation (AF). Surgical results are scarce, with only two published reports comprising a total of 30 patients. This study aimed to address this area of deficiency.

**Methods:** Retrospective analysis of patients operated for Carpentier type I MR due to annular dilatation and history of AF in the time period 2007-2018.

**Results:** 13 patients (62% women, mean age 71±8 years) were operated for symptomatic grade 3-4 MR (NYHA class II-III). Mean duration of AF was 102±49 months, two had previous catheter ablation treatment. Mean left ventricular (LV) end-systolic diameter was 3.6±0.8 cm and mean ejection fraction was 55±9%. Mean left atrial end-systolic diameter was 5.1±0.8 cm and mean mitral annular anteroposterior diameter was 4.0±0.5 cm. All operations were elective with mean Euroscore II of 4.6±2.7%. All were operated with mitral valve annuloplasty. Surgical ablation was performed in 38%, although none converted to sinus rhythm. 31% had concomitant tricuspid repair, one aortic valve replacement and one coronary bypass grafting. Estimated cumulative 10-year survival was 100%. Postoperative echocardiogram before discharge showed trace or no MR. After follow-up of 8±4 months EF was 53±10% (p=0.68), 69% had MR grade 0-1, whereas 31% had moderate MR (3 grade II; 1 grade III) (p=0.014).

**Conclusions:** Mitral valve annuloplasty in Type I MR secondary to AF had excellent long-term survival. However, residual MR in 1/3 of the patients should be further elaborated with emphasis on AF.

## Long-term outcome of patients with DSWI following cardiac surgery – preliminary results from the SWEDEHEART registry

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### Background

Deep sternal wound infection (DSWI) is a major complication following open heart surgery with increased mortality and morbidity for the patient. The incidence is usually 1-4 % and 90-days mortality 0-16 %. Numerous studies have analysed short-term outcome of DSWI and defined risk factors. However, less is known about long-term survival and complications of these patients. We therefore studied long-term outcome of DSWI patients in a large nation-wide cohort of heart surgery patients.

### Methods

This retrospective cohort study included 114,860 patients from the SWEDEHEART registry who underwent CABG (70.6 %), valve repair or replacement (18.6 %) or both (10.8 %) between 1997 to 2015. DSWI patients were identified by surgical intervention codes in the Swedish Patient Registry (reoperation for deep infection). DSWI cases were compared to non-infected patients and to 228,105 age and gender matched controls from the general Swedish population. Median follow-up was 8.0 years.

### Results

Altogether, 1,515 patients (1.3 %) developed DSWI, most of them after CABG (69.7 %). Mean time from surgery to surgical intervention was 19.5 days (range 0-90 days). DSWI patients were older and had significantly higher BMI than those without. They had more often diabetes, hypertension, heart failure, previous stroke, renal failure and more often underwent combined CABG and valve surgery. Ninety-day mortality was 7.9 % vs. 3.0 % ( $p < 0.001$ ) in the DSWI vs. non-infected group, and 1- and 5-year mortality was 12.8 % vs. 4.5 % and 28.9 % vs. 14.1 %, respectively ( $< 0.001$ ). Both DSWI and non-DSWI patients had inferior unadjusted mortality compared to the control group (Figure 1).

### Conclusion

In this nation-wide cohort study, the unadjusted ninety-day mortality was almost threelfold higher for DSWI patients than for non-DSWI patients and long-term all-cause mortality was also significantly increased in the DSWI group.

### Graphics

Unadjusted Kaplan-Meier survival curves for patients with (blue) and without DSWI (green) and healthy controls (red).