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Successful management of an unwanted complication; VAC therapy

İstenmeyen bir komplikasyonun başarılı tedavisi; VAC terapi

Median sternotomy is the most common approach in cardiac surgery with 3% risk of mediastinitis development despite sterile techniques, antibiotics and appropriate wound care. Post-sternotomy mediastinitis (PSM) is a serious condition associated with 30% mortality rate. Treatment of this unwanted condition includes debridement, antibiotic irrigation and reconstruction with omentum or pectoral muscle. Due to its challenging nature, management of PSM became a subject of scientific interest. Comprehension of the crucial role of early extubation and mobilization in the acceleration of wound healing besides the benefits of sufficient microvascular blood supply as well as edema reduction; application of topical negative pressure (Vacuum assisted closure method; VAC therapy) has been suggested with identification of the rapid closure of the wound via increase in granulation tissue. Being first used by Obdeijn et al. for the treatment of PMS in 1999, VAC therapy has become popular in USA by Argenta and Morykwas in 1995 and in Europe in 1997 (1).

Past studies revealed 4-fold increase in microcirculation by application of 125 mmHg negative pressure, while the opposite effect in case of 400 mmHg negative pressure. In patients with use of internal thoracic artery for bypass, reduction in blood flow to peristernal wound margins was demonstrated to lead to a delay in the wound healing with benefits of negative pressure application via positive effects on the blood circulation. Depending on the size of the wound, VAC can be performed based on 5-12 sessions with 48-72 hour intervals. In patients under warfarin therapy, it is possible to perform procedure by switching to low molecular weight heparin when necessary. In larger mediastinal defects including heart with bypassed grafts, controlled application of lower pressure (75-100 mmHg) as well as prevention of the risk of right ventricle rupture via use of barrier isolating polyvinyl alcohol from sterile gas seems possible (2-5).

A total of 7 patients (obese and with short sternum) who were applied with VAC therapy for the mediastinal sternal wound infection following coronary bypass surgery performed in our hospital between 2009-2012 were included in this study (Table 1). Partial (2/3 of the region)

Table 1. Patients` characteristics

Patient	Age, gender	BMI, kg/m^2	Comorbidity	Operation	CPB time	C-RP WBC	Tissue culture	VAC therapy+ Antibiotic
1	65, M	25.1	HT HPL Type 2 DM Cigarette	LIMA-LAD Ao-OM Ao-Rdp	55 min	26 mg/L 13.4 g/L	*S. epidermidis*	10 sessions (20 day) + ampicillin + sulbactam (4x2gr)
2	73, F	27.3	HT HPL Type 2 DM	LIMA-LAD Ao-Rdp Mitral repair	78 min	54 mg/L 16.1 g/L	*S. aureus*	8 session (17 day) + daptomysin (1x500 mg)
3	71, F	26.9	HT COPD HPL Type 2 DM	LIMA-LAD Ao-D Ao-OM Ao- RCA	68 min	68 mg/L 12.6 g/L	*S. aureus*	8 session (16 day) + vancomysin (4x500 mg)
4	66, M	24.8	HT HPL Cigarette	LIMA-LAD AO-IM-OM Ao-Rdp	67 min	46 mg/L 11.3 g/L	*S. aureus*	9 session (18 day) + vancomysin (4x500 mg)
5	76, M	25.8	COPD HPL Type 2 DM	LIMA-LAD Ao-D-OM Ao-RCA	73 min	74 mg/L 15.6 g/L	*S. epidermidis*	5 session (10 day) + ampicillin + sulbactam (4x2 gr)
6	71, F	25.6	HT COPD HPL	LIMA-LAD Ao-RCA	46 min	83 mg/L 14.4 g/L	*S. epidermidis*	6 session (12 day) + ampicillin + sulbactam (4x1 gr)
7	78, M	26.4	HT HPL Type 2 DM	LIMA-LAD Ao-IM Ao-Rdp	54 min	52 mg/L 11.4 g/L	*S. epidermidis*	7 session (15 day) + ampicillin + sulbactam (4x2 gr)

Ao - aorta, BMI-body mass index, COPD - chronic obstructive pulmonary disease, CPB - cardiyopulmonary bypass, C-RP - C- reaktif protein, D - diagonal coronary branch, DM - diabetes mellitus, HPL - hyperlipidemia, HT - hypertension, IM - intermediate coronary branch, LAD - left anterior descending artery, LIMA - left internal mammary artery, OM - obtuse marginal coronary branch, RCA - right coronary artery, Rdp - right posterior descending coronary branch, VAC - vacuum assisted device, WBC - white blood cell (leukocyte)

Figure 1. A) Dehiscence and necrotic infected tissue in the lower 1/3 of the sternum. B) Hydrophobic polyurethane content 10% silver foam (VAC Granufoam Silver) and Therapeutic Regulated Accurate Care (T.R.A.C.) pad system (Kinetic Concept Inc. San Antonio, TX, USA), C) Intact sternum and vascularized granulation tissue

incision site infection on sternum and mild to moderate sternum dehiscence in the 1/3 lower regions were evident in all patients. For that reason, chest corset was administered in each patient. Use of softer corsets has been considered to increase the success of the treatment via more appropriate stabilization of the sternum. All of the sternums were stabilized following the procedure. No additional surgical method was applied to the sternum or to the wound site. Initially high levels for C-reactive protein and white blood cells count were controlled every 4 days during the course of negative pressure and antibiotic therapy. Antibiotic treatment was continued until tissue cultures become negative. During application of 100 mmHg negative pressure, silver foam was carefully observed to prevent a direct contact with the heart. Hence no barrier system was placed under the foam. Wound debridement was performed in each session. Gradual contraction in wound margins was observed on the lateral and basal surfaces. Increase in capillary-rich granulation tissue was observed after each session (Fig. 1). The wound was left open to heal by secondary intention in 4 patients, while primary closure of skin edges of the wound was performed in 3 patients. None of the patients developed a complication.

In conclusion, our findings indicate VAC (Kinetic Concept Inc. San Antonio, TX, USA) to be a successful, rapid and convenient alternative to more complex surgical interventions in the management of this unwanted complication of an open cardiac surgery being performed with a great effort, especially in appropriate patients with infected wounds accompanied with tissue loss.

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