

# EVIDENCE BASED MEDICINE

14 CLINICAL TRIALS | 8 COUNTRIES | N=12666





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**ORIGINAL ARTICLE**

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## Total Arterial Myocardial Revascularization using Bilateral Internal Mammary arteries and the role of postoperative sternal stabilization to reduce wound infections in a large cohort study

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**KEY QUESTION:**

Does external sternal stabilization using a vest (e.g. the Posthorax® Vest) lower the incidence of wound complications?

**KEY FINDING(S):**

External stabilization lowered the incidence of wound infections and length of stay when a wound complication did occur.

**TAKE-HOME MESSAGE:**

The routine of a sternum stabilization vest after bilateral mammary artery harvesting may be considered.

**ABSTRACT****OBJECTIVES:**

The total arterial myocardial revascularization using bilateral IMA shows improved results regarding mortality, long-term survival as well as superior graft patency and thus has become the standard technique according to recent guidelines. On the other hand, those patients might suffer from an increased risk of developing sternal wound infections, especially when being obese or having a medical history of diabetes. One reason for the wound complications may be an early sternum instability, which could be avoided using a thorax support vest (e.g. Posthorax vest). This retrospective study compares the wound complications after bilateral IMA grafting according to the use of a Posthorax vest.

**METHODS:**

Between April 2015 and May 2017 1613 patients received

a total arterial myocardial revascularization using bilateral IMA via a median sternotomy and have been administered a Posthorax support vest on the 2nd postoperative day. We compared those patients with the 1667 patients operated via the same access the preceding 26 months. The endpoints have been the incidence of wound infections, when did the wound infection occur and how many wound revisions were needed until wound closure.

**RESULTS:**

The demographic data of both groups were similar. A significant advantage for the use of a thorax support vest could be seen regarding the incidence of wound infection ( $p=0.036$ ) and the hospital length of stay when a wound complication did occur ( $p=0.018$ ).

**CONCLUSION**

As seen in this retrospective study, the early perioperative use of a thorax stabilization vest such as the POSTHORAX® Vest can reduce the incidence of sternal wound complications significantly. Furthermore, when a wound infection occurred and the patients returned to the hospital for wound revision, the patients who had been administered the POSTHORAX® Vest postoperatively will have a significantly shorter length of stay until wound closure.

**ORIGINAL ARTICLE – ADULT CARDIAC**

Interactive Cardiovascular and Thoracic Surgery (2013) 1–8 doi:10.1093/icvts/ivt240

# Prevention of sternal wound complications after Sternotomy: Results of a large Prospective Randomized Multicenter Trial

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Received 17 October 2012; received in revised form 22 April 2013; accepted 29 April 2013

## ABSTRACT

### OBJECTIVES:

A prospective randomized multicenter trial was performed to analyse the efficacy of a vest (Posthorax support Vest®) to prevent sternal wound infection after cardiac surgery, and to identify risk factors.

### METHODS:

From September 2007 to March 2010, 2,539 patients undergoing cardiac surgery via median sternotomy were prospectively randomized into those who received a Posthorax® Vest and those who did not. Patients were instructed to wear the vest postoperatively for 24 h a day for at least 6 weeks; the duration of follow-up was 90 days. Patients who did not use the vest within a period of 72h postoperatively were regarded as study dropouts. Statistical calculations were based on an intention-to-treat (ITT) analysis. Further evaluations comprised all subgroups of patients.

### RESULTS:

Complete data were available for 2,539 patients (age 67 ± 11 years, 45% female). Of these, 1,351 were

randomized to receive a vest, while 1,188 received no vest. No significant differences were observed between the groups regarding age, gender, diabetes, body mass index, chronic obstructive pulmonary disease (COPD), renal failure, the logistic EuroSCORE and the indication for surgery. The frequency of deep wound complications (dWC: mediastinitis and sternal dehiscence) was significantly lower in vest (n = 14; 1.04%) vs non-vest (n = 27; 2.27%) patients (ITT, P < 0.01), but superficial complications did not differ between groups. Subanalysis of vest patients revealed that only 933 (Group A) wore the vest according to the protocol, while 202 (Group BR) refused to wear the vest (non-compliance) and 216 (Group BN) did not use the vest for other reasons. All dWC occurred in Groups BR (n = 7) and BN (n = 7), although these groups had the same preoperative risk profile as Group A. Postoperatively, Group BN had a prolonged intubation time, a longer stay in the intensive care unit, greater use of intra-aortic balloon pump, higher frequency of COPD and a larger percentage of patients who required prolonged surgery.



## CONCLUSION

Consistent use of the Posthorax® Vest prevented deep sternal wounds. The anticipated risk factors for wound complications did not prove to be relevant, where as intra and postoperative complications appear to be very significant.



Cardiol Ther  
DOI 10.1007/s40119-016-0078-y

## A randomized trial to assess the contribution of a novel Thorax Support Vest (corset) in preventing mechanical complications of median Sternotomy

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### ABSTRACT

#### OBJECTIVES:

Mechanical complications of median sternotomy may cause significant morbidity and mortality in cardiac surgical patients. This study was aimed at assessing the role of Posthorax® support Vest (Epple, Inc., Vienna, Austria) in the prevention of sternal complications and the improvement of anatomical healing in patients at high risk for mechanical sternal dehiscence after cardiac surgery by mean of median sternotomy.

#### METHODS:

A prospective, randomized, study was performed and 310 patients with predisposing factors for sternal dehiscence after sternotomy for cardiac surgery were included. The patients were divided into two groups: patients who received the Posthorax® support Vest after surgery, and patients who did not. Primary variables assessed included the incidence of mechanical sternal complica-

tions, the quality of sternal healing, the rate of re-operation, the duration of hospitalization, rate and duration of hospital, re-admission for sternal complications. Secondary variables assessed were the post-operative pain, the number of requests for supplemental analgesia and the quality of life measured by means of the EQ-5D format.

#### RESULTS:

Patients using vest demonstrated a lower incidence of mechanical sternal complications, a better anatomical sternum healing, lower hospital stay, no re-operations for sternal dehiscence before discharge and lower re-admissions for mechanical sternal complication. In addition, patients using a vest reported a better quality of life with better freedom from limitations in mobility, self-care, and pain.



### CONCLUSION

Our findings demonstrate that the use of the Posthorax Vest reduces post-sternotomy mechanical complications and improves the healing of the sternotomy, the clinical course, and the post-operative quality of life.

Cardiol Ther Table 5 Outcomes (number event or mean $\pm$ SD)	Group A (n = 155)	Group B (n = 155)	p value
Post operative length of stay (days)	7 $\pm$ 2,7	12 $\pm$ 3,4	0.02
Re-admission for mechanical complications	6	16	0.05
Re-operation for mechanical complications	0	7	-
Length of stay following re-admission	8 $\pm$ 3,2	24 $\pm$ 7,0	0.05
Sternotomy line [2 mm at discharges]	7	31	0.005
Dislocation of sternotomy line	0	8	-
Follow-up (mean, 2.4 $\pm$ 2.1 years, range, 0.83–5.25 years)	95,8 $\pm$ 6,1	84,7 $\pm$ 5,3	0.001
5 years freedom from mechanical events (%)			

## INTERACTIVE CARDIOVASCULAR AND THORACIC SURGERY ADVANCE ACCESS PUBLISHED AUGUST 30, 2016:



### BEST EVIDENCE TOPIC

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## Do external support devices reduce sternal wound complications after cardiac surgery?

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### ABSTRACT

A best evidence topic in cardiac surgery was written according to a structured protocol. The question addressed was whether external support devices reduce sternal wound complications after cardiac surgery with sternotomy. Altogether 116 papers were found using the reported search, of which six presented the best evidence to answer the clinical question. The author, year, journal, study type, patient group studied, relevant outcomes, results and study weaknesses are tabulated. Six randomized controlled trials investigating the effect of external chest support devices on sternal wound complications in adult patients undergoing sternotomy for cardiac surgery were selected. These studies demonstrate a significant reduction of deep sternal wound complication on comparing external support with no support. Non-elastic devices were more effective in reducing sternal complication compared with the elastic bandage (four trials). Three studies reported significant reduction of mean hospital stay in patients receiving non-elastic chest support devices. We conclude that early poststernotomy use of an external non-elastic sternal support device reduces overall sternal wound complications and may reduce the hospital length of stay.



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SURGERY

## A newly designed Thorax Support Vest prevents Sternum instability after median Sternotomy

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### ABSTRACT

#### OBJECTIVES:

Sternum infection remains one of the primary causes of postoperative morbidity and mortality after median sternotomy. We report the clinical efficacy for primary reinforcement of the sternum with a new design of thorax support vest.

#### METHODS:

A prospective randomized study including 455 patients was started in September 2007 to evaluate the effectiveness of the Posthorax sternum vest (Epple Inc., Vienna, Austria). One hundred and seventy five patients were treated with the sternum dressing postoperatively (group A), 227 patients did not receive the vest (group B) and 53 patients refused it (group C). Several clinical and operative data were evaluated. All the patients were recorded using the STS risk scoring analysis for mediastinitis after cardiac surgery.

#### RESULTS:

The median age and gender distribution were comparable in both groups. Preoperative data like renal failure, chronic obstructive pulmonary disease, peripheral artery disease, and myocardial infarction were not significant. There were more patients with diabetes in group A and C (A: 39.4%, B: 29.1%, C: 43.4%,  $p = 0.036$ ). A total of 55.8% underwent coronary bypass grafting, 15.4% aortic valve replacement, 7.7% mitral valve repair and 21.1% concomitant cardiac procedures. The median risk factor analysis and body mass index were comparable. In the follow-up period up to 90 days, in group A we observed 0.6% sternum wound complications, in group B 4.9%, and in group C 9.4% (group A vs B: Fisher's exact test  $p = 0.0152$  and group A vs C:  $p = 0.0029$ ).



### CONCLUSION

The use of the Posthorax<sup>®</sup> sternum Vest shows a favourable outcome to prevent sternum instability after cardiac surgery. There was one reoperation in patients treated with this sternum vest compared to 16 in the control groups.



## Obese Cardiac Patients: Significant reduction of deep sternal wound complications by wearing the Posthorax® Vest?

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### OBJECTIVES:

Sternal wound healing disturbances are still a frequently postoperative complication after median sternotomy especially in obese patients. Surgical wound revision and prolonged hospitalization increase the costs disproportionately. Thus we planned a study to evaluate if the sternal wound complication rate after cardiac surgery can be profitably reduced by wearing the Posthorax® Vest.

### METHODS:

The Study started in 08/2014 until 07/2015. All 129 elective obese patients (BMI > 30kg/m<sup>2</sup>) scheduled for cardiac surgery were preoperatively adapted with a vest. If the patient did not wear strictly the vest, he was eliminated

from the study. The Outcome in the Vest group was compared to a Control group of similar 131 patients from 07/2013 until 12/2013. Group differences were tested by exact Fisher test and T-test (SPSS 23).

### RESULTS:

Deep sternal wound complication rate was 4.7% (6/129) in the Vest group compared to the Control group with 10.7% (14/131). The Vest and Control group were matchable in BMI (34kg/m<sup>2</sup>) and age (65yrs), operation time (195 minutes) and time on respirator. The Vest group had a significant shorter stay on ICU and showed significant earlier mobilization than the Control group (p< 0.0001).



### CONCLUSION

The rate of deep sternal wound complication in the Vest group tells its own tale. There is a reduction of half as less. As limitation we have to ask if the Vest group is comparable to the Control group because of significant shorter ICU stay and earlier mobilization, but otherwise these factors belong to postoperative course without complications. Of course the surgical technique for wound closing is also important and dependent on the surgeon. Nevertheless in our clinic we apply the Posthorax vest in every obese patient who has to underwent cardiac surgery via median sternotomy in order to reduce postoperative deep sternal wound complications and costs.

## Comparison of Thorax support systems after median sternotomy: Evaluation of force distribution in a biomechanical analysis

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### OBJECTIVES:

Based on the clinical success using the Posthorax support vest to prevent sternum related complications the biomechanical mechanism of different sternum support systems were evaluated.

### METHODS:

Elastic bandages were compared with the Posthorax support vest in 27 patients after sternotomy and 27 volunteers. The effect of the supportive devices was acquired with eight specially designed high sensitive real time pressure transducers, which were placed between the chest wall and support devices.

Measuring points during normal breathing, coughing, and arm movement were analyzed.

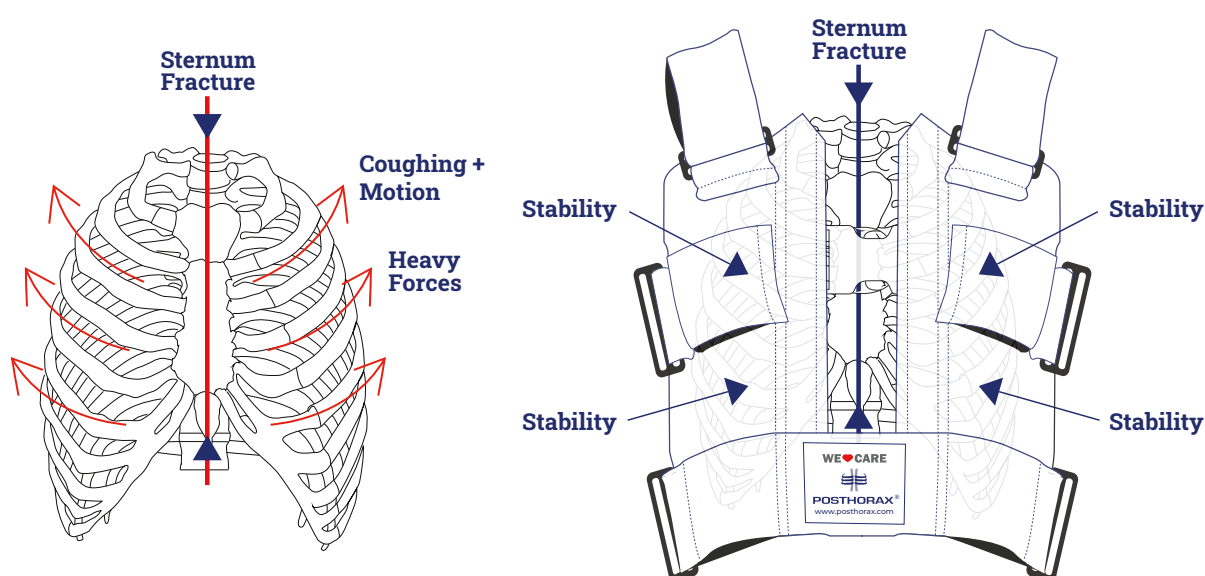
### RESULTS:

The Posthorax support vest proved to be superior in the parasternal and posterior region compared to the elastic bandage in all groups at normal breathing (Sensor 0+4:  $2.788 \pm 0.79$  N vs.  $0.88 \pm 0.2$  N and Sensor 3+7:  $2.06 \pm 0.88$  N vs.  $0.78 \pm 0.04$  N;  $p=0.001$ ). During coughing and arm movement all sensors at the anterior and posterior chest wall revealed a significant higher pressure using the Posthorax support vest (Sensor 0+4:  $3.34 \pm 0.98$  N vs.  $1.47 \pm 0.59$  N; Sensor 3+7:  $5.69 \pm 2.99$  N vs.  $1.92 \pm 0.7$  N;  $p=0.001$ ).



### CONCLUSION

The findings of the study proved a positive biomechanical effect of the Posthorax support vest in the anteroposterior movement which predicates its favorable clinical effect in avoiding sternum related complications.



# Significant reduction of deep sternal wound infections Post Cardiac Surgery by the Posthorax Vest - a single Center Observational cohort study in 2200 patients

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## INTRODUCTION:

Obligatory Posthorax vest application was introduced in our institution for all patients undergoing cardiac surgery via median sternotomy since march 2010. In this analysis we compare incidence and severity of wound healing complications in patients having received the vest with numbers observed in a matched patient cohort in 2009 without vest.

## PATIENTS:

Group I (vest) n=1130pts; 3-12/2010.; Group II (no vest) n=1094; 3-12/2009; comparable cohorts with regards to age, risk profile and indication for surgery.

## RESULTS:

Approximately 10% of all eligible patients did not wear the vest, of those 5% due to medical reasons, another

5% due to non compliance. Incidence of all wound healing complications (WHC) was 2,56% (n=29) in Gr.I vs. 3,19% (n=35) in Gr.II (p=0,05). Of those patients with WHC in Gr.I 72,4%(21/29) had not worn the vest due to either non compliance (n=15) or medical reasons (n=6). Deep WHC (mediastinitis/sternal dehiscence) happened in n=10(0,88%)in Gr.I vs. n=22(2,01%) in Gr.II; p<0,001.

None of the patients wearing the vest on a constant basis developed a deep WHC. Duration of postoperative hospital stay for presternal and deep WHC will be calculated!



## CONCLUSION

Application of the Posthorax vest leads to significant reduction of WHC. In particular, we observed that consequent use of the posthorax vest seems to almost eliminate the incidence of mediastinitis and sternal dehiscence.

## Sternum support May prevent major atelectasis after median sternotomy

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### ABSTRACT

#### OBJECTIVES:

Atelectasis and other pulmonary complications are common after cardiac surgery. A new type of sternum support vest (Posthorax<sup>®</sup>) has been shown to lower the risk of deep mediastinitis after median sternotomy. Clinical observations at the department of thoracic surgery at the Karolinska university hospital indicated that the vests also lowered the risk of atelectasis. We, therefore, designed a study aimed at testing if a sternum support vest could be shown objectively to lower the risk of a number of pulmonary complications after median sternotomy.

#### METHODS:

Two groups of patients were selected for inclusion. Group A (n = 67) were operated on in September 2011, before the vest was introduced. Group B (n = 80) were operated on in

March 2012, after the introduction of the vest. The median age and ratio of men to women was similar in both groups, with 70% men. Scoring systems (0-4) were created to quantify the degree of atelectasis in each lung lobe and pleural effusion on each side on the post-operative chest x-ray images. The severity of atelectasis was compared between the groups. Information was also gathered from medical records.

#### RESULTS:

A significantly lower (p = 0.02) prevalence of complete or near complete lobar atelectasis was seen in group B. This difference was seen only among men (p = 0.01). There were no other significant differences in complications between group A and group B.



### CONCLUSION

This study provided the first evidence that a sternum support vest could lower the risk of complete atelectasis among patients who have undergone median sternotomy.

# The first UK experience with Posthorax® Vest - Prophylactic use results in reduced sternal wound complications following sternotomy

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## OBJECTIVES:

Deep sternal wound complications (DSWC) after cardiac surgery have an incidence of 2 to 8% and carry a significant mortality and morbidity as well increased expenditure. The surgical technique of sternal closure and the co-morbidities of the patient are the main factors affecting the incidence of dehiscence and wound infection. The majority of hospital policies in prevention of DSWC, involve the pre and intra operative period. The aim of this study was to evaluate the effect of a post operative supportive sternal jacket (Posthorax®).

## METHODS:

2,284 patients underwent median sternotomy in our centre over a 2 year period. Patients with increased risk for DSWC such as high BMI, diabetes, steroids, redos and Chronic Obstructive Pulmonary Disease (COPD) were prospectively selected to wear the Posthorax® vest prophylactically (Group I n=214). Post operative outcomes were compared with Group II n=2,070 (No Posthorax®). Mean values for risk factors between Group I & Group II were respectively; BMI  $31.3 \pm 5.9$  &  $27.8 \pm 4.9$  ( $p < 0.001$ ), diabetes 25.6% & 19.4% ( $p = 0.05$ ), COPD 17.3% & 12% ( $p = 0.03$ ) and

redos 16.3% & 11.5% ( $p = 0.07$ ). The groups were comparable in terms of age, EuroSCORE, gender, left ventricular function and urgency.

## RESULTS:

The overall incidence of DSWC for the 2 year period was 2.3% (53/2284). The incidence of DSWC between Group I and Group II was 2/214 (0.9%) vs 51/2070 (2.4%) ( $p = 0.2$ ) and for mechanical sternal dehiscence was 0/214 (0%) vs 8/2070 (0.3%) ( $p = 0.5$ ) respectively.



## CONCLUSION

Despite a higher risk profile, patients with prophylactic Posthorax® vest had a lower incidence of postoperative sternal complications.

## Sternal Instability in Clinical Practice

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Is sternal instability a problem in clinical practice? Yes, absolutely! Mediastinitis (DSWI) is a feared complication to sternal instability and cause both morbidity and mortality. It varies between 1,5-4 % in the literature, in average 2 % .

DSWI cause suffering and prolongs hospital stay from 7 days up to 38 days in average. The mortality rate goes up to 30 % in different studies. It also increased the cost for the patient 5 times compared to normal.

Sternal dehiscence is the major cause of mediastinitis ( 68%) and coagulase negative staphylococci (CNS) is the most common bacteria in this group. Staphylococci aureus is the most common bacteria when the sternum is stable.

At surgery we are stabilizing the sternum with steel wires. That is all and we think that is enough. We must think as the orthopedic surgeon does. We have to stabilize the sternum under the whole healing process, that means 6-8 weeks. Clearly steel wires are not sufficient. We have a specific problem with our fracture and that is, sternum moves all the time. A couple of years ago a new product came in the market, the Posthorax vest. I must admit, I was skeptical at the beginning. After presentation at the EACTS yearly conference and after more studies I was convinced. This vest keeps its promises, it decrease the frequency of DSWI.

We started to use this vest at Karolinska University Hospital in October 2011. One year and 978 sternotomies later I'm overwhelmed by the result.

The DSWI frequency 2011 was 2 % and 2012 it was 0,6 %. Other interesting findings are, the rehabilitation of the patient is better and easier. They cough and the mobilization is better and easier because the patients had not so much pain compared to the period before the vest. The x-ray shows significant less atelectasis. We have decreased the hospital stay with more than 1 day among women.

Of the 6 patients that had mediastinitis last year, 3 had worn the vest according to the protocol. We found no coagulase negative staphylococci in the cultures among the patient with vest and that speaks in favor for that the vest stabilizes the sternum.

## Perioperative management and strategies to decrease sternal wound infection

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### INSTRUCTION:

Sternal wound infections can lead to major morbidity and mortality in patients undergoing cardiac surgery<sup>1</sup>. It was also found recently to have an impact on long-term survival. Since sternal wound infection (SWI) may lead to an extended length of hospital stay additional surgical procedures, vacuum-assisted wound dressing, and antibiotic therapy, its impact on the health care costs are enormous as they may almost triple the costs for patients undergoing CABG<sup>2</sup>. The rate of SWI varies in different reports. Approximately 0.3%-5.0% of median sternotomy surgical approaches result in infection<sup>3</sup>. Since there are risk factors that are hard to change and may contribute to poor wound healing leading to sternal infection such diabetes, obesity, history of smoking, COPD, and immunosuppression 4,5.

### METHODS:

After obtaining an approval from our institutional review board (including a waiver of signed informed consent) a database review was conducted. We analyzed retrospectively the data of all patients undergoing cardiac surgery between 2008-2010 (first period) and 2012 (second period). Data from 2011 were not included, since changes were implemented in that year and it was considered as a transition period. In the second period we introduced evidence-based practice changes to reduce sternal infection. Education of all health care members including physiotherapist, nurses and surgeons was provided to implement changes. The changes implemented were hand disinfection technique, sternotomy, sternal and skin closure technique, efficient operation time, strict guideline in post-operative wound care and the use of the Posthorax<sup>®</sup> vest in all patients. Sternal wound infections were classified according to the guidelines of the Center of Disease Control and Prevention Fig. 1, 6: superficial if only the skin and subcutaneous tissue are involved, deep when the infection reaches the sternum but does not involve it and organ/space when sternal osteomyelitis or mediastinitis occurs. Continuous data are presented as mean standard deviations (S.D.) and a Mann-Whitney test was used to compare the data. Categorical data are presented as the

number and percentage and are compared using the  $\chi^2$ -test or Fisher's exact test.

### RESULTS:

There were a total of 1,689 patients. 1,250 patients underwent cardiac surgery during the first period 2008-2010 and 439 patients during the second period 2012. Off pump coronary bypass was the major procedure in both periods 47.5% and 43.1% respectively, followed by isolates valve surgery 19.2% and 21.4% respectively, followed by combined coronary bypass and valve surgery 17.7% and 18.5% respectively. There was no difference in age, gender, diabetes, BMI, creatinine, euro score, and type of surgery between the two groups. There was a significant difference in the history of hypertension 79.5% and 68.0% respectively ( $p < 0.0001$ ), ejection fraction average 53.4% and 54.6% respectively ( $p = 0.018$ ) and CRP 12.32 mg/ml and 11.95 mg/ml ( $p < 0.001$ ) between the two groups Table 1. However, no correlation was seen between those variables and sternal infection Table 2. There was no difference in the percentage of type of surgeries performed during those two periods Fig. 2. Use of BIMA was significantly more in the second period. BIMA was used in 31% bypass patients in the first period and 62% in the second period ( $p = 0.006$ ) Fig. 3. Surgical time (average minutes versus 251 minute,  $p < 0.0001$ ) intubation time (average 27.5 hours versus 24 hours,  $p < 0.0001$ ), postoperative peak creatinine kinase (average 57.6ug/L versus 53.7ug/L,  $p < 0.0001$ ) and the unit of blood transfusions (average 3.49 packet red blood cell versus 3.02 packed red blood cell,  $p = 0.030$ ) was significantly lower in the second period and the use of noradrenalin (average 9.35 mcg/min versus 11.1 mcg/min,  $p = 0.009$ ) was higher in the second period Tab 3. In the first period 3.4% developed pre-sternal infection, 3.2% deep sternal infection and in the second period 1.1% developed pre-sternal and 1.6% deep sternal infection. There was a significant reduction in both pre-sternal infection and deep sternal infection in the second period Fig. 4. Sternal infection was associated to surgical time, intubation time, blood transfusion, and use of noradrenalin and BIMA Tab 4.



### CONCLUSION

Strategies to reduce sternal infection have shown a significant reduction of sternal infection despite increase in BIMA.

## Use of the Posthorax Vest in patients who underwent heart surgery during cardiac rehabilitation and its impact on functional recovery and respiration function

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The POSTHORAX® vest has shown to reduce morbidity and mortality in the postoperative period for patients undergoing cardiac surgery via median sternotomy, thanks to the prevention of dehiscence and the instability of the sternal wound. In the past, the use of thoracic devices, such as flexible bands, had shown to aggravate the restrictive lung disease, which, on the other hand, is typical of the first post-operative phase (which is related to atelectasis, pleural effusions, parenchymal imbibition, etc.). In this study we wanted to evaluate the impact of the POSTHORAX® vest on the recovery of lung function and functional capacity in patients undergoing cardiac surgery via median sternotomy as part of a cardiac rehabilitation program lasting 14 days. Upon arrival at our rehabilitation centre, those patients who did not present contraindications for enrolment (over 80 years of age, no BPCO, no operation of thoracic aortic aneurysmectomy, no already obvious presence of sternal wound complications) were enrolled in a consecutive way and randomised to the two arms of the study: Group 1 (15 patients, age = 64 ± 12, M = 12) wore the POSTHORAX® vest 24 hours a day, while Group 2 (15 patients, age = 65 ± 8, M = 10) did not wear it. All subjects underwent on the first day a plethysmography with calculation of total lung capacity (TLC) and respiratory flow in the 1st sec. (FEV1), a measure of alveolar-capillary diffusion for CO (DLCO), and a 6 minute walk test (6MWT); the same examinations were repeated on day nine prior to discharge. In the two weeks of hospitalisation, all the patients were subjected to the same rehabilitation regime consisting of aerobic exercises on the exercise bike and/or treadmill, callisthenics, and breathing exercises.

	Group 1 (with vest)						
	1	2	P <sub>2 vs 1</sub>	Δ <sub>c</sub>	2 <sub>c</sub>	P <sub>2 vs 2</sub>	Δ <sub>2c-1</sub>
TLC	4,79 ± 0,83	5,34 ± 1,27	<b>0,00</b> 7	0,55 ± 0,67	5,12 ± 1,3	0,321	0,33 ± 0,90
TLC%	79,9 ± 14,1	88,8 ± 14,3	<b>0,00</b> 6	8,9 ± 10,9	85,3 ± 16,3	0,393	5,4 ± 19,6
FEV1	1,75 ± 0,51	1,97 ± 0,73	0,067	0,22 ± 0,43	2,14 ± 0,64	0,0095	0,39 ± 0,33
FEV1%	64,4 ± 16,3	74,1 ± 20,9	0,005	9,6 ± 11,2	78,5 ± 17,1	0,109	14,0 ± 10,5
FEV1 / FVC	80,8 ± 8,4	79,3 ± 5,7	0,547	1,43 ± 8,95	77,2 ± 4,7	0,064	3,58 ± 7,73
DLCO	4,16 ± 0,89	4,51 ± 1,17	<b>0,02</b> 7	0,42 ± 0,63	4,59 ± 1,12	0,617	0,43 ± 0,54
DLCO%	52,2 ± 8,2	56,0 ± 11,0	<b>0,00</b> 1	5,9 ± 5,7	55,8 ± 11,1	0,876	4,7 ± 7,3
KCO	1,03 ± 0,14	1,06 ± 0,16	0,307	0,03 ± 0,09	0,99 ± 0,22	0,192	0,04 ± 0,16
KCO%	77,4 ± 11,6	76,8 ± 14,8	0,783	0,6 ± 7,8	73,5 ± 19,3	0,227	2,8 ± 12,0
Hb	10,4 ± 1,4	10,7 ± 0,9	0,188	0,43 ± 0,98			
6MWT%	55,8 ± 18,8	83,0 ± 15,4	<b>0,00</b> 0	26,6 ± 13,0			

Table 1 shows the results obtained.

The study, in addition to confirming the already known restrictive lung disease typical of this patient population, demonstrates the full effect of a rehabilitation cycle on the recovery of respiratory function and submaximal functional capacity. The absence of differences between the two groups in terms of the improvement of various ventilation parameters and the distance walked in the 6MWT also shows that the use of a device such as the POSTHORAX® vest does not have a negative impact on the recovery of these parameters. The absence of contraindications may be a reason for the continued use of this kind of device in all patients during the rehabilitation cycle following cardiac surgery after sternotomy.



## Sternal dehiscence in patients with moderate and severe chronic obstructive pulmonary disease undergoing cardiac surgery: The Value of supportive Thorax Vests

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(*J Thorac Cardiovasc Surg* 2011.,141:1398-402)

### OBJECTIVES:

Sternal dehiscence after open surgery is a major cause of morbidity and mortality, and chronic obstructive pulmonary disease is a significant risk factor. Therefore, we aimed to determine whether moderate and severe chronic obstructive pulmonary disease had an effect on the development of sternal dehiscence and whether the use of the Robicsek technique for sternal closure along with sternal support vest postoperatively would reduce the incidence of sternal dehiscence in patients with moderate/severe chronic obstructive pulmonary disease undergoing cardiac surgery.

### METHODS:

Two studies were performed. In study 1, 842 patients undergoing cardiac surgery and figure-of-8 wire closure were retrospectively evaluated in 2 groups: group 1a (328 patients with chronic obstructive pulmonary disease) and group 1b (514 patients without chronic obstructive pulmonary disease). In study 2, 221 patients with moderate and severe COPD who were scheduled for open surgery were prospectively enrolled. The Robicsek technique was used for sternal closure. The postoperative thorax support vest was used in 100 patients (group 2a), and no additional procedure was applied in 121 patients (group 2b).

### RESULTS:

In study 1, the dehiscence rate was significantly higher in group 1a (7.9%) than in group 1b (1.2%.,  $P < .001$ ), and mortality rates in patients with dehiscence were 53.8% and 33.3%, respectively. In study 2, the dehiscence rate was significantly lower in group 2a (1%) than in group 2b (11.5%.,  $P = .002$ ). None of the patients with dehiscence in group 2a died, and 35.7% of patients died in group 2b.



### CONCLUSION

The Robicsek technique for sternal closure and the use of a thorax support vest postoperatively are highly effective in preventing sternal dehiscence after cardiac surgery in patients with moderate and severe chronic obstructive pulmonary disease.

# The Benefits of the wearing of the Posthorax® Vest

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## ABSTRACT

### INTRODUCTION:

Despite the ever-evolving surgical technique and the decrease in invasiveness with the increase in the average age of patients and the growing and worsening comorbidities despite the careful prevention, the rate of wound infections is still increasing. At the same time, the number of nursing days is increasing as well. The average cost is between 35-50.000€.

### OBJECTIVES:

Between 2020 and 2021, we used 154 Posthorax® vests in our institution. We wanted to examine how all of these costs affected hospital expenditures.

### MATERIAL AND METHOD:

Between 2020 and 2021, we applied 154 Posthorax® vests. 33,8% (BMI=25+) of patients receiving the vest were overweight, 52,6% (BMI=30+) were obese, 33,8% had diabetes mellitus and 8,4% had COPD. The length of surgery exceeded 31 minutes by 31,8%. We compared the period 2019-2020 in which we didn't use the vest with the period 2020-2021 in which the 13% of patients received the Posthorax® vest.

### RESULTS:

Comparing the periods 2019-2020 and 2020-2021 in terms of preoperative data, there is no significant difference. However, highlighting those who wore vests had a higher incidence of obesity (32% vs 52%), COPD (6,3% vs 8,4%), and diabetes (78,8% vs 90%). In the group which later was wearing vests, the length of surgery time exceeded 210 minutes in 31,8%, while in the control group this proportion was 18,4%. In the postoperative period, the incidence of reoperations due to infections decreased from 2,7% to 1,8%.



## CONCLUSION

Compared to the period 2019-2020, in addition to the increase in the proportion of factors predisposing to severe wound complications, the number of wound complications decreased with the use of the vest, despite the fact that only the high-risk group (13%) wore the vest. Based on all this, by increasing the number of Posthorax® vest wearers, the rate of wound healing disorders can be further reduced.



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