

## Video-assisted laser resection of lung metastases – feasibility of a new surgical technique

(Abstract ID: 125)

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### Background:

Our pilot study described our initial experience to do a laser resection of lung metastases under videothoroscopic control via a minithoracotomy. With this approach, if needed, mediastinal lymphadenectomy is also possible.

### Materials and methods:

Fifteen patients (11 men, 4 women, mean age: 60 years) with resectable lung metastases of different solid primary tumors (7x colorectal cancer, 3x melanoma, 2x renal cell carcinoma and oropharyngeal cancer, breast cancer and seminoma one each) were included. An anterior minithoracotomy incision (approx. length 5-7 cm) was created in the the fifth intercostal space and a soft tissue retractor (Alexis®, Applied Medical, USA) was positioned. Two additional working ports were inserted. The entire lung was palpated via the minithoracotomy. All detected lung metastases were removed under thoracoscopic control. Nonanatomic resections were performed using a diode-pumped Nd: YAG laser (LIMAX®120, KLS Martin GmbH & Co KG, Tuttlingen, Germany) with a laser power of 80 watts in a noncontact modus. Deeper parenchymal lesions were sutured.

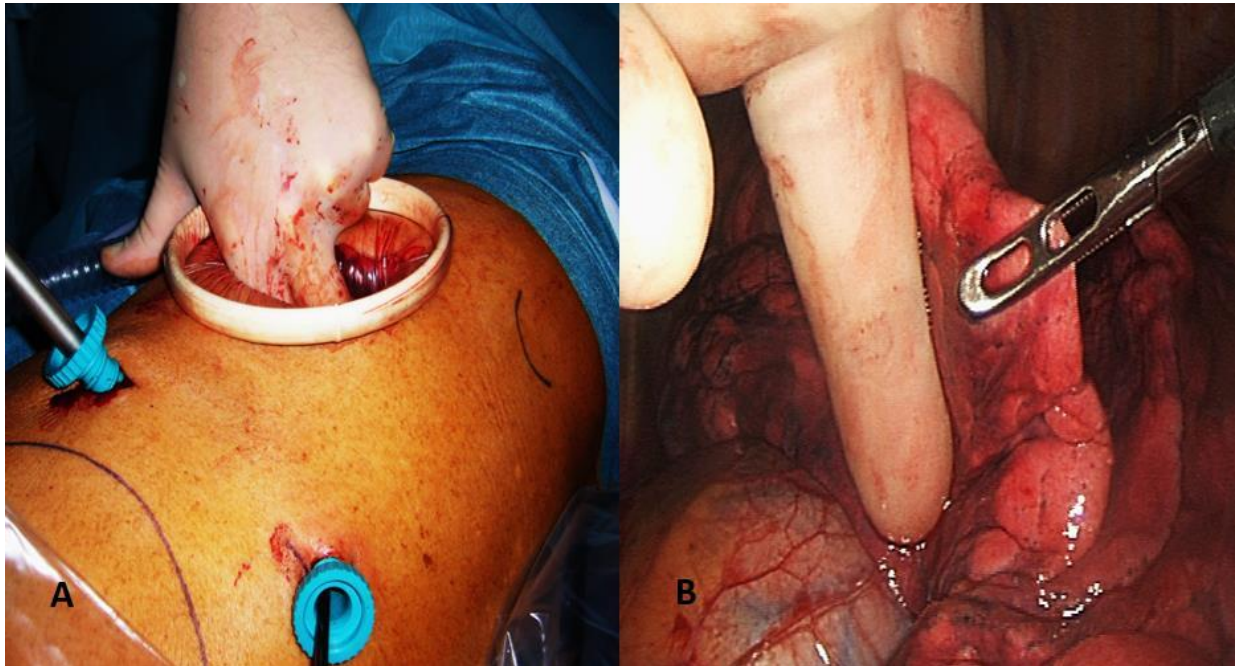
### Results:

29 lung metastases up to 30 mm in size were resected and all metastases diagnosed on preoperative imaging were detected. All diagnosed lung metastases were completely resected (R0). The median operation time was 102 (range 85 to 120) minutes. Median blood loss was 47,6ml and no postoperative complications occurred. No local recurrences nor new lung metastases were observed within 6 months after the procedures.

### Conclusion:

In case of lung metastases, a minithoracotomy enables us to palpate the lung under videothoroscopic control. After their identification, they can be completely resected with a diode-pumped Nd: YAG laser. This procedure is very safe and effective. This procedure questions the need for an open approach in surgery for pulmonary metastases. Video-assisted laser resection of lung metastases is safe, effective and full fills the requirements of modern lung metastases surgery.

**Picture:**



: Video-assisted palpation of the lungs A: view from outside B: thoracoscopic view of the palpation of the lung

## Thoracoscopic resection of a rare tumor in the posterior mediastinum – case report

(Abstract ID: 176)

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### Background:

A variety of histologically different tumors can occur in the mediastinum which is divided in an anterior, middle and posterior part. Most of the mediastinal tumors in adults are located in the anterior mediastinum. Masses in the posterior mediastinum are often neurogenic tumors. Mediastinal hemangiomas are rare tumors in the posterior mediastinum with an estimated incidence of 0.5% or less of all mediastinal masses. We present a case of mediastinal hemangioma in the posterior mediastinum.

### Materials and methods:

A 62 year old woman was referred to our hospital for further diagnosis of a dyspnea on exertion. Physical examination, lung function tests and routine blood tests were unremarkable. No positive previous history of surgery or tumor has been noted. On chest x-ray a suspicious mediastinal mass was detected which was confirmed on chest CT-scan as 6.5 cm large tumor in the posterior right mediastinum reaching to the left side with a vascular supply outgoing from the aorta. Tumor histology still was unclear and even fine needle biopsy didn't prove tumor entity and dignity. Therefore surgical resection of the tumor was indicated to confirm tumor histology.

### Results:

Access was made by a video assisted thoracoscopy from the right side. Macroscopically a well vascularized, capsuled large tumor could be identified located behind the lung laying on the vertebral column. Tumor excision was carried out using a harmonic scalpell. Special care was taken in identifying the supplying blood vessels outgoing from the aorta. These vessels were clipped and then cut. In this fashion the tumor could be excised in toto without causing a major bleeding. Histologically a 6.5 cm large hemangioma regressively changed with hemorrhage, fibrosis and calcifications was diagnosed. The postoperative course was uneventful and the patient was discharged from hospital five days after the operation.

### Conclusion:

Hemangiomas in the mediastinum are very rare tumors. Most of the hemangiomas described in literature were located in the anterior mediastinum and only in 22% hemangiomas were located in the posterior mediastinum. Up to one-half of the patients have no symptoms at presentation and the remainder present with non-specific symptoms such as cough, dyspnea etc.. Preoperative diagnosis therefore is often difficult and the diagnosis often is only made postoperatively. Surgery is the method of choice for diagnosis and treatment. In the aforementioned case we performed a thoracoscopic resection of the tumor which had the advantage of a good visualization. Especially for the identification and handling of the vessels outgoing from the aorta a good visualization is essential in prevention of a major bleeding. Therefore our case demonstrates that even larger tumors in the posterior mediastinum can be resected safe via a video assisted thoracoscopy.

## Penetrating thoracic trauma patients in gross physiological derangement: responsibility for the general surgeon in the absence of trauma surgeon and cardiothoracic surgeon?

(Abstract ID: 191)

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### Background:

Background: Penetrating chest trauma still represents a substantial proportion of trauma arriving in the trauma departments in Southern Africa, and 10 - 15 % of these patients need urgent Thoracotomy or Emergency Department Thoracotomy (EDT). The present study assessed the clinical reasons for urgent thoracotomy, organs most injured, and the surgical procedures most often needed for each organ injured.

### Materials and methods:

Methods: All penetrating chest patients needing consecutive chest surgery admitted to the Chris Hani Baragwanath Academic Hospital Emergency Department were studied (Cohort of 36 months).

### Results:

Results: Indication for thoracotomy was initial chest drainage volume in 56/145 patients (39 % ), followed by cardiocirculatory depression or hemopericard on ultrasound (19 % ). Bleeding without cardiac compromise (24/145 resp. 17 % ) was followed by chest X-Ray diagnostic (12 % ). Clinical diagnosis plus intercostal drainage volume were sufficient evidence in 124/145 patients for surgery. 67 thoracotomies (42 left sided) were followed by 44 sternotomies; 3 of the latter after xiphoid window. 21 combinations (thoracotomy-laparotomy, sternotomy-thoracotomy and sternotomy-subclavian) were done, as well as 2 triple procedures. In 88 lung injuries, 38 tractotomies, 14 segment resections and 8 through-and-through-sutures were done most often. 57 non-mediastinal vascular injuries needed 20 intercostal ligatures, 15 mammary ligatures and 5 pulmonary vein repairs. 37 cardiac injuries needed 29 ventricular sutures (15 right, 14 left sided), and 4 right atrial closures. 17 thoracoabdominal injuries including liver damage needed packing (n=6), suture-repair (n=5) or packing and plugging. 14 mediastinal non-cardiac injuries underwent 5 aortic repairs, 5 oesophageal repairs, and 2 caval repairs. Mortality was 25/145 patients (17,2 %).

**Table:**

	survivors	demise	total	mortality
bleeding stopped	10	1	11	9%
lung repair	7	1	8	13%
tractotomy	36	2	38	5%
segmentectomy	13	1	14	7%
lobectomy	6	5	11	45%
others	3	1	4	25%
clamping hilum	0	2	2	100%
total	75	13	88	15%

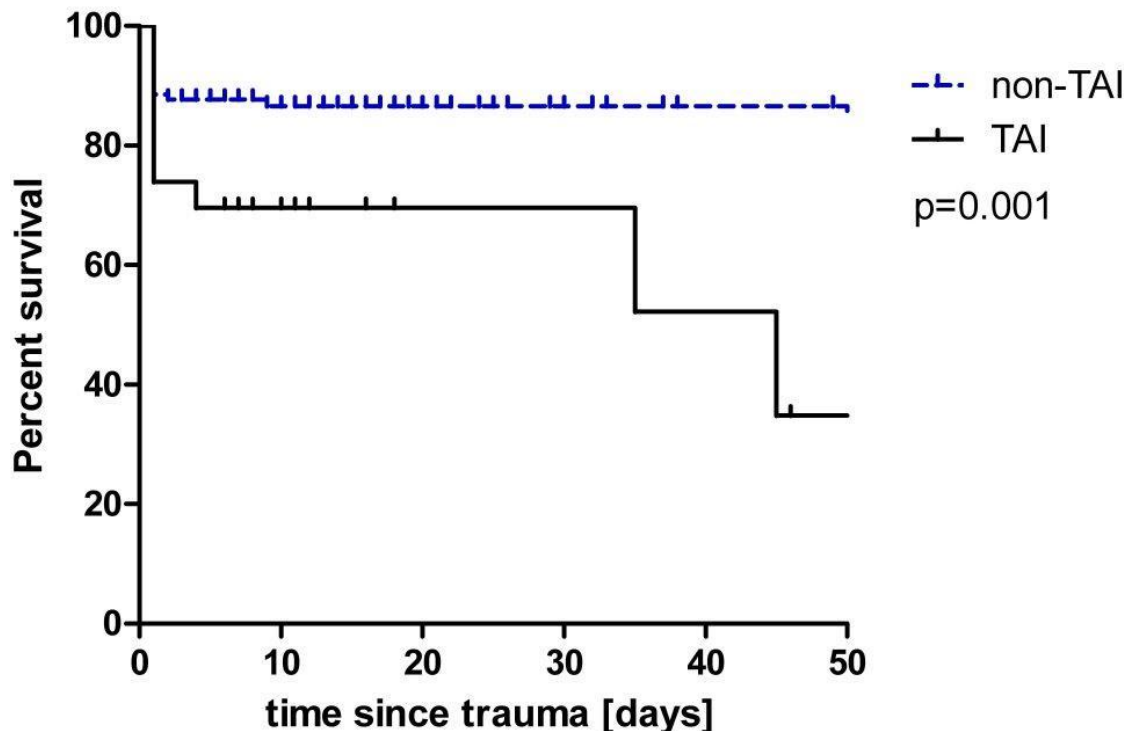
Spectrum of pulmonary injuries found during surgery in 145 patients with penetrating chest injuries needing surgery (clamp = clamping of the hilum during Emergency Department Thoracotomy)

**Conclusion:**

Conclusions: Two thirds of all surgical decisions can be done on clinical grounds, the intercostal drain at close sight. Most of the injuries in the chest can be managed by simple procedures to control life threatening bleeding. There is no reason for the emergency surgeon not too familiar with penetrating chest surgery to be overrespectful and refrain from opening the chest, as most patients - otherwise dying - can be saved.

[[Results from our South Africa Pen Trauma Database were partially presented to the WJS. This research work was funded by the Deutsche Bundeswehr Research Council Grant M-SAB1-5-A015.]]

**Picture:**



Survival of penetrating chest surgery patients presenting with thoracoabdominal injuries (TAI; black closed line) versus patients with penetrating chest non-thoracoabdominal injuries. In contrast the broken line shows the survival of patients with isolated penetrating trauma without abdominal injury.

## What resources will be needed to care for 145 penetrating chest surgery patients – and who will survive?

(Abstract ID: 192)

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### Background:

Penetrating chest trauma is still a substantial proportion of trauma arriving in the trauma departments in Southern Africa, and penetrating trauma is rising through terrorist attacks in Europe as well. 10-15% of these patients need urgent chest surgery, Emergency Department Thoracotomy (EDT) or further explorations. The present study assessed outcome, quantified resources needed and compares it to previously reported experiences.

### Materials and methods:

Methods: All penetrating chest patients needing chest surgery admitted to the Chris Hani Baragwanath Academic Hospital were studied through a three year period, resources needed were described and in hospital mortality was noted.

### Results:

Results: 145 patients arrived alive; 8 patients in extremis underwent immediate EDT. 2 patients died in the ED, 6 in theatre and 13 on the Intensive Care Unit. 76% (16/21) died within day 1-2, further 10%(2/21) within the next week, and the remaining 14% from week 5 to 10. Cardiac and lung injuries had lowest mortality with 5% and 15%, while mortality exceeded 50% in oesophageal injuries, thoracoabdominal plus bowel or pancreatic or kidney injuries. In 14 patients with disseminated intravascular coagulopathy and damage control procedures mortality exceeded 60%. Stab deaths were uncommon following the day 1, while gunshot weren't. Longest ventilation and ICU therapy was seen in thoracic esophageal and hepatic injuries (ventilation 17,2 resp. 6,9 days), while esophageal injuries and patients with DIC/DCS needed surgery most often (4,2 resp.2,4 ops). Mortality probability exceeds 50% following the second week not being dischargeable from ICU.

**Table:**

	pts. [n]	vent[d]	ICU[d]	ward[d]	TTT [d]	ops [n]	mort %	mort [d]*
neck	14	6	8	13	21,1	2,1	21%	1
chest \	113	4	6	10	15,5	1,6	16%	1
mediastine								
- chest	88	4	6	11	16,7	1,6	15%	1
lung								
- chest	63	4	6	7	13,0	1,4	19%	1
vessels								
Mediastine	51	4	5	9	14,2	1,5	14%	1
- heart	37	1	3	8	10,8	1,2	16%**	1
- mediast.	10	6	8	9	16,8	1,3	20%	1,5
vasc								
- oes	5	17	19	15	33,6	4,2	60%	9
mediastine								
thoraco-	24	5	7	7	14,0	2,3	38%	1
abdominal								
DIC/DCS	14	8	9	9	17,2	2,4	64%	1
All	145	3	5	10	14,9	1,5	14%	1

\* Median Time of demise [days]

\*\* Cardiac mortality is equally low for both sides (LA/LV n=16; Mort. 19%; RA/RV n=21; Mort. 14 %)

ICU time, ventilation days and associated mortality for major injuries; TTT=total treatment time; mort=mortality

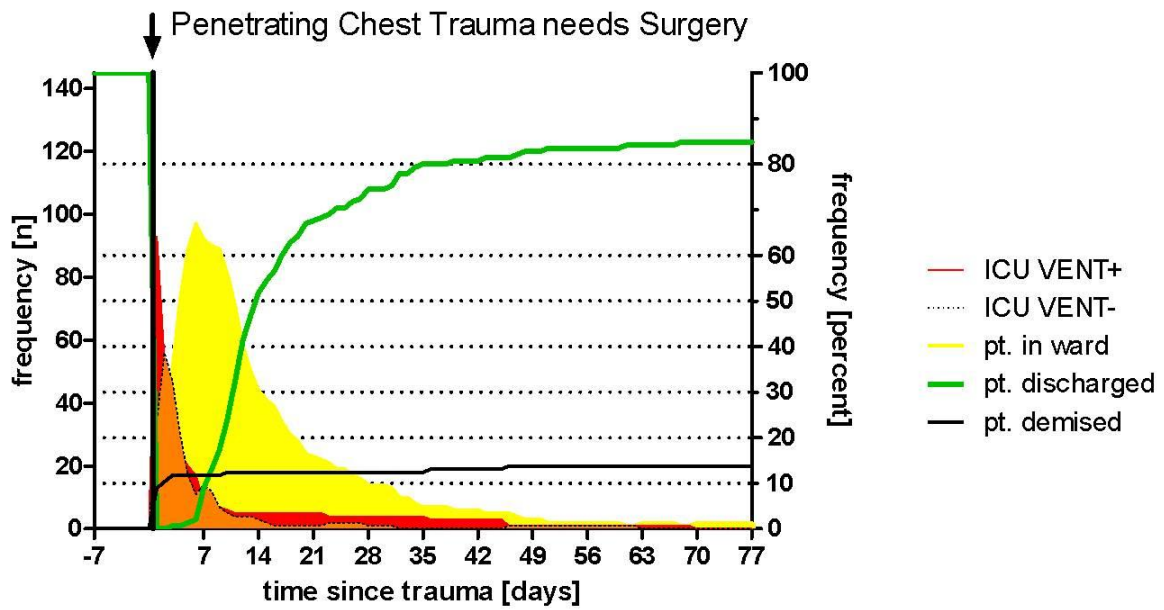
**Conclusion:**

Conclusions: Penetrating chest patients undergoing EDT with 38% mortality show better survival compared to esophageal or thoracoabdominal combination injuries; whereas thoraco-abdominal injuries show 38% mortality, needing 2,3 operations in average. Salvageable injuries -lung, cardiac and mediastinal vessels - can be handled in field hospitals regarding outcome and resources. Potentially septic and multi-operation-injuries as identified should be shifted to larger and better staffed / equipped hospitals as soon as civil unrest or combat allows.

[[Results from our South Africa Pen Trauma Database were partially presented to the WJS. This research work was funded by the Deutsche Bundeswehr Research Council Grant M-SAB1-5-A015.]]



Picture:



Resource allocation for n=145 penetrating chest injury patients with the need for surgery



## **Primary spontaneous – pneumothorax fact or fiction? Treatment based upon the underlying pathology**

(Abstract ID: 322)

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### **Background:**

Primary spontaneous pneumothorax (PSP) is a pneumothorax which occurs in healthy patients and conservative management is widely accepted currently. Anyway, changes of lung structure are described and we should probably draw conclusions out of this fact to base our treatment upon the underlying pathology.

### **Materials and methods:**

The study includes 185 patients affected by first episode of a PSP. All patients received the similar video-assisted thoracic surgery (VATS) approach, including wedge resection and parietal pleurectomy. Specimen of lung resection and parietal pleura of every patient were send to histopathologic examination. Data were evaluated retrospectively. Follow-up was done by questionnaire.

### **Results:**

Mean follow up period was 70.8 months ( $\pm$  33.5 months). Subpleural emphysematous changes were found in every histopathological specimen of the lung.

In addition, fibrosis of visceral pleura was found in 70.8% of the specimen. 93.5% of the specimen of parietal pleura showed mesothelial hyperplasia and 78.9% showed chronic inflammatory changes. Recurrence occurred in 2.2% of our patients.

### **Conclusion:**

Conservative management of PSP is not focused on the underlying pathology. We recommend the use of VATS as the treatment of first choice for patients with first episode of PSP. It is a safe procedure with a very low rate of recurrence and a high patient satisfaction.

## Experience after 60 robotic lobectomies

(Abstract ID: 438)

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### Background:

The oncological lobectomy along with systemic lymphadenectomy takes up a substantial part of the surgical intervention in lung cancer. In recent years the minimal invasive approach to this procedure gains significant awareness. In our institution the minimal invasive lobectomy is furthermore operated with a four-armed da Vinci-Si® System (Intuitive Surgical, Sunnyvale, CA, USA). In this report we would like to share our experience after 60 robot assisted lobectomies, outlining the pros and cons for the mentioned system.

### Materials and methods:

All clinical data of the patients who underwent a robot-assisted lobectomy in our institution and also the key data of the surgical procedure itself were collected. Evaluation was made with focus on the adaptation of positioning of the patient, as well as the system and the following consequences.

### Results:

A constant docking time of the robot of under 15 minutes was achieved after the 15th case. In order to achieve a short preparation time for the single operation preparing standard procedures taking the surgeons and anesthesiologists ideas together is recommended. The operating-time was equally to open procedures. There was no learning curve to be observed. This was due to an already established procedure and handling of the robot assisted methodology for other cancer entities. Altogether seven times a conversion was required. In four times the conversion was due to a unclear operational situs. There were no difference in complications rated according to Clavien/Dindo. Finally, there was no significant difference in oncological radicalness.

### Conclusion:

The robot assisted lobectomy is a safe and feasible procedure with the same oncological radicalness as the conventional method. We were able to safely implement the robot assisted lobectomy in our clinic. Developing a profession-overlapping standard especially between surgery and the anesthesiological colleagues before implementing this procedure can help to overcome uncertainty immensely.

## **Video Assisted Thoracoscopic Repair of Thoracic Wall Hernia in Intrapleural Onlay Technique**

(Abstract ID: 464)

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### **Background:**

The incidence of thoracic wall hernia is extremely rare owing to anatomical complexity of the thoracic wall.

### **Materials and methods:**

A 56- year-old male patient, with a past surgical history of open mitral valve replacement via anterior thoracotomy, presented to our department with respiratory dependent crepitation and sensation of entrapment on the right side in the area of the thoracotomy scar. The Physical examination as well as computerized tomography (CT) showed 4 x 12 cm thoracic hernia in the 4th intercostal space. Based on the surgical approach used in IPOM (intraperitoneal onlay mesh) in the treatment of abdominal wall hernias, a similar operative method was performed in this case using video assisted thoracoscopy utilizing 15 x 20 cm polypropylene mesh.

### **Results:**

The patient was discharged on the 5th postoperative day and remained free of complaints after 3,5 follow up years.

### **Conclusion:**

A minimally invasive thoacoscopic mesh repair in intrapleural onlay technique is a feasible approach in the surgical treatment of thoracic wall hernias

## **POSSUM score as a significant risk marker for major complications in lung resection**

(Abstract ID: 561)

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### **Background:**

Lung cancer still poses one of the major carcinoma entities and in particular, patients diagnosed with a non-small cellular lung cancer (NSCLC) frequently undergo surgery. More than 90% of these patients once in their lives were smoking. Commonly ongoing abuse results in structural lung diseases (e.g. COPD) and further lifestyle diseases.

Oncological surgery of the NSCLC primarily comprises the lobectomy by different approaches. Overall this presents a major surgical procedure to the patient and various intra- and postoperative complications may arise.

Up to date many scores in order to calculate the risk of a surgical procedure to each patient are reported on. A significant score in risk adjusted prediction is the "Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity" (POSSUM). In this study we aim to implement the POSSUM score to a large cohort of patients that underwent surgery for a NSCLC.

### **Materials and methods:**

Overall 136 patients reaching from the years 2013 up to 2015 were included in this study. All these patients suffered of NSCLC and underwent surgery. After consent, clinical data of all patients was gathered centrally and statistical analysis was performed. Complications were classified by Clavien/Dindo and the physiological, as well as operative POSSUM score was calculated. Differences between groups were calculated by a t-test and also Chi<sup>2</sup>-test. The influence of the POSSUM score on the presence of a major complication was tested by a multiple binary logistic regression. Goodness of fit analyses were done by using ROC-curve analysis and calculation of AUC values. A cut-off point was determined by calculating the Youden's index.

### **Results:**

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## Massive solitary fibrous tumor of the lung: A case report

(Abstract ID: 734)

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### Background:

Solitary fibrous tumors (SFTs) are rare mesenchymal neoplasms arising from the submesothelial tissue and usually show a benign clinical course. We present a case of a 55-year-old patient with an incidental SFT of the right lower lobe of the lung with displacing growth.

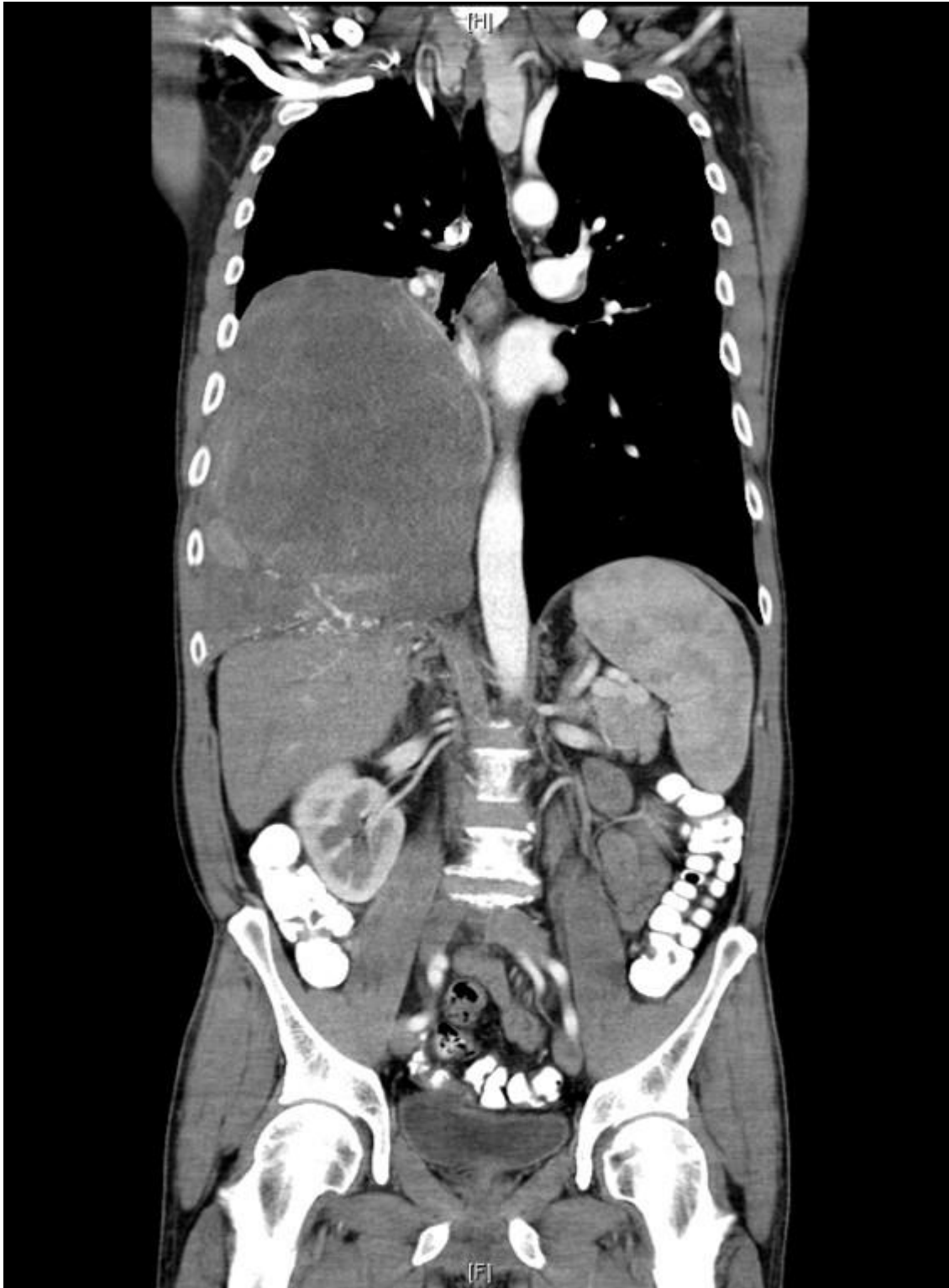
### Materials and methods:

A healthy, 55-year-old non-smoker was admitted to our surgical department with exertional dyspnoea, chest pain, fever and night sweats in the last 6 months. A computed tomography scan (CT) was conducted after chest X-ray revealed an elevation of the right diaphragm showing a solitary mass of the right chest (19 x 15 x 21 cms) with caudal displacement of the liver and the right lung (Figure 1). No signs of organ infiltration and metastasis were observed. Bronchoscopic examination revealed a total compression of the right middle lobe and an occlusion of segments 7 to 10. After obtaining representative histological materials of the tumor mass the case was presented in the sarcoma tumor board meeting. Here, a radical surgical approach was indicated and a complete en-bloc tumor extirpation with partial right lower lobe resection, via a posterolateral thoracotomy was planned. Due to the possibility of tumor growth into the thoracic wall, materials for diaphragmatic and thoracic wall replacement were ordered and the procedure was planned in an interdisciplinary team of thoracic surgeons and plastic surgeons. The tumor resection was completed uneventfully, without the need of a thoracic wall reconstruction. The post-operative chest X-ray showed an adequate expansion of the right lung. The final histological results confirmed a R0 resection and the immunohistochemical analysis revealed an SFT with planar necrotic tissue, expression of Vimentin, CD 34, Bcl2 and CD 99. The proliferation rate of Ki67-positive cells was 30%. The patient recovered well and was dismissed home on the 9th post-operative day. In the six months of follow up care the patient remained tumor-free.

### Conclusion:

SFTs of the lung parenchyma are rare, thus patients with SFT should be early referred to a specialized centre. A complete surgical resection is usually possible, however an interdisciplinary therapy plan and a multidisciplinary surgical approach are substantial for the success of the treatment.

Picture:



CT scan of the SFT mass.



## **Monitoring the effectiveness of the vacuum bell during pectus excavatum treatment: technical innovation**

(Abstract ID: 953)

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### **Background:**

The vacuum bell (VB) is the only non-invasive treatment for PE, and represents a valid alternative to surgery. So far, no suitable tool was available for assessing objectively the efficiency of the VB. During the application of the VB an elevation of the sternum up to the observation window occurs, depending on the applied negative pressure.

We hypothesize that duration of the treatment with the VB depends on the flexibility of the chest, that it exists a relationship between the age of the patient, the depth of the pectus, the sternal elevation, and the negative pressure inside the VB.

In collaboration with the University of Applied Sciences and Arts of Northwestern Switzerland, we developed a new measurement system, providing the pressure inside the VB and the related elevation of the sternum during the application of the VB.

### **Materials and methods:**

The measuring device (MD) is mounted on the conventional VB, and is available for the different sizes of the VB. It consists of three optical distance measurement sensors and a differential pressure sensor. The MD allows to determine the elevation of the chest in correlation to the applied negative pressure within the VB. One sensor measures through the VB window the distance of chest wall during treatment, and two sensor placed outside the VB detect the distance of sensors to the unaffected sternum.

The measured parameters were: – depth of the pectus excavatum – pressure within the VB: negative pressure created during the VB application – sternum elevation: during the VB application, the sternum will elevate towards the observation window of the VB. The patients were divided into three groups – 6-10 years (group 1) – 11-15 years (group 2) – 16-20 years (group 3).

### **Results:**

67 patients were included in the study.

The older the patient, the higher is the pressure required to lift up the sternum. This correlation however was not statistically significant. The younger the patient, the shorter is the time delay to lift up the sternum, the higher is the sternum elevation.

After three months of VB treatment, the pressure within the VB and the sternum elevation reach higher values, and the waveshape becomes steeper.

When comparing the depth of the PE to the patient's age, there is a statistically significant difference between the groups 16-20 to 6-10 and 16-20 to 11-15 ( $p < 0.05$ ). However, when comparing the sternum elevation to the patient's age, there is no statistically significant difference between the three different groups.

### **Conclusion:**

For the first time the sternum elevation and the created pressure during the application of the VB in patients with PE become measurable objectively.

Correlations between the patient's age, the depth of the PE , and the sternum elevation has been established.

Consideration of those data may influence the therapeutical strategies, i.e. patient with high pressure values should first undergo a conservative treatment by the VB to lower the pressure.

We propose to implement the MD for primary evaluation of PE patients, to establish new treatment algorithm (eligible patients for VB treatment), and to significantly decrease the surgical treatment related risks by validating the conservative treatment of PE by the VB.