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RESEARCH ARTICLE

Jugulo-atrial Bypass Procedure in Malignant Mediastinal Tumor with Superior Vena Cava Syndrome (SVCS) at Sanglah General Hospital, Bali, Indonesia: Case Series

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Abstract

Background: Superior vena cava syndrome (SVCS) is a collection of symptoms and signs due to obstruction in the superior vena cava (SVC). More than 90% of SVCS cases are caused by malignancy (lung, breast, intra-mediastinal organs) and vascular reconstruction surgery is the last resort in the management of SVCS. Decompression surgery still can be performed on all types of tumours. These case series aim to elaborate on the outcome of the jugulo-atrial bypass procedure in malignant mediastinal tumour with SVCS at Sanglah General Hospital, Bali, Indonesia. Case Description: In Case 1, Male 31-year-old, has chief complaint shortness of breathing accompanied by swelling on face, neck, and chest that has become worse since one month prior to admitted to the Sanglah General Hospital. A similar clinical finding was also found in Case 2, Male 53-year-old, with a productive dry cough and coughing up blood for more than two months and revealed an anterior mediastinal mass on CT-Scan. However, in Case 3 Male 68-year-old, his shortness of breath began after the history of lump on neck since 3 years ago. He was also diagnosed with the antiphospholipid syndrome and received oral anticoagulant therapy for 17 months. The sagittal, coronal, and axial view of chest CT scan with contrast showed an apparent demarcated heterogeneous mass in the anterior mediastinum with central necrosis. The calcification component was also found as a resulted in vena cava superior suppression on each case. The operative procedure was a median sternotomy with jugulo-atrial bypass procedure and followed by chemotherapy. The complete resolution of the anterior mediastinal mass as well as the improvement of clinical outcome were exhibited few weeks after treatment. Conclusion**:** Two of the three cases of malignant mediastinal tumour have been performed jugulo-atrial bypass surgery to reduce SVCS. From the histopathological examination, these three cases with SVCS were malignant mediastinal tumour. Jugulo-atrial bypass procedure was proven to reduce complaints of shortness of breath and swelling post-surgery.

Keywords : *SVCS, Malignant Mediastinal Tumor, Jugulo-Atrial By-Pass.*

Introduction

Superior vena cava syndrome (SVCS) is a vascular complication as one of the predictors of poor prognosis in the mediastinal tumour [1]. In the United States, the incidence of SVCS occurs approximately 15,000 cases annually, and 90% has been associated with advanced malignant diseases that cause invasion of the venous intima or an extrinsic mass effect [2]. A previous study which assessed the 337 patients with malignancies and SVCS registered through 1992 at the University of Texas M. D. Anderson Cancer Center found that the histologic type varied. 3 From 77 (35 %) patients had small cell carcinoma, 46

(21 %) had adenocarcinoma, 44 (20 %) had squamous cell carcinoma, 8 (4%) had large cell carcinoma, and 63 (29 %) had unspecified carcinomas from 219 patients (64.7 %) who had lung cancer [3].

The extrinsic pressure due to tumour invasion or impedance of venous return from intra-atrial or intraluminal pathology have been related to the obstruction of the superior vena cava and lead to the SVCS [4]. So that, superior vena cava (SVC) which is located in the supero-anterior mediastinum, makes it vulnerable to being pushed or invaded by mediastinal tumours [5].

The clinical signs of SVCS depend on the degree of obstruction and growth of nearby malignancies. The clinical presentation of SVCS can be acute or subacute [6]. The common symptoms and physical signs are included facial swelling, dyspnea, cough, dilated neck veins, and/or prominent cutaneous veins [6].

However, the severity of the syndrome is also depended on the obstruction's location as well as the rapidity of onset due to the collateral veins do not have time to distend to accommodate increased blood flow [6]. Based on the clinical manifestation, immediate intervention is necessarily important to improve the condition of patients.

Intervention in SVCS is aimed at reducing patient complaints, such as shortness of breath, cyanosis, or swelling on face and superior limbs. Although the prognosis of malignancy accompanied by SVCS is generally poor, it is still considered beneficial if the jugulo-atrial bypass procedure can significantly reduce patient complaints [7]. Superior vena cava syndrome make patient's quality of life worse, so early identification and bypass procedure are needed.

The jugulo-atrial bypass is the most common surgical procedure in SVCS [8]. However, the different clinical situation makes this surgery procedure challenging and influence the outcome of patients [8]. Based on those mentioned above, this case series among three cases of mediastinal malignancy with SVCS aims to evaluate the jugulo-atrial bypass procedure and tumour resection at Sanglah General Hospital, Bali, Indonesia.

Case Description

Case 1

Patient with initial WD, male, 31-year-old, complained of shortness of breath accompanied by swelling on face, neck and chest that has become worse since one month before admitted to the hospital. Physical examination: respiratory rate 30 times per minute, swelling on face, ptosis eyelid, right and left jugular vein distension, no collateral veins seen in neck or chest, auscultation of heart, lungs and abdomen were normal.

Sagittal, coronal, and axial view of chest CT scan with contrast showed an apparent demarcated heterogeneous mass (11.7 x 7.4 x 11.6 cm) in the anterior mediastinum with central necrosis and calcification component which resulted in vena cava superior suppression (Figure 1A, B and C).

Patients received radiation therapy 3 times but did not improve clinically. Repeated chest CT images showed a suspected mediastinal tumour malignant. New multiple nodules appear on the right lung (Figure 1D).

Examination of tumour marker levels showed elevated levels of Alpha Feto Protein (AFP> 1000 IU/mL, normal <5.8 IU / mL), levels of ß-human chorionic gonadotropin (ß-HCG 11.07 mIU/mL, normal < 5.3 IU / mL), and levels of lactose dehydrogenase (LDH 1743 U/L, normal 240-480 U/L).

The operative procedure was a median sternotomy and tumour was resected for tissue sampling. After the mediastinum was opened, a mass with a rubbery consistency, encapsulated, and uneven surface covered the superior vena cava, left innominate vein and left internal jugular vein (Figure 1E).

The sliced mass appeared to have an uneven surface. Some were pale yellow, and the others were yellowish grey-white. The necrotic area was seen around 40% with bleeding. Tumours were resected widely. After debulking excision, the procedure was continued by making end-to-side bypass with 15x9 mm Y-vascular graft from the right and left internal jugular veins to the right atrium (Figure 1F). Complaints of shortness of breath and swelling on face improved in four days postoperative.

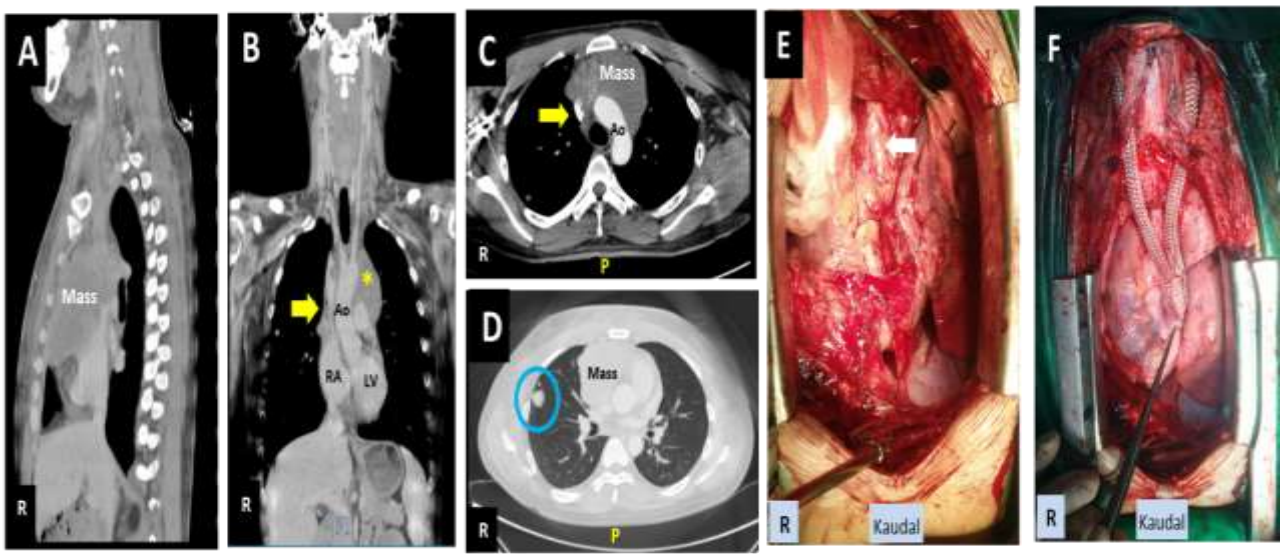

Figure 1: (A) Chest CT scan with contrast from the sagittal section shows a mass filling the anterior mediastinum. (B) & (C) Images of coronal and axial sections confirm the finding of the mass (11.7 x 7.4 x 11.6 cm, lobulated with central necrosis) surrounds the superior vena cava. (D) Chest CT-scan post *lung window* radiation: persistent mediastinal mass size accompanied by new nodules in the right lung, anterior segment of the superior lobe (blue circle), other nodules found in the posterior segment of the superior lobe and superior segment of the inferior lobe. (E) Intra-operative image: mass excision (white arrow). (F) The procedure continued with vascular reconstruction and jugulo-atrial bypass procedure RA, right atrium; LV, left ventricle; Ao, aorta

Histopathologically, the tumour had characteristics of mixed germ cell tumours with seminoma components, yolk sac tumours, embryonal carcinoma and choriocarcinoma. Patients undergo chemotherapy with a four-cycle BEP regimen (bleomycin, etoposide and cisplatin) standard doses. A serial plain chest radiograph was performed to evaluate the outcome of the surgical procedure accompanied by the administration of systemic chemotherapy (Figure 2A-B). The plain chest radiograph suggests a mixed type of pulmonary metastases (nodular, pneumonic and pleural type metastases). After four cycles of chemotherapy, chest CT-scan was performed with results of complete resolution of the anterior mediastinal mass, good graft patency, varying size of pulmonary nodules in both lungs accompanied by mixed-type lung metastasis (Figure 2C-E). Tumour marker levels, LDH decreased and increased postoperatively (Figure 3). The patient experienced a seizure and died 20 days postoperatively. The seizure was suspected as a result of the tumour metastases process in the brain.

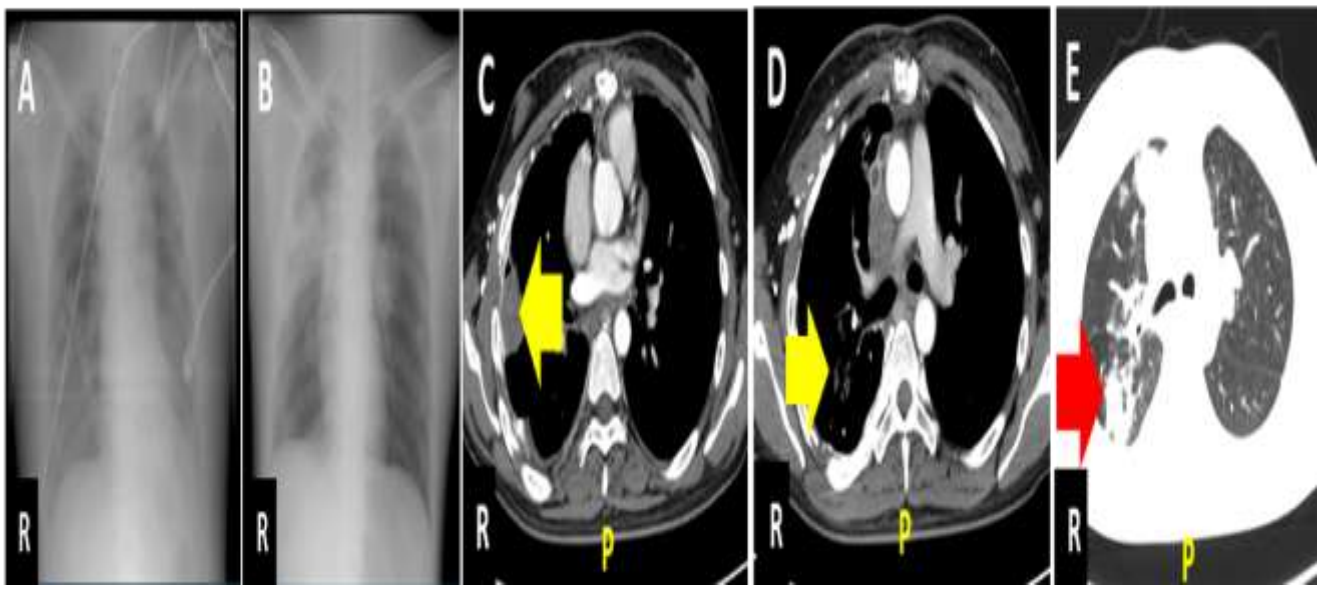

Figure 2: (A) A plain radiograph of the 5-hour and (B) 6-month postoperative shows opacity in the upper lobe of the right lung and firmly demarcated nodules in the right and left parahiler. (C) and (D) Transverse section of chest CT scan with contrast post-operative and chemotherapy shows multiple nodules in the right lung (yellow arrows). (E) Lung window CT-scan confirms the nodule (red arrow). There is no visible mass in the mediastinum

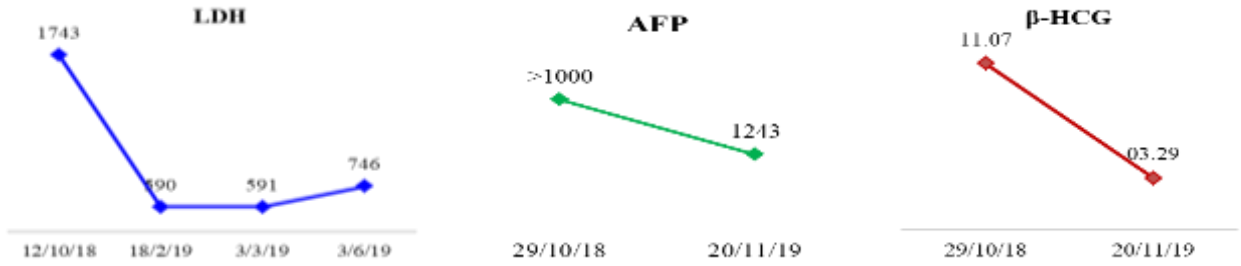

Figure 3. Tumor marker levels: LDH, AFP and β-HCG before and after therapy (surgery and chemotherapy).

Case 2

Patient with initial PW, male, 53-year-old, active smoker, complained shortness of breath and swelling on face that has become worse since two weeks before admitted to the hospital. Complaints began with a productive dry cough and coughing up blood for more than two months. As a preliminary examination, the patient underwent a plain chest radiograph and found an image of a well-demarcated opacity with an uneven surface, a suspicion of a mediastinal mass (Figure 4A).

The patient then underwent a chest CT scan that confirmed the findings of the anterior mediastinal mass (Figure 4B-C). The biopsy sample was taken by transthoracic needle-aspiration procedure with cytological findings in the form of chronic suppurative inflammation. Complaints were getting worse and consulted to the Thoracic and Cardiovascular Surgery Division. Physical examination showed distension of the neck vein and swelling on both face and hands. CEA (Carcinoembryogenic antigen) tumor markers 2.4 ng / mL (normal <5 ng / mL).The operative procedure was a biopsy incision with a median sternotomy approach when the mediastinum is opened.

There was a fragile black mass and this mass was easily bleed. From palpation, the mass was infiltrating into the intraperitoneal structure and superior vena cava. Followed by the identification of innominate vein with an intact impression, then a vascular bypass was made from the right jugular vein to the right atrium using an 8 mm PTFE graft.

Histopathological examination supports the characteristic of angiosarcoma epithelioid and carcinoma. Two days postoperative in the intensive room showed clinical improvement of SVCS. Shortness of breath got better and swelling on both arms and hands began to shrink. Treatment was continued in the regular ward.

Plain chest radiograph postoperative showed persisted size of right superior mediastinum mass accompanied by an image of the pneumonia type metastases process (Figure 4D). At the 3-day follow-up photo after the procedure, a right pleural effusion was seen which it was suspected as a metastatic process (Figure 4E). Twenty days postoperative, the patient died because of respiratory failure. Adjuvant therapy for the malignancy has not been given.

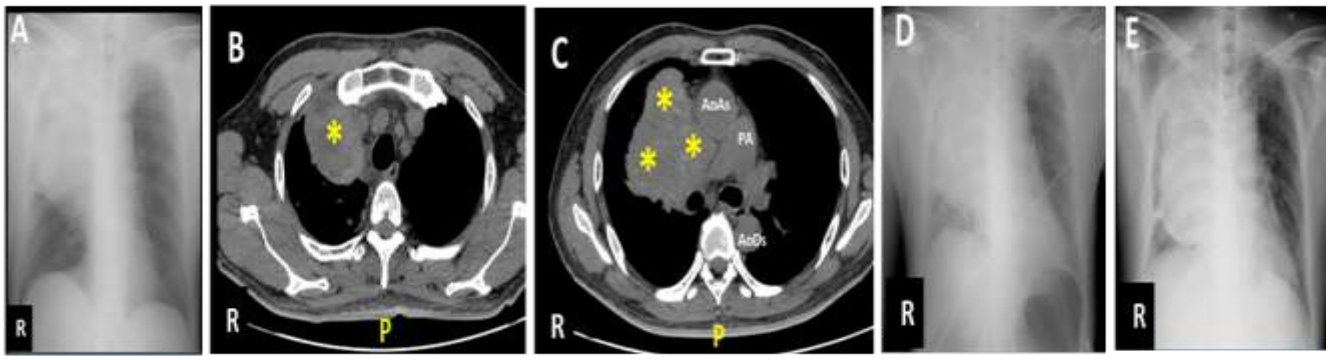

Figure 4: (A) Plain chest radiograph showing a lobulated opacity projected to the level of right Th1-8 paravertebral, suspicion of the right superior mediastinal mass, accompanied by a suspicion of the pneumonic type of pulmonary metastases. Thickening of the superior aspect of pleural space and thickening of the minor fissures directs the suspicion of pleural effusion-type metastases. (B) and (C) confirm the finding of a mass in the anterior mediastinum (yellow asterisk) which suppresses the structure of the superior vena cava and make a partial obstruction of the right bronchus. Multiple nodules in the superior lobe of the right lung with pneumonia. (D) Plain chest X-ray after the bypass procedure and (E) 3 days post-operative. PA, pulmonary artery; AoAs, ascending Aorta; AoDs, descending Aorta

Case 3

IWS, male, 68-year-old, active smoker. Patients with a history of lump on his neck since three years ago and the results of the biopsy did not lead to malignancy. However, complaints of shortness of breath began to emerge and echocardiographic results showed an image of thrombus in the superior vena cava. Anti-nuclear antibody test (ANA test) titer was 1: 320. Based on these findings, the patient was diagnosed with the antiphospholipid syndrome; then the patient received oral anticoagulant therapy for 17 months. Complaints of shortness of breath worsened and since last week, the patient complained swelling on both face and hands. Physical examination showed extensive venectation on his chest through the neck (Figure 5A). Echocardiographic examination showed an image of mass in the right atrium (Figure 5B). Plain chest radiograph showed the size and shape of the heart are normal and there was a left pleural effusion (Figure 5C). LDH levels were 331 U/L (normal 240-480 U/L).

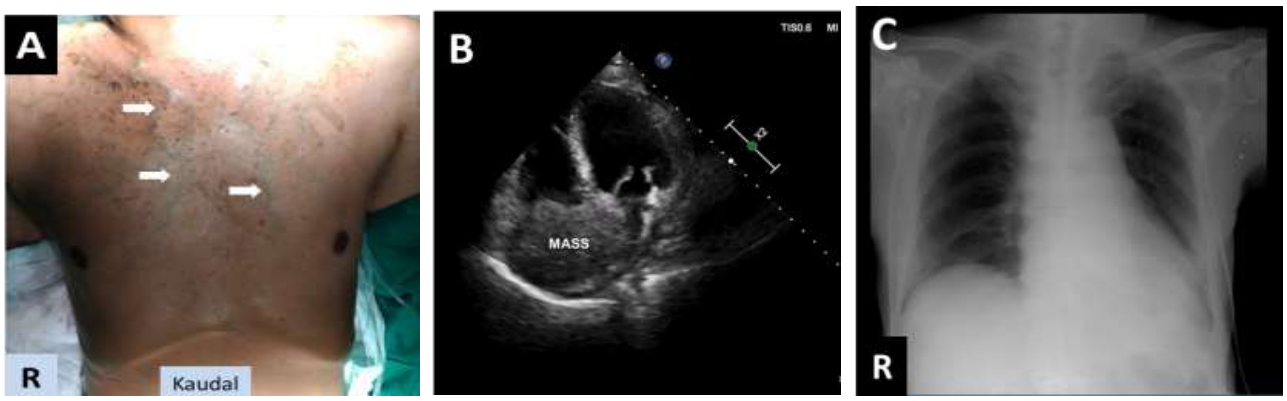

Figure 5: (A) Venectation in the patient's neck and chest. (B) Transtorachic echocardiography showed an image of mass filling the right atrium attached to the interatrial septum, lead suspicion of cardiac myxoma.

Chest CT scan with contrast showed a mass in the right atrium (7.3 x 9.7 x 13.2 cm) with heterogeneous contrast enhancement (Figure 6A-B). Lesions appear to fill the vena cava, which lead suspicion of thrombus. Collateral veins to the azygos vein, hemiazygos vein, lateral and internal thoracic veins (dominant right), chest wall veins, and paravertebral plexus (Figure 6C).

Surgery was performed with the help of a cardiopulmonary bypass (CPB) machine. Cannulation of the femoral artery and vein as CPB access. Tumour excision procedure was performed with a median sternotomy approach followed by the opening of the pericardium. Systemic hypothermia and administration of cardioplegia were given to stop the heart. The right atrium is opened, there was a solid mass with a smooth uneven surface on the right atrium, the superior-inferior vena cava, the right-left innominate vein. The mass was attached to the right atrial wall and difficulted to release, so the operator decided to do an excisional biopsy (Figure 6D). Histopathologically, the mass had a characteristic of thymic carcinoma (squamous cell carcinoma) with a differential diagnosis B3 type thymoma. The patient died because of respiratory failure eight days post-operative. During treatment in intensive care, the patient has not received therapy for the malignancy underlying the SVCS.

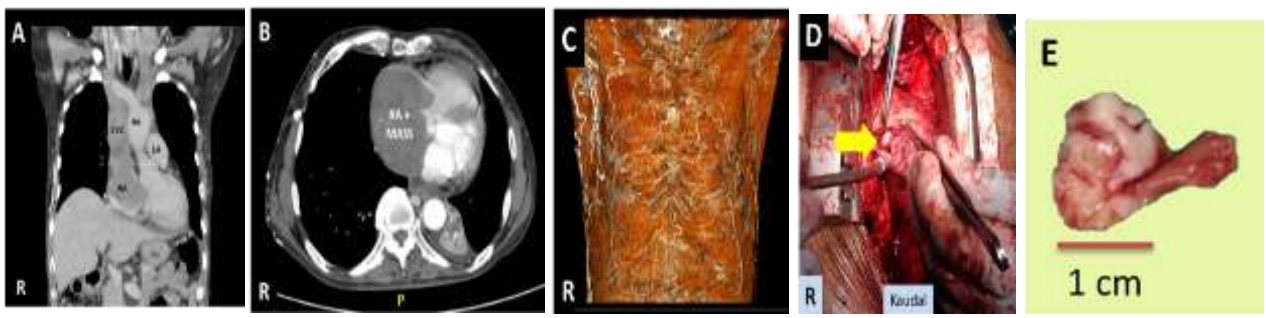

Figure 6: (A) and (B) CT scan of the coronal section shows an image of a mass filling the right atrium and superior-inferior vena cava which is confirmed by axial section. (C) From the 3D reconstruction, a collateral vein system is formed in the chest wall. (D) Intraoperative photos: excisional biopsy of the tumour (yellow arrow) taken directly from the right atrial chamber. (E) Macroscopic tissue tumour. SVC, superior vena cava; RA, right atrium; Ao, aorta; LA, left atrium

Discussion

Three cases of SVCS were reported with malignant mediastinal tumours (Table 1). Diagnosis in all three cases was based on clinical findings of SVCS in the form of dyspnea and oedema on the face and both upper limbs. Physical examination revealed neck vein distension and vein venectation on chest and neck. Clinically, SVCS can be grouped into three groups: hemodynamic, respiratory and neurological disorders. From the various symptoms and signs reported, oedema on the face and both upper limbs found 60-100% of cases, dyspnea and cough 40-75% of cases, and neck vein distension 30-80% of cases [9,10].

Anamnesis must include the history of previous malignancies and a history of vascular intervention. Symptoms of SVCS appeared within a few weeks [10,11]. This was related to the three cases, where the onset of SVCS appeared within one week to 1 month. No history of the vascular intervention was found in all three cases, so aetiology of SVCS due to thrombosis can be ruled out.

The degree of severity depends on the degree of obstruction and how quick the onset of constriction occurs [10]. Clinical severity will determine whether or not vascular bypass is done immediately in SVCS [10,11]. The National Institutes of Health makes the Common Terminology Criteria for Adverse Events (CTCAE) to categorize SVCS clinically into mild, moderate, severe, life-threatening and fatal categories [1,12]

Based on it, the clinical types of the three patients we treated were grade 3 or severe because of dyspnea by oedema of the larynx due to increased venous hydrostatic pressure around the airway based on SVCS grading system [12].

Further radiological findings must be confirmed histopathologically to determine the type of tumour and its definitive treatment [1,10]. In the initial stages, the examination of tumour markers can be carried out in several cases [13]. Referring to the approach and management of anterior mediastinal mass findings published by Carter et al., men in the age of 10-39 years, with heterogeneous mass images on chest CT-scans accompanied by pulmonary metastases followed by increased AFP and ß-HCG tumour markers direct suspicion on germ cell tumours (level of confidence 10-25%) [13]. This is in related with case 1 that we report, where the results of histopathology examination have confirmed the findings of germ cell tumours with mixed type characteristics or commonly known as non-seminoma germ cell tumours (NSGCT). Pure seminoma is rarely followed by an increase in both markers [14].

This approach is also applied in cases 2 and 3. In men and women with anterior mediastinal mass findings, age over 40 years, thymoma is the most commonly reported, followed by tumour thyroid, and other types. Thymoma suspicion (level of confidence~ 50 %) will be more reliable if myasthenia gravis (MG), pure red cell aplasia or hypogammaglobulinemia are found clinically, which are not found in both cases 2 and 3 [9].

Based on the distribution of SVCS aetiology due to malignancy, more than 78-85% of SVCS cases are found in lung cancer, where 80% of cases are found in non-small cell lung cancer (NSCLC) [2,9,15]. Suspicion of lung cancer is increased in patients with age more than 50 years and has a history of active smoking. CEA marker tumour examination can be done as an initial screening [9]. Blanco-Prieto et al. in their study assessed the sensitivity of several tumour markers to detect early-stage lung cancer, reporting an increase in CEA levels to have a sensitivity of 91.7% and specificity of 45.4% [16].

Based on this study, the possibility of primary malignancy from the lungs can be temporarily excluded in case 2. Besides, the examination of LDH levels is still a routine biomarker for some cancers. An increase in LDH indicates tissue damage, and excessively high levels generally lead to malignancy, including NSCLC, GCT, and Ewing's sarcoma in the bones [17]. Too high LDH levels are one of the unfortunate independent prognostic indicators so that it can be checked during the process of follow-up of treatment outcomes in malignant patients [6,17].

Previously, SVCS with malignancy was an indication of emergency radiotherapy. However, recent case reports recommend that diagnosis and biopsy should precede radiation therapy or chemotherapy because it

is considered more effective and efficient in terms of time and choice of intervention in reducing complaints and improving patient quality of life [2,6]. Only in SVCS with life-threatening conditions (cerebral oedema, laryngeal oedema), which the endovascular procedures, venocavograms or reconstructive surgery procedures are not available. Accordingly, radiation therapy can be utilized as the first choice [5].

In a series of post-radiation SVCS cases, clinical improvement is found in 31 % of patients and partial response in 23 % of patients. An autopsy study found complete patency only found in 14 % and partial patency in 10 % of patients, while reports of clinical improvement were found in almost 85 % of patients. From these findings, it is seen that there is a mismatch between the objective assessment of the degree of SVC obstruction with the patient's clinical course.

Based on this, it seems that clinical improvement after radiotherapy has begun to be doubted because the improvement is most likely due to the formation of collateral venous circulation in the patient itself [9]. This finding seems to be one of the reasons why radiation therapy is given in case 1 did not provide significant clinical improvement.

The endovascular procedure has become one of the most common therapies, considering that most SVCS cases occur due to external compression, so that by installing a stent, it can immediately increase blood flow through SVC [1,5,7]. Compared to radiotherapy, the endovascular procedure is reported to provide fast clinical improvement. Cyanosis improves within a few hours, and oedema decreases within 48-72 hours (response rate, 75-100 %) [5]. However, the opposite was reported by Wilson et al., clinical improvement post stent was only found in 17% cases.

This situation indicates that the clinical improvement in patients not only caused by SVC obstruction [9]. Endovascular surgery is more recommended in non-malignant SVCS. In contrast, open surgery is preferred in cases of the pathological mediastinum. Both methods showed satisfactory results in terms of complaint regression (endovascular, 97.3%; open surgery, 93.5%) as well as mid-term primary patency with a low incidence of secondary interventions (endovascular, 26.9%; open surgery, 28.4%) [18].

The outcome of open surgery in this serial case report reports a mortality rate of 5% and a patency rate 80-90% [9]. Management in all three cases focuses on establishing a histopathological diagnosis while reducing the symptoms of obstruction. The three cases that we handled have been performed an excisional biopsy of tumour tissue around SVC.

The excision procedure in cases 1 and 2 was followed by the procedure of making jugulo-atrial bypass. In the third case, it was found that the mass filled almost the entire right atrium and massive infiltration on the SVC to the right-left innominate vein and because the mass was difficult to release reconstruction procedures or vascular bypass is not done. Besides, when compared with two other cases, SVCS symptoms in case 3 has complained for more than one year. Extensive venectation appearance on patient's chest indicates the collateral vein system has formed and sufficiently compensates for the backflow from the upper body.

The worsening condition in case 3 seems to occur due to the growth of mass that has filled almost the entire right atrium resulting in decreased right heart function, tricuspid valve regurgitation and congestive heart failure. Wilson et al. report a similar condition, where the success of opening the flow of SVC obstruction with mediastinal malignancy was not followed by clinical improvement of SVCS [9]. The outcome of therapy is very dependent on the type of underlying tumour [9]. By focusing on establishing a definitive diagnosis, an open biopsy procedure is performed in case 3.

Internal jugular vein bypass and right atrium are the most common bypass procedures performed on SVCS [8]. Various innovations in finding new techniques to improve venous return are continually being developed. Panneton et al. reported SVCS with pulmonary carcinoma and extensive thrombosis in innominate veins, axillosubclavia and left internal jugular vein due to the use of central vascular access and endovascular procedure that have failed three times.

Right jugular vein bypass is performed through a femoral vein with saphena magna graft and support from PTFE graft expansion to prevent kinking [19]. The procedure is also known as a saphenous-jugular bypass. This procedure has the advantage of not having to pass through the thoracic region (in cases of extensive mediastinal fibrosis). This peripheral bypass can be one of the palliative therapy options for SVCS patients [8].

Histopathology result from the first case meets the characteristics of mixed germ cell tumours. Based on the International Agency for Research on Cancer (IARC) published by the World Health Organization (WHO, 2015) the management of mixed type germ cell tumours is chemotherapy followed by resection of the remaining tumours [10]. The first-line chemotherapy regimen consists of BEP (bleomycin, etoposide, and cisplatin), EP (etoposide, cisplatin), and VIP (cisplatin, etoposide, ifosfamide).

Recent studies of cisplatin-based chemotherapy in the malignancy of GCT are more satisfying, with a 5-year survival rate reaching nearly 95% and 80% in patients with metastases. About 20-30% of cases have a recurrence and require additional chemotherapy [10]. In case 1, the patient had completed four cycles of BEP chemotherapy. Prognosis determination in GCT is still based on the International Germ Cell Cancer Collaborative Group (IGCCCG) staging system. The system divides GCT into good, intermediate and bad prognosis based on primary GCT location, AFP, ß-HCG, LDH levels, histological findings (seminoma non-seminoma) and the presence or absence of metastases. The mediastinal GCT findings accompanied by pulmonary metastases as found in case 1 belong to a poor prognosis [20].

Histopathological features in case 2 meet the characteristics of epithelioid angiosarcoma. This type of tumour can occur in various body locations. From 300 cases of epithelioid angiosarcoma reported, one-third of cases appear in the subcutaneous layer (most often in the head and neck), a quarter of cases in soft tissue, and the rest in the liver, spleen, breast, bone and heart. Findings in the mediastinum are infrequent, or out of 1046 cases of mediastinal tumours that have been reported, only 7 cases of angiosarcoma were found [21].

Establishing a pathological diagnosis is generally challenging due to the non-specific histopathological feature often requiring further examination in the form of immunohistological stainings, such as vascular marker factor VIII-related antigens, CD31 and CD34. In case 2, the immunohistological analysis could not be performed, because this examination was not routinely done at Sanglah Hospital because of the relatively high cost. Prognosis is generally poor with a 5-year survival rate around 24%. In cases where no resection is taken, the average life expectancy is around 7.3 months. Resection with or without adjuvant chemotherapy or radiation therapy is still the modality of choice for current treatment [21.]

Survival rate post aggressive resection followed by chemotherapy in a case series was reported to be around 17%. Tan et al. reported a case of angiosarcoma with radiotherapy and four cycles systemic chemotherapy (cisplatin) have satisfactory outcomes [21]. Patients in case 2 had not received definitive therapy, radiotherapy or chemotherapy. The patient died 20 days after the surgery.

Besides, the histopathological findings in case 3 fulfil the characteristics of thymic carcinoma (squamous cell carcinoma). Thymic carcinoma is the most common type or about 90% of cases. Combination with thymoma is reported in 10-20 % of cases. Patients often present at an advanced stage with a survival rate of 30-50%.23 Determination of staging and grading can use the TNM system from Masaoka [14]. We classify case 3 as Masaoka stage III.

Based on the IARC, resectable thymus carcinoma has a slightly better prognosis than unresectable cases [14]. Complete resection is the best therapeutic option for achieving long-term survival. Due to the location of the tumour that fills and attaches to the right intra-atrial wall, resection has a very high risk of morbidity and mortality. A tumour that invades large blood vessels is associated with poor prognosis. In cases where resection is not possible, chemotherapy and radiotherapy are reported to be able to increase the likelihood of the tumour could be resected further [22]. Post open biopsy procedures, neither radiotherapy

nor chemotherapy has been given. The patient died eight days after the surgery.

Cconclusion

Complications of mediastinal tumour oncology in the form of SVCS are rare. When SVKS is identified, the aetiology must be determined immediately. Superior vena cava syndrome in cases of malignancy rarely requires emergency intervention because the progression of the disease gradually gives enough time for the body to form a collateral venous system. Although rarely performed at an early stage, surgery can be considered to reduce symptoms of SVC obstruction by many choices of vascular bypass techniques at this time. Another advantage of the surgical procedure is access for biopsy sampling. However, SVCS outcomes are highly dependent on the type of underlying malignancy. Nonetheless, interventions to open up the flow of SVC are still considered in accordance to reduce SVCS symptoms in patients.

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