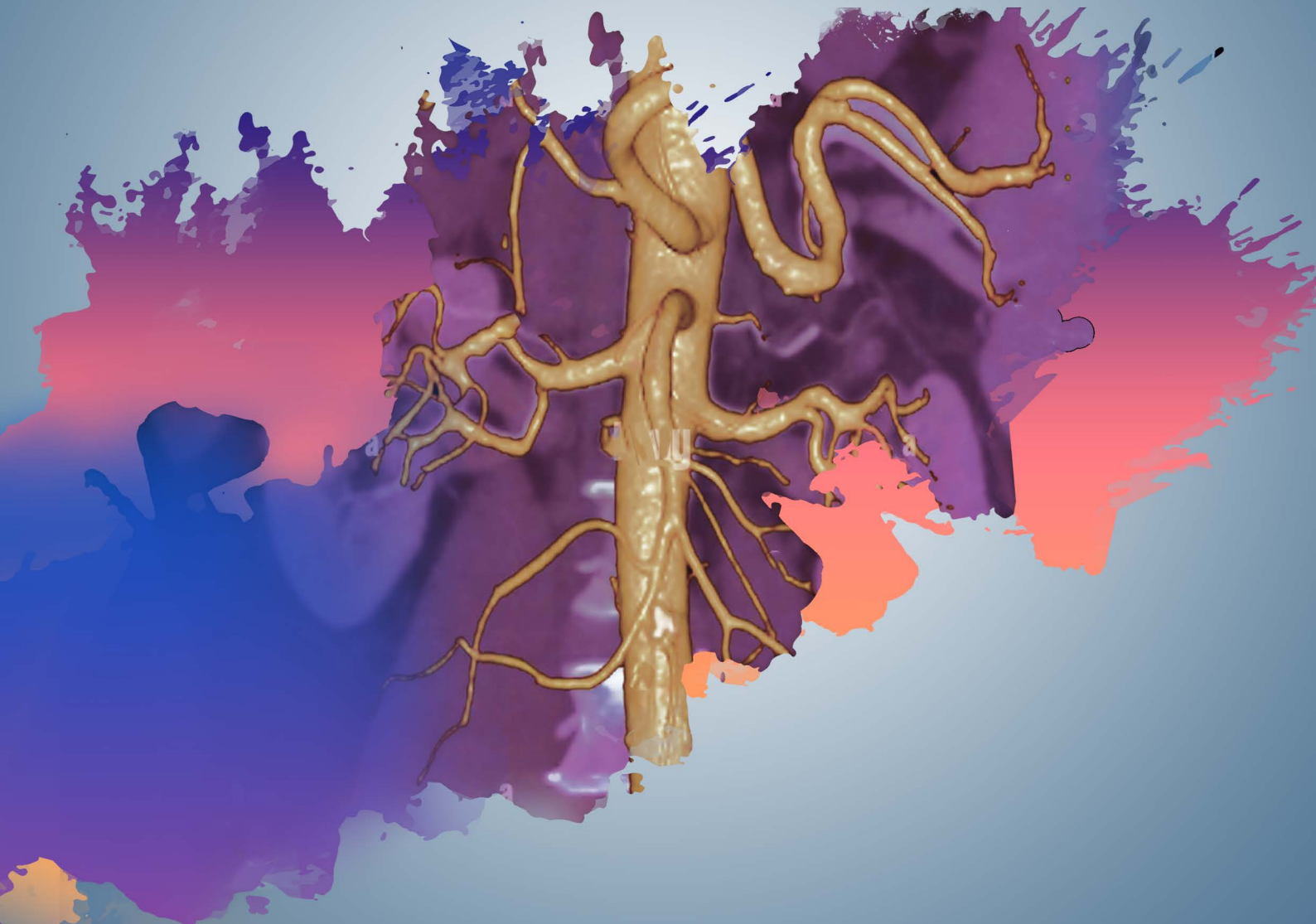
Vol.1 No.2
December 2021
e-ISSN: 2785-8944

The Interventionalist

Scientific Journal of Medical Intervention Journal

https://doi.org/10.32896/tij.v1n2



Pleuroscopy in exudative pleural effusion: A North Malaysia experience
Successful transcatheter embolization of splenic artery pseudoaneurysm in acute necrotising pancreatitis
Managing unintentional iatrogenic triple lumen central venous catheter (tlcvc) arterial puncture

eISSN 2785-8944

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Editor

EDITORIAL

On behalf of the editorial board of The Interventionalist Journal (TIJ), I would like to extend my deepest appreciation to the founder team, who had built the foundation of this journal.

The aim of The Interventionalist Journal is to provide and served as a platform for all clinicians who are doing minimally invasive procedures to share their findings, expertise, innovations and experiences at the regional and international significance. We envisaged being providing a high-standard and evidence-based platform for publishing high impact publications.

I am humbly inviting each of you to actively participate and contribute to The Interventionalist Journal as an author, reviewer, and reader.

The Interventionalist Journal has a strong starting point and I am confident that, we can eventually venture into new heights.

Sincerely,
Ezamin Abdul Rahim,
MD, MMed Rad
Editor-in-Chief
The Interventionalist Journal

THE INTERVENTIONALIST JOURNAL

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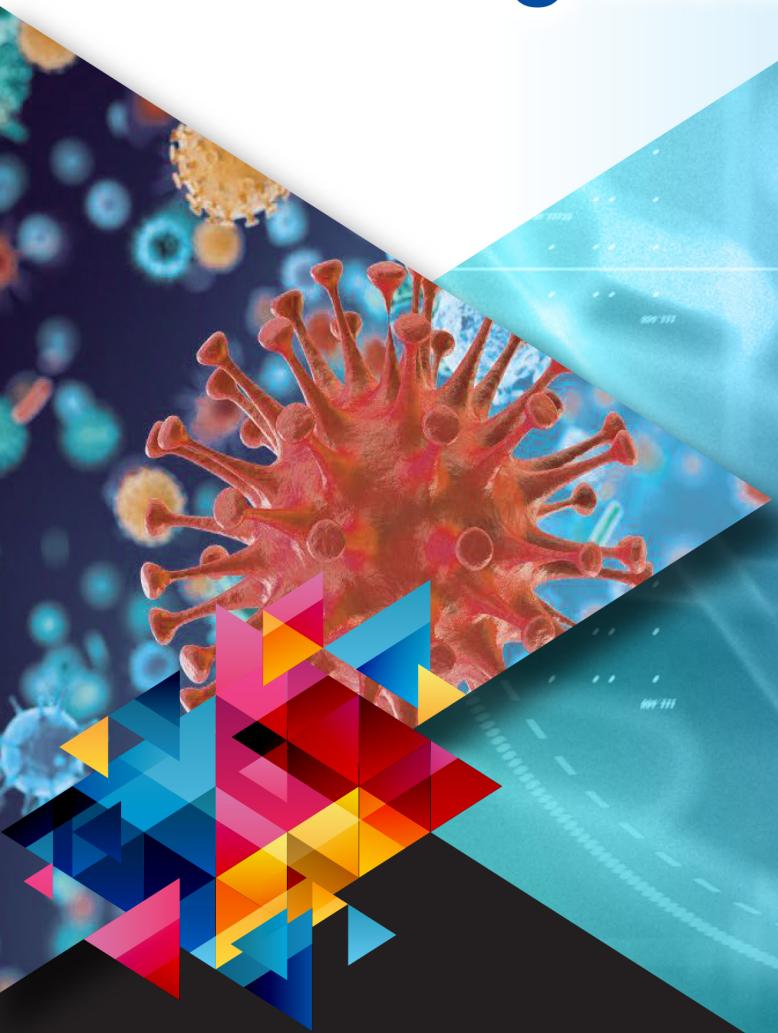

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PLEUROSCOPY IN EXUDATIVE PLEURAL EFFUSION: A NORTHERN MALAYSIA EXPERIENCE

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DOI: https://doi.org/10.32896/tij.v1n2.1-6
Published: 31.12.2021

ABSTRACT

Background: Pleuroscopy is an investigation modality available for further evaluation of exudative pleural effusion. The aim of this study is to determine the diagnostic yield and the common cause of pleural effusion in patients who underwent pleuroscopy in the Respiratory department of Hospital Sultanah Bahiyah.

Methods: This is a retrospective descriptive analysis study of 105 patients who underwent pleuroscopy in Hospital Sultanah Bahiyah between July 2014 and Dec 2016. Hospital Sultanah Bahiyah is the sole centre performing this procedure in Northern Malaysia.

Result: Biopsies were carried out in 92% of the cases with a diagnostic yield of up to 90%. The commonest finding was malignancy (53%) with adenocarcinoma being the commonest subtype followed by granulomatous inflammation (18.6%) which is expected in Malaysia given our burden of tuberculosis. Majority of our patients were male (57.1%) with a mean age of 60 years old. With regards to safety profile, re-expansion pulmonary oedema with no procedure related mortality had occurred in one patient as a complication

Conclusion: Pleuroscopy is a safe procedure. Despite the high tuberculosis burden in Malaysia, the commonest cause of exudative pleural effusion in this study is malignancy. Therefore, pleuroscopy should be considered in all cases of exudative pleural effusion.

Keywords: Exudative pleural effusion; Pleuroscopy, Lung Malignancy, Tuberculosis

BACKGROUND

Exudative pleural effusions are a common encounter in daily practice. The etiology varies across different parts of the world. While pneumonia, malignancy, and thromboembolism account for most exudative effusions in the United States [4], tuberculosis (TB) is the most frequently encountered etiology in other developed and developing countries [5]. In general, the first line of investigation in most pleural effusions are diagnostic thoracocentesis. However, in some cases, especially in cases of exudative pleural effusion this procedure alone is inadequate in determining the etiology of the pleural effusion, hence requiring further investigation such as pleural biopsy. This can be done either through a blind biopsy using Abram's needle or via pleuroscopy.

Pleuroscopy or medical thoracoscopy is a form of a minimally invasive procedure that allow direct visualisation and biopsy of the pleura. The first pleuroscopy was introduced by Hans-Christian JacÖbaeus in 1910 for the replacement of pleural fluid with air as a treatment of tuberculous pleural effusion [1, 2]. Medical thoracoscopy can be performed under local anesthesia and conscious sedation by experienced pulmonologists.

In Malaysia, pleuroscopy was first introduced in 2004 and were only available in certain hospitals. The service was introduced in Hospital Sultanah Bahiyah in 2014.The objective of this study is to determine the yield and safety of medical pleuroscopy as a diagnostic tool for exudative pleural effusion and to determine the common etiologies for exudative pleural effusion amongst our patient population. To our knowledge, this is the first study from Northern Malaysia and Peninsula Malaysia to analyze the diagnostic yield and safety profiles of this procedure in our local population.

METHODS AND DATA COLLECTION

This is a retrospective descriptive study of all patients that underwent pleuroscopy. This data is obtained from the respiratory department Hospital Sultanah Bahiyah, Alor Setar (HSB) as part of the investigation for exudative pleural effusion. The diagnosis of exudative pleural effusion was based on Light's criteria.

The study was conducted at Respiratory Department Hospital Sultanah Bahiyah, which is the only center performing pleuroscopy in the state of Kedah, and it caters for patients from the state of Kedah and Perlis, the most northern part of Malaysia peninsula.

All pleuroscopy records in Hospital Sultanah Bahiyah (HSB) from July 2014 until Dec 2016 were retrieved from the bronchoscopy database and patients' names, identification card number and registration number were recorded. Patient data was used to trace the result of pleural fluid analysis and biopsies taken during pleuroscopy. Additional informations were obtained from discharge and follow up notes.

We analysed our data using SPSS version 20. Ccontinuous data were presented in the form of mean and SD while categorical data were presented in number and percentage. The ccomparison between 2 groups were made using unpaired t test for continuous data and chi squared test for categorical data. The significant level is set at 0.05

THORACOSCOPIC PROCEDURE

Medical pleuroscopy is performed in the bronchoscopy suite by respiratory physician under local anaesthesia in this hospital. A semi rigid thoracoscope (LTF Type 160, Olympus) is used for the procedure. The other modality available is the rigid thoracoscope (which is not available in our centre). Firstly, patients were positioned in a lateral decubitus position with the affected side up. Bedside ultrasound was performed prior to the procedure to identify point for incision and feasibility for pleuroscopy. This point is located in the mid axillary line between the 4th and 7th intercostal space.

Following identification and preparation of the procedure site, local anaesthesia with 2% lignocaine was given. Afterward, a 1-2cm incision was made followed by a blunt dissection. The trocar was then inserted once the pleural space was accessed. The pleuroscope was introduced into the pleural cavity via the trocar. The pleural cavity was inspected, and pleural biopsies were taken from the abnormal looking pleura (mass/ nodule). In cases where the pleura appeared normal, random biopsies may be taken.

After the procedure, chest tube was inserted and connected to an underwater seal drain. Correct placement of chest tube was confirmed by the swinging of pleural drainage and chest radiograph. The chest tube was then removed once the pleural fluid stop draining (or has drained less than 100ml over 24 hours) or once the lungs are fully expanded on subsequent chest radiograph.

RESULT

A total of 105 patients with effusion underwent pleuroscopy with a mean age of 60 (18) year-old (figure 1) and majority were male (n = 60, 57%). 97 patients had a pleural biopsy done while the remaining 8 patients only underwent a pleural fluid analysis (figure 2). Pleural biopsy and pleural fluid analysis were diagnostic in 94 patients (90%) and pleural fluid analysis alone was diagnostic in 6 patients (6%) (table 1). Among those who were diagnostic with pleural biopsy and pleural analysis, malignant etiologies were the commonest (n = 56,

53%) and with pleural fluid analysis alone (table 2) similar percentages were recorded for malignant and benign etiologies, n = 3 (3%).

Adenocarcinoma was the commonest malignant finding in pleural biopsy and pleural analysis, and pleural fluid analysis; n = 47% (53%) and n = 3 (3%). Other malignant findings in pleural biopsy and pleural analysis were squamous cell carcinoma 4 (4%), small cell carcinoma 3 (3%), poorly differentiated carcinoma, n = 1 (1%) and yolk sac tumor, n = 1 (1%). For non-malignant etiologies, granulomatous inflammation was the commonest finding, n = 38 (36%) followed by chronic inflammation, n = 7 (7%). Tuberculosis was diagnosed in 1 case based on pleural fluid alone. Malignant etiologies were more common in older age, 67(13) vs 50 (19) year-old (p 0.01) (Table 3).

With regards to safety profiles, only one patient developed re-expansion pulmonary edema and there were no procedure related mortalities. Furthermore, there were no complications such as subcutaneous emphysema, bleeding, or infection.

Figure 1. Patient age distribution

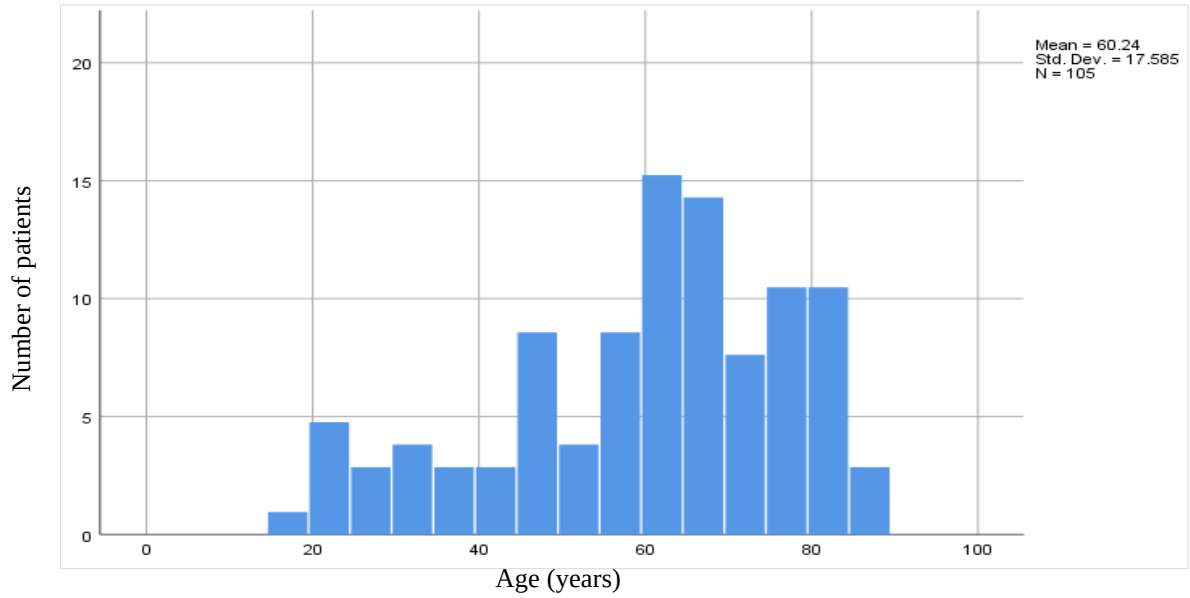

Figure 2. Flow chart of type of investigations underwent by patients

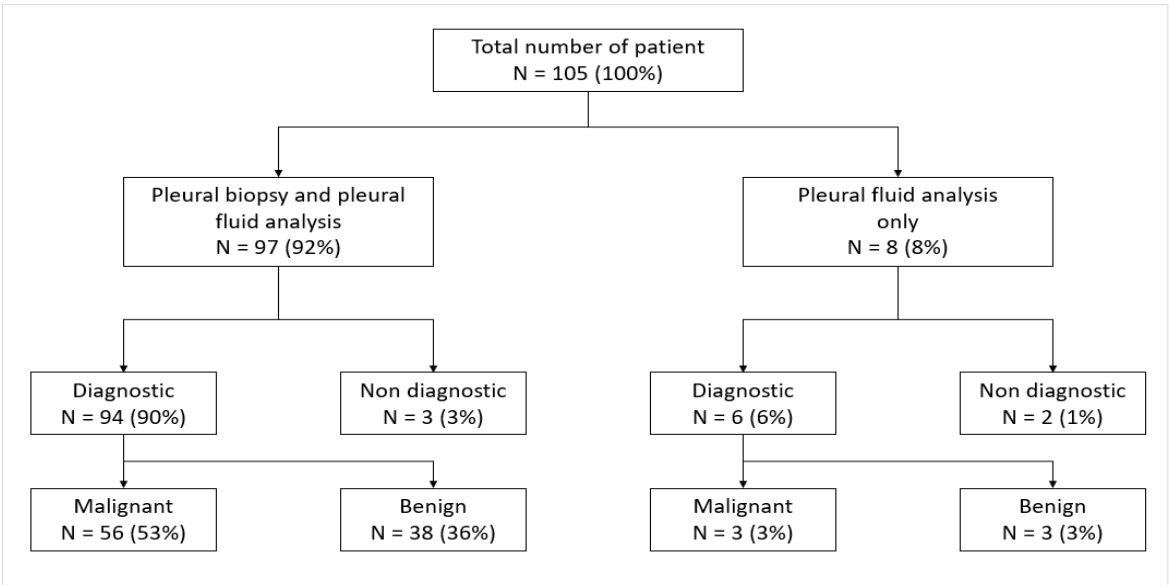

Table 1. Pleural biopsy and pleural fluid analysis N = 97 (92%)

		N	**%**
Malignancy		**56**	**53%**
	Adenocarcinoma	47	48.5%
	Squamous cell carcinoma	4	4.1%
	Small cell carcinoma	3	3.1%
	Poorly differentiated carcinoma	1	1.0%
	Yolk sac tumour	1	1.0%
Benign		**38**	**36%**
	Granulomatous inflammation	18	18.6%
	Chronic inflammation	7	7.2%
	Mesothelial cell	7	7.2%
	Fibrinous tissue	3	3.1%
	Atypical cell	1	1.0%
	Bony like tissue	1	1.0%
	Necrotic tissue	1	1.0%
Inconclusive	**Inadequate sample**	**3**	**3.1%**

Table 2. Pleural fluid analysis only N = 8 (8%)

		N	**%**
Malignancy	**Adenocarcinoma**	**3**	**3%**
Benign		**3**	**3%**
	Tuberculosis	1	1%
	Liver cirrhosis	2	2%
Inconclusive		**2**	**2%**

Table 3. Comparison of age between malignant and benign etiologies. 5 patients were excluded due to non-diagnostic pleural fluid and biopsy result.

Aetiologies	Number of patients	Mean age	Standard deviation	p-value
Malignant	66	67	13	0.01
Benign	34	50	19	

DISCUSSION

Exudative pleural effusion is a commonly encountered respiratory illness in day-to-day practice. Thoracocentesis is usually the first line of investigation however in up to 30% of cases it fails to provide the definitive diagnosis. Pleuroscopy provides a direct visualization of the pleural space and allows biopsy of the pleura to be taken under direct visualization. In cases of malignant pleural effusion, the sensitivity of pleuroscopy guided biopsy was reported between 81-95% (4-5). In this study, 97% of biopsy samples were diagnostic with only 3 samples obtained were non diagnostic This is similar to the other previous studies where adequate material were obtained in 93%-100% of the time (1,2). Non diagnostic samples may be due to insufficient samples sent for analysis.

In the present study the biopsy results from pleuroscopy provide definitive diagnosis in 70 % (n=74) of the cases where diagnosis of malignancy (N= 56) or tuberculosis (N=18) was made through histological analysis. This is slightly lower compared to the previous study (88- 93%) (1-2) (Gao et al and Sakuraba et al). This may be partly contributed by the fact that no pleural biopsy was taken in 8 of the cases. Unfortunately, we were unable to ascertain the reason to why pleural biopsy was not done in these 8 cases since it was a retrospective study.

Overall, malignancy is the most common cause for exudative pleural effusion comprising 56.2% (n=59) of cases. This percentage correlates and is slightly higher than other study where malignancy ranges between 45%-85% (2). This may be contributed by the fact that our patient pool belongs to the older category (mean age 60) compared to Gao Bao et al study group where~~by~~ the mean age is 46. Pleuroscopy also offers better tissue yield for additional mutation studies for targeted therapies especially in cases of advanced lung adenocarcinoma, whereby EGFR mutations are common in Asian population (6). Another reason for higher number of malignancy cases in our patient population can be attributed to selection bias whereby in some patients, pleuroscopy was not done if diagnosis of PTB has been made through sputum acid fast bacilli and hence this group of patients were excluded from our study.

Our data confirmed that the commonest diagnosis based on pleuroscopy is primary lung malignancy despite tuberculosis being rampant in our country. Interestingly, we specified the incidence of the different histologic subtypes. The adenocarcinoma of lung was confirmed to be the most common, comprising of more than 49.5% of the study sample.

Granulomatous inflammation was found in 19% (n=18) of the cases whereby all the patients were treated as pleural TB. None of them presented with recurrent pleural effusion. These patients were following up for a minimum duration of 6 months. Relying solely on Ziehl Nielsen staining of pleural fluid and pleural biopsy specimen is not helpful as the sensitivity was low, 0.0% and 3.8% respectively (7). However, pleural biopsy histopatholgy has a sensitivity of 53.8% and sensitivity of culture on both BACTEC 12B liquid medium and LJ medium was as high as 92.3% (7). Furthermore, molecular testing for tuberculosis using pleural fluid has a low sensitivity and high specificity (8). These facts support the use of pleuroscopy in the diagnosis of tuberculosis. However, the addition of MTB culture and sensitivity, MTB PCR and adenosine deaminase (ADA) result would be helpful to further confirm the diagnosis of tuberculosis. Based on current clinical practice, ADA test is only available in a private laboratory and patients have to pay for additional cost, thus making it less routinely sent during pleuroscopy.

We found that malignant pleural effusion is more commonly seen in the older age group; 67 vs 51 year-old (p 0.01) in comparison to other studies.

With regards to safety only one patient developed re-expansion pulmonary edema and there was no procedure related mortality. Apart from that, there were no complications such as

subcutaneous emphysema, bleeding, or infection. Comparison to other studies. Thus, this study reaffirms that pleuroscopy is a safe procedure. Only 5 patients remained non-diagnostic post pleural fluid analysis and biopsy which require additional investigations.

LIMITATIONS

This study describes a single centre experience and retrospective data. We also could not ascertain reason for biopsy not taken and those loss to follow-up

CONCLUSION

To the best of our knowledge, this is the first study that illustrates the diagnostic yield directly on a cohort of patients and the safety of pleuroscopy in the diagnosis of pleural diseases in Northern Malaysia. We report data of more than 105 consecutive pleuroscopies over a 30 months duration. No patient selection was performed, and no follow-up time was considered except for pleural tuberculosis patients. Our cancer frequency (56%) is similar to the one presented in existing literature. It suggests that the sensitivity in detecting malignancy of our procedure is as high as previously reported.

Pleuroscopy is a safe procedure and is a valuable modality in providing a diagnosis to the underlying cause of exudative pleural effusion. It can be easily done with minimal complications in a centre with experienced pulmonologists.

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SUCCESSFUL TRANSCATHETER EMBOLIZATION OF SPLENIC ARTERYPSEUDOANEURYSM IN ACUTE NECROTISING PANCREATITIS

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DOI: https://doi.org/10.32896/tij.v1n2.7-11
Published: 31.12.2021

ABSTRACT:
Splenic artery pseudoaneurysm is a rare condition commonly arises as a sequelae of pancreatitis. Pseudoaneurysm is clinically silent until it ruptures. Thus, untreated pseudoaneurysm carries a high mortality rate up to 90%. We present a case of necrotising pancreatitis complicated with unruptured splenic artery pseudoaneurysm, which was found incidentally from computed tomography (CT) of abdomen. Patient was presented with symptomatic anemia and bleeding from the abdominal drain. We proceeded with embolization of pseudoaneurysm by using Histoacryl glue. The embolisation was successful but complicated with partial splenic parenchymal infarction secondary to glue reflux. Despite that, patient was discharged home well. Transcatheter embolization is considered the current treatment of choice for pseudoaneurysm as it provides an alternative to conventional surgery due to its low morbidity and mortality rates. In this case report, we want to share our experience in the approach of the splenic artery pseudoaneurysm management.

Keywords: splenic artery, pseudoaneurysm, pancreatitis, interventional radiology

INTRODUCTION:

Splenic artery pseudoaneurysm is a rare condition that is commonly detected incidentally from radiological imaging. It typically results from the enzymatic autodigestion of the arterial wall by pancreatitis. Untreated pseudoaneurysm is prone to rupture with a high mortality rate of up to 90% (1). Transcatheter embolisation is a treatment of choice due to its high successful rate and lower morbidity and mortality rates than conventional surgery (1,2). In this case report, we want to share our experience in the approach of the splenic artery pseudoaneurysm management.

CASE REPORT:

A 59-year-old man was a chronic alcoholic drinker, admitted with epigastric pain. Glasgow-Imrie score deteriorated within 48 hours of hospitalisation. Computed tomography (CT) abdomen showed evidence of acute necrotising pancreatitis with peripancreatic collections (Figure 1). Immediate CT guided drainage of the peripancreatic collections done by the interventional radiology (IR) team. Following that, the patient was discharged well. He was readmitted again 3 weeks later for bleeding from the abdominal drain, hypotensive episode with blood pressure of 100/50mmHg and symptomatic anaemia with a haemoglobin level of 6.9 g/dL. Repeated CT revealed unruptured splenic artery pseudoaneurysm (Figure 2A), which was confirmed upon selective splenic angiogram (Figure 2B). The pseudoaneurysm appears arising from the lower pole branch of the

splenic artery. The splenic artery was cannulated with a 1.9Fr microcatheter with its tip placed near the ostium of the lower pole branch due to vascular tortuosity. Embolisation was done with 10% Histoacryl glue mixed with lipiodol. There was reflux of glue into the main and upper pole branch of splenic artery (Figure 3A). Post embolisation angiogram showed non opacification of the upper pole branch, main splenic artery and the pseudoaneurysm with visible collateral arterial supply seen from the left gastric artery and gastroepiploic artery (Figure 3B). Resolution of splenic artery pseudoaneurysm with 40% viable splenic parenchyma at the upper and lower pole is confirmed by the follow-up CECT abdomen 3 days post embolisation (Figure 3B). Following one-month post-embolisation, patient was in a good condition, asymptomatic with normal haemoglobin level of 10.6g/dL and sonographic evidenced of resolved peripancreatic collections.

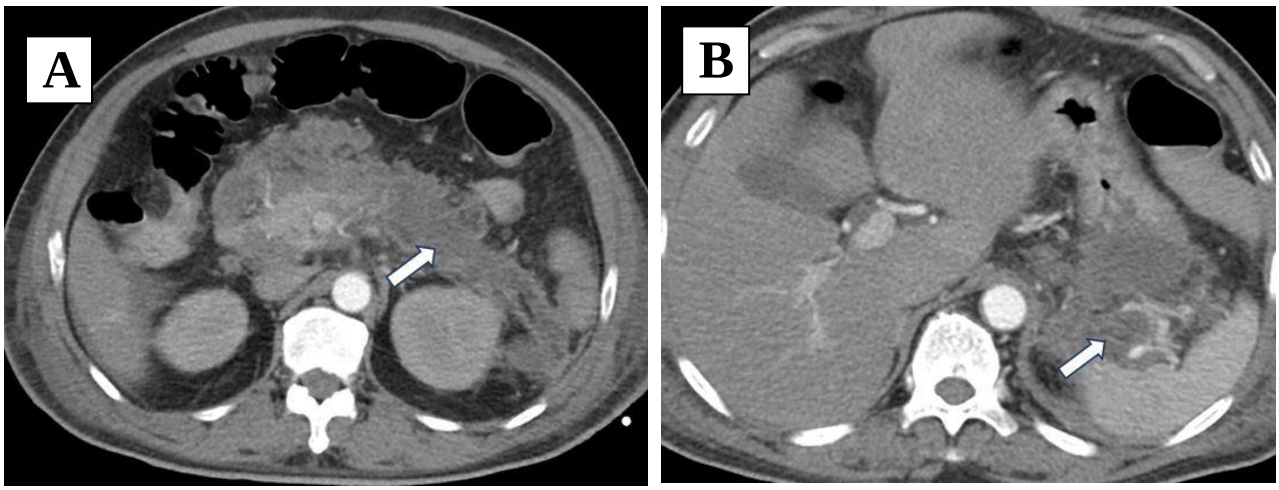

Figure 1: Contrast enhanced CT abdomen shows peripancreatic collections (white arrow in A) extending until splenic hilum (white arrow in B).

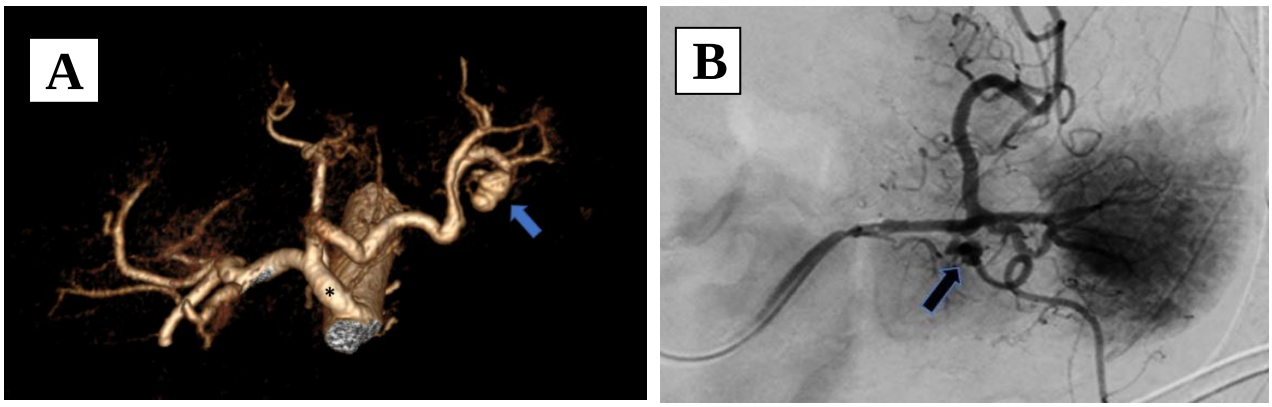

Figure 2: (A) Volume rendering computed tomography angiography (CTA) abdomen shows splenic artery pseudoaneurysm (blue arrow) arising from lower pole branch of splenic artery. Note the coeliac trunk (*) **(B)** Selective splenic angiogram confirmed the diagnosis of splenic artery pseudoaneurysm (black arrow).

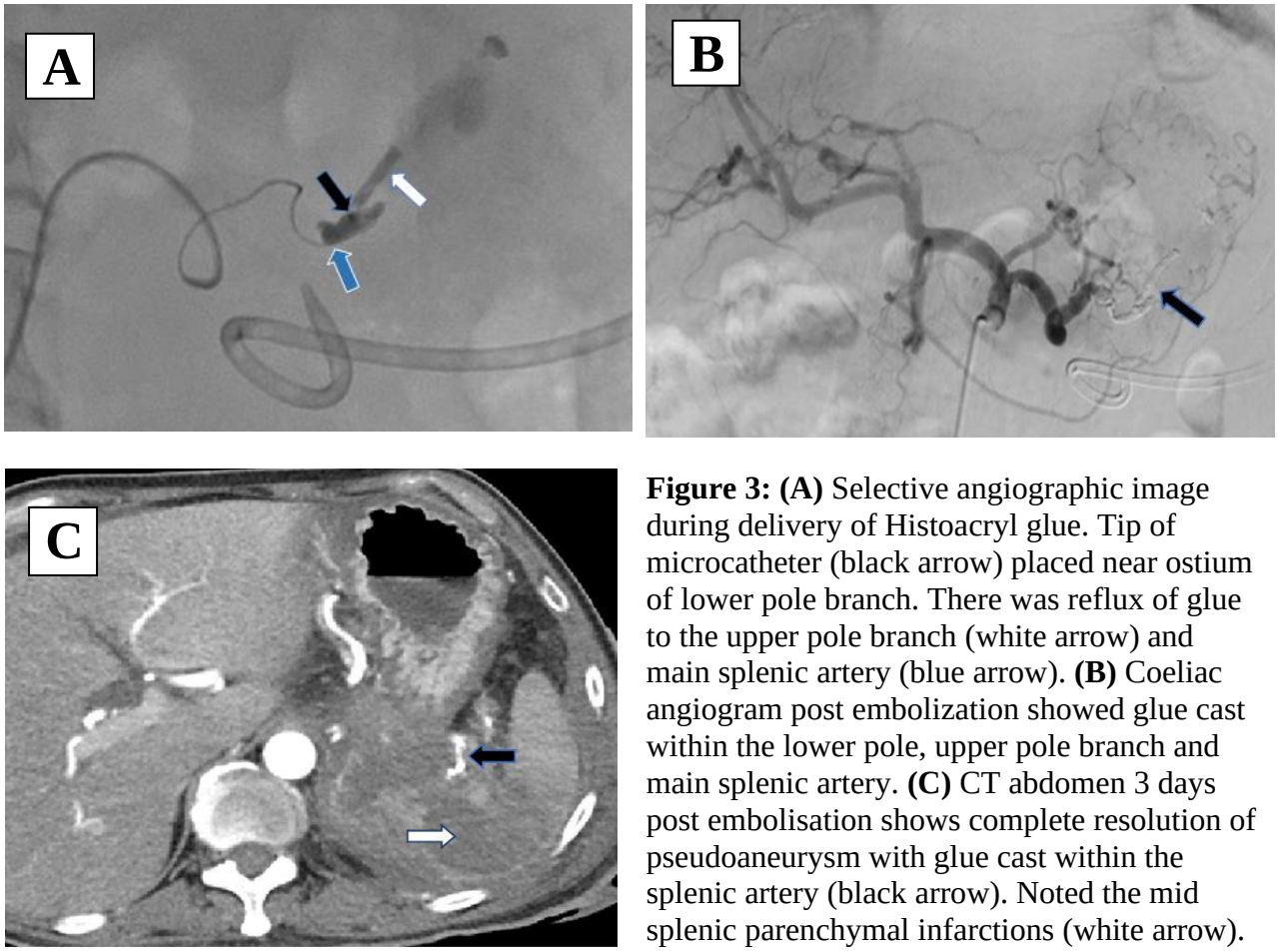

Figure 3: (A) Selective angiographic image during delivery of Histoacryl glue. Tip of microcatheter (black arrow) placed near ostium of lower pole branch. There was reflux of glue to the upper pole branch (white arrow) and main splenic artery (blue arrow). **(B)** Coeliac angiogram post embolization showed glue cast within the lower pole, upper pole branch and main splenic artery. **(C)** CT abdomen 3 days post embolisation shows complete resolution of pseudoaneurysm with glue cast within the splenic artery (black arrow). Noted the mid splenic parenchymal infarctions (white arrow).

DISCUSSION

Splenic artery pseudoaneurysm predominantly occurs as a sequela of pancreatitis. The pancreatitis leads to enzymatic autodigestion, which disrupts and weakened the intimal and medial layers of the arterial wall (1,2). Splenic artery is the commonest site for pseudoaneurysm following an event of pancreatitis due to its ordinary course where it runs along the pancreas towards the spleen (3,4). Pancreatic pseudocyst, on the other hand is the other complication of pancreatitis which may induce pseudoaneurysm formation.

Pseudoaneurysm is clinically silent. The patient may present with non-specific symptoms such as hematemesis, hematochezia or melena (2,4). In the current case report, the patient has minimal intermittent bleeding from the abdominal drain, which is one of the earliest signs of impending rupture. The manifestation of gastrointestinal bleeding is likely due to hemosuccus pancreaticus (1,4). This is a rare condition, occurs due to ruptures of the splenic artery pseudoaneurysm into the pancreatic duct through a fistula and drain into the duodenum via Ampulla of Vater (4). The pseudoaneurysm secondary to pancreatitis appear to be the leading cause of this condition.

Pseudoaneurysm has a thin wall, making the risk of rupture is high. Therefore, early detection and prompt treatment are necessary regardless of its size and irrespective of whether the patient is symptomatic or asymptomatic (2,3). The untreated ruptured splenic pseudoaneurysm carries high mortality rates up to 90%. Transcatheter embolisation is the current treatment of choice for pseudoaneurysm as it is minimally invasive and provides an alternative to conventional surgery. It has high success rates and low post-procedural mortality rates (5,6).

Angiography is also convenient in detecting the accurate location of the pseudoaneurysm, assessing the collateral flow, evaluating the suitability prior to embolisation and appear to be the more accessible approach to the pseudoaneurysm when the conventional surgery would be more complex procedure (5-7).

Few embolisation materials, namely stent, coils, glue (cyanoacrylate), gelfoam and sclerosing agents, are widely available (6,7). The commonly used embolic material is stent. It can be placed in various anatomical sites and can preserve the arterial patency; however, it is not suitable for tortuous vessels such as splenic arteries (6,7,8). Meanwhile, coils and glue are suitable for embolisation of end-artery and tortuous vessel like splenic artery. Similarly, both glue and coils causing occlusion of the inflow, outflow of the pseudoaneurysmal sac by inducing thrombosis (7,9). Glue is especially beneficial for instantaneous vascular occlusion than coils or stent. The cyanoacrylate glue induces thrombosis by polymerization into a cast once it is in contact with the blood plasma (10). Glue also can be delivered more distally if the targeted vessels are small or tortuous (5,9). In this case, the lower pole splenic artery branch is cannulated near the ostium, we unable to selectively advanced the microcatheter into the pseudoaneurysm due to tortuosity. Thus, decision made to embolize the pseudoaneurysm from the ostium by using glue as a primary agent.

Adequate training and expertise are needed in handling the glue as non-targeted embolisation, catheter trapping, and fragmentation may occur as a complication (9). The risk of non-targeted embolisation was high in this case because the position of the microcatheter tip was proximal and near the ostium. Therefore, reflux of glue was anticipated from the beginning. Other than that, the glue concentration used in this case may also play a role in inducing the reflux into main and upper pole branch of splenic artery. Glue and lipiodol mixed concentration were adjusted based on targeted vessel diameter, catheter tip distance to targeted lesion and blood flow velocity. However, 10% Histoacryl glue-lipiodol mixed concentration used in this case might be lower than the recommended concentration. High glue-lipiodol concentration of around 30% to 50% will be more suitable for rapid polymerization time and occlusion, as well as preventing the mixture from reflux and migration (10).

In this case, the glue was reflux into the main and upper pole branch of splenic artery. Therefore, approximately half of the spleen was infarcted while the remaining received collateral supplies from the left gastric artery and gastro-epiploic artery. Splenic infarction and postembolisation infection are considered least serious complications following endovascular treatment. Other than optimal glue concentrations, reflux and migration of glue can also be prevented by correct injection techniques. Delivery of glue can be controlled by slow but continuous injection to allow the glue cast to fill the vascular lumen. Glue delivery also should be stopped when the blood flow already arrested. Unintended glue adherence and migration can also be prevented by immediate retraction of the catheter after glue injections (10). Meanwhile, splenic infection in this case is prevented by prophylactic antibiotic given prior the procedure. Despite successful embolisation of the pseudoaneurysm, patient was ended up with partial splenic infarction. However, patient has early recovery and was discharged home well. Thus, endovascular treatment is helpful and reliable in reducing the high-risk complication, postoperative morbidity and mortality rate than conventional surgery (8, 9, 10).

CONCLUSION

The accurate diagnosis and prompt treatment of the splenic artery pseudoaneurysm is crucial in providing the best possible patient's outcome. With regards to this, transcatheter embolisation is the ideal approach in preventing invasive surgery.

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MANAGING UNINTENTIONAL IATROGENIC TRIPLE LUMEN CENTRAL VENOUS CATHETER (TLCVC) ARTERIAL PUNCTURE

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DOI: https://doi.org/10.32896/tij.v1n2.12-18
Published: 31.12.2021

ABSTRACT

Unintentional arterial puncture by central venous catheter insertion/placing can result in destructive complications especially if a large bore (>7F) catheter was used. Unplanned immediate catheter ejection with manual external compression is hazardous due to potential torrential blood leakage or formation of a pseudoaneurysm. Endovascular removal with a vascular closure device deployment is preferred in this situation. The aim of this case report is to discuss the alternative strategies if the vascular closure device fails to secure hemostasis.

Keywords: Angiography, Arterial cannulation, Angioseal.

CASE REPORT

A 32 years old lady, had an abortion in her second trimester. A post-evacuation of retained products of conception (ERPOC) was commenced; however, it was complicated with postpartum haemorrhage. Subsequently, the patient developed severe pre-eclampsia with acute pulmonary oedema. An 8Fr triple lumen central venous catheter (TLCVC) was inserted under ultrasound guidance in the intensive care unit (ICU). However, the post-TLCVC insertion chest X-ray showed that the tip of the catheter was not located at the intended location. Instead, it was located at the aortic arch area (Figure 1). A subsequent CT angiography (CTA) showed that the TLCVC had passed through the right internal jugular vein wall piercing into the right subclavian artery. The arterial entry point was identified just immediately distal to the bifurcation of the brachiocephalic trunk (Figure 2).

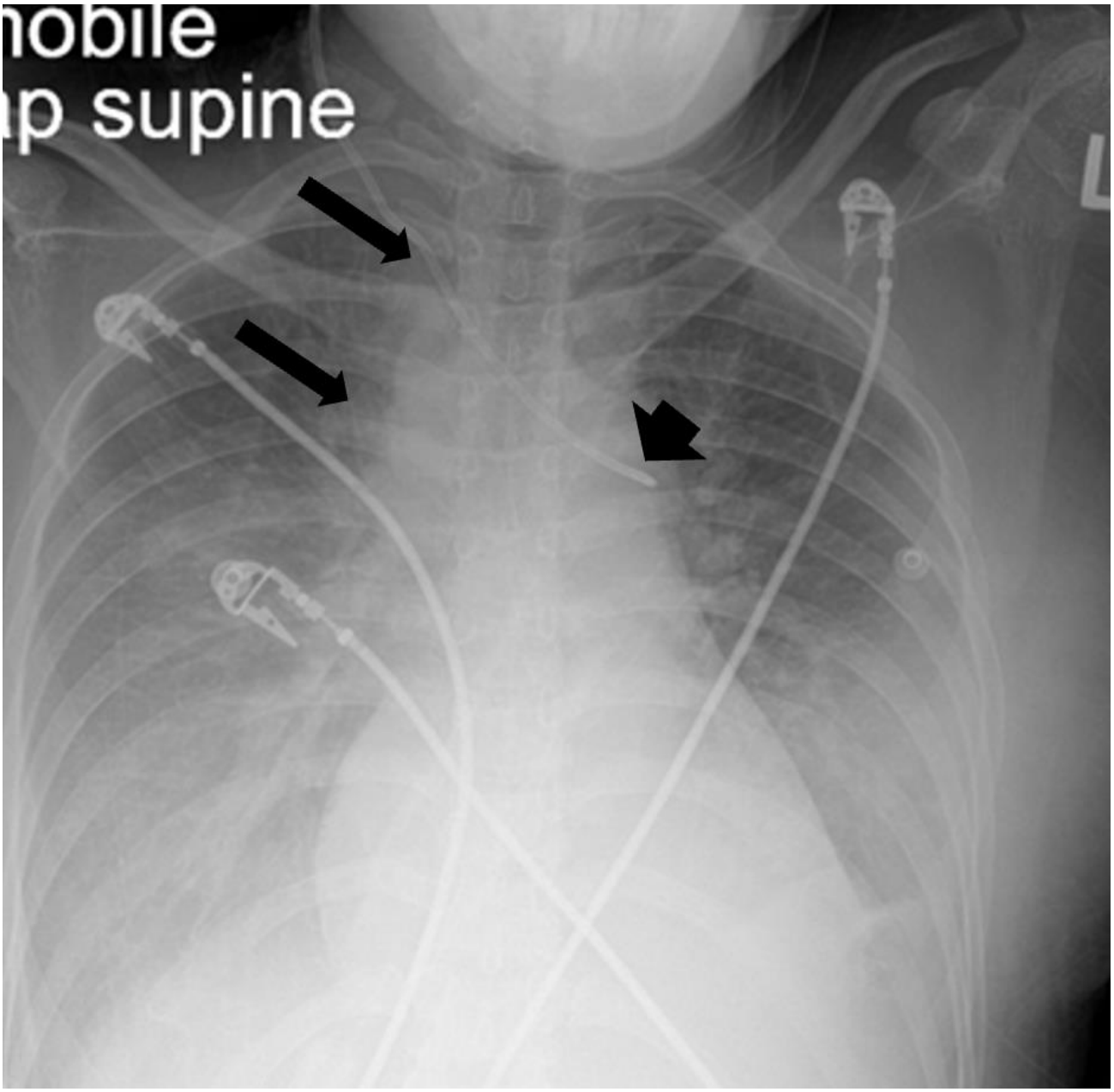

Figure 1: Moderate upper mediastinal haematoma (black long arrow). Tip of the TLCVC is located at the arch of aorta (black arrowhead).

Figure 2: Blank arrows showing the inadvertent TLCVC

The patient remained stable in ICU. The endovascular treatment was considered. The initial plan was to seal the arterial puncture site with a vascular closing device (8 Fr angio-seal VIP-Terumo). The procedure was done under local anaesthesia. The patency of right internal cerebral artery and the right vertebral artery were first checked by cerebral angiogram through the femoral sheath (Figure 3). A 6Fr guiding sheath (Teleflex Arrow) was left at the right brachiocephalic artery. The aim of this guiding sheath is to facilitate balloon inflation. A 260cm 0.035" inch guide wire was also left with its tip at the right axillary artery. This was to ease the catheterization of the endovascular balloon device if the vascular closure device failed. This endovascular balloon will function as a tamponade.

Figure 3: The right subclavian artery, the right vertebral artery and their branches were patent (Angiographic run prior to removal of TLCVC). Note the angulation of TLCVC that caused the failure of the angio-seal VIP device insertion.

Step by step narrative:

A 0.035" guide wire was then inserted through the central lumen of the inadvertent TLCVC. The guide wire tip was placed in the arch of the aorta to ensure that there is enough length of the guide wire during exchange with the angio-seal locator system. The TLCVC was then removed. This was done quickly with external compression of the site of puncture. The angio-seal insertion sheath was inserted first; followed by the arteriotomy locator device. These 2 components were successfully placed within the artery, the arteriotomy locator and guide wire were removed whilst holding the angioseal introducer.

The angio-seal VIP device was subsequently inserted into the sheath hub, however the operator was not able to advance the device further to its full length. During the struggle, the operator accidently dislodged the sheath hub and the partially inserted angio-seal VIP assembly from the intended arterial puncture site. The operator immediately did manual local compression to the neck. An angiographic run was done during the chaotic moment through the 6Fr guiding sheath that showed a massive contrast leakage from the TLCVC arterial puncture site at the right subclavian artery (Figure 4).

Figure 4: Angiographic run showed massive contrast leakage from the puncture site at the right subclavian artery (white arrow).

A balloon sized 8mm x 40mm was immediately inserted and inflated at the site of the proximal right subclavian artery (arterial puncture site). The balloon acted as a tamponade to reduce extravasation thus promoting haemostasis (Figure 5). Inflation and deflation of the balloon at the intended area and angiographic run were done several times. The last angiographic run showed there was no more contrast leakage seen from the inadvertent arterial TLCVC puncture site.

Figure 5: shows endovascular balloon inflation at the site of leakage.

The femoral sheath was left in situ and secured with Tegaderm in preparation of a re-bleeding event. The patient was stable throughout the procedure. Patient only complained of pain in the right neck region during the manual compression. She was closely monitored in the intensive care unit and discharged to the general ward after 2 days.

DISCUSSION

Catheter-related cervicothoracic arterial injury is a known complication related to central venous catheter insertion. However, currently there are no definite guidelines on handling accidental large-bore arterial cannulation. Generally, the management may include removal and manual external compression, endovascular intervention or surgical exploration. Simply removing the inadvertent TLCVC followed by immediate local manual compression technique has a relatively high morbidity rate. The complications that may occur with this simple technique are airway obstruction due to haematoma, stroke and pseudoaneurysm. Surgery is the gold standard with a higher success rate; however, exploratory neck surgery is an invasive procedure.

Endovascular arterial plug serves as an alternative approach in such cases. Using the advantage of the mechanical seal of copolymer anchor and collagen sponge to close the accidental

arteriotomy site. The seal is held securely in place by a self-tightening suture. All these mechanical parts will be absorbed within 90 days. The Angioseal device is meant to be used as an arterial closure at the femoral artery. The usage of this device on other than the femoral artery is termed as off-label use.

The failure of this device in our case is probably due to acute angulation of the inadvertent puncture tract. This acute angulation caused the angioseal introducer sheath to bend thus preventing the angioseal device to be locked in the designated position as shown in Figure 3.

It was reported that arterial closure device failed in 4.9% of cases. Minor complications such as recurrent wound bleeding or hematoma were also reported to be 3.8%. (1,2,3). Variables such as obesity, emergency procedure, and short neck pose higher risk for failure (4,5,6,7).

CONCLUSION

This case report is done to highlight a simple algorithm in managing iatrogenic triple lumen central venous catheter (TLCVC) arterial puncture, in which intra-arterial balloon tamponade and external compression are applied simultaneously.

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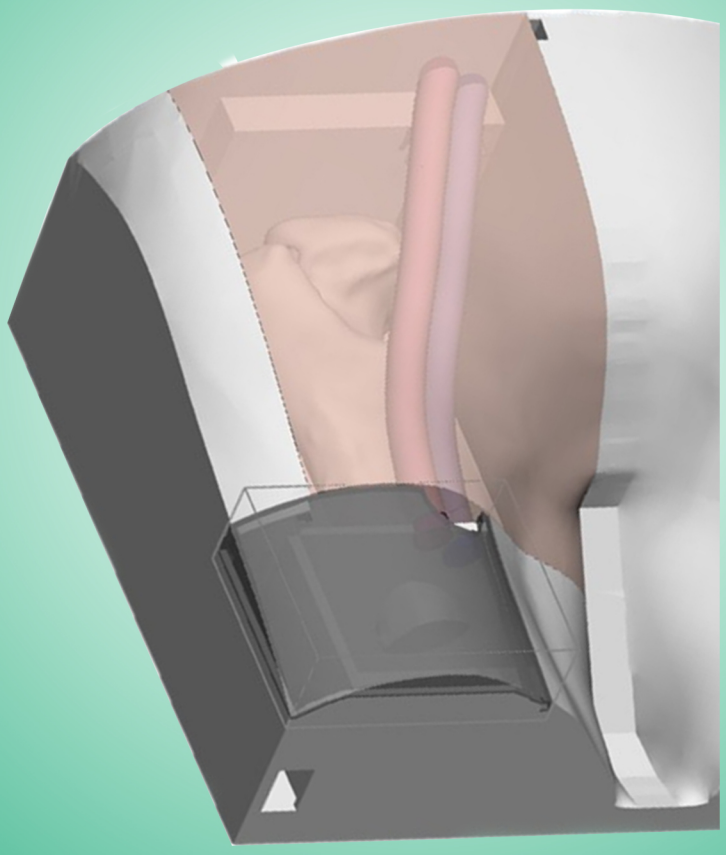
FEMORAL ACCESS TRAINING INTERVENTION

Ultrasound guided simulation of femoral access management in just mobile femoral casing.



A non-complicated design with replaceable puncture site and anatomically accurate features including the femoral bone, femoral artery & femoral vein.

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