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EFFECTIVENESS OF INTEGRATED PROPHYLACTIC ANTIBIOTICS PRESCRIPTION IN PATIENTS UNDERGOING RADIOFREQUENCY AND MICROWAVE ABLATION OF LIVER TUMORS: A RETROSPECTIVE COHORT STUDY

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ABSTRACT:
An institutionalised in-house antibiotic prophylaxis (AP) guideline was developed in May 2019 to standardize AP prescription. This retrospective cohort study evaluated the effectiveness and clinical outcomes of the newly launched AP guideline on patients undergoing radiofrequency (RFA) and microwave (MWA) ablation of the liver from November 2018 to March 2020. Patients without high risk of biliary tree contamination were recommended a single dose of 2g IV cefazolin (or 600mg IV clindamycin in cases of beta-lactam allergy). Univariate analysis was conducted to evaluate the clinical outcomes.

The study included 87 patients who underwent 93 procedures consisting of 18 RFAs and 75 MWAs for liver tumours. Concordance with AP guidelines improved significantly (38.5% vs. 87.0%; $p<0.001$). There were no ablation-related infections and mortality within 30 days post-ablation, and post-procedural nausea and vomiting were significantly reduced (15.4% vs. 1.9%; $p=0.020$). No significant difference in post-procedural fever (7.7% vs. 5.6%; p-value=0.693), chest and/or abdominal pain (5.1% vs. 7.4%; $p=1.000$) were noted.

The newly implemented in-house antibiotic prophylaxis guideline streamlined AP prescribing in patients undergoing RFA and MWA. Additional research is needed to determine the effects on infection and mortality in patients with high-risk factors such as bile duct stents, sphincterotomies, and biliary-enteric anastomoses.

Keywords: Liver tumours, antibiotic prophylaxis, radiofrequency ablation, microwave ablation

INTRODUCTION

Over the past 3 decades, percutaneous hyperthermic ablation gained acceptance as the treatment of choice for patients with unresectable primary hepatocellular carcinoma (HCC) or liver metastases secondary to carcinoma due to its low morbidity rates(1). Radiofrequency and microwave ablations are hyperthermal ablation methods often associated with oncological applications; while other methods include laser and ultrasound(2). Radiofrequency ablation (RFA) creates coagulative necrosis by current-induced ionic friction in tissue that occurs at the targeted tumour and surrounding hepatic parenchyma(3), while microwave ablation (MWA) causes coagulative necrosis leveraging on the electromagnetic field to agitate water molecules(4). MWA is sometimes chosen as a favourable alternative to RFA for several reasons: it can achieve higher intra-tumoral temperatures to treat multiple lesions simultaneously, has no need for grounding pads, less susceptibility to the sink phenomenon, ability to work on larger ablation zones with shorter ablation times and possibly better local tumour control(5).

By inoculating the bloodstream or causing post-ablative tissue necrosis, hyperthermal ablation procedures are associated with the risk of infection(6). Similar rates of liver abscesses are observed in the RFA(1.8%) and MWA(1.6%) groups(7). The presence of biliary-enteric anastomoses, sphincterotomies, and bile duct stents can lead to contamination of the biliary tree, putting patients at high risk of infection(8). There has been no evidence that antibiotic prophylaxis is beneficial without these high-risk factors(9), but international guidelines for percutaneous interventional radiology recommend it due to the potential bacterial seeding in necrotic tissue(10). Antibiotics were prescribed in a heterogeneous manner to patients undergoing liver ablation. In May 2019, AP prescription guideline was standardised based on published evidence and international guidelines, following discussions with the Department of Vascular and Interventional Radiology (DVIR) and antimicrobial stewardship unit.

The primary objective of this retrospective cohort study was to determine the compliance with the new DVIR antibiotic prophylaxis recommendation, before and after implementation, and the effect that the new guideline has on patient outcomes. The secondary objective assessed the safety of the current antibiotic prophylaxis regimen to determine the need to revise the guidelines and improve antibiotic prophylaxis prescription.

METHODOLOGY

Study Population and Design

This was a retrospective review of the compliance and clinical effects of the newly implemented in-house DVIR antibiotic prophylaxis guideline in May 2019 for RFA and MWA. Duration of post-procedural AP was considered compliant if it was prolonged due to suspicion of infection. In the implementation period, measures were taken to improve the prescription of APs. In July 2019, a Computerised Decision Support System (CDSS) enhancement was introduced to aid doctors with AP prescriptions, and an internal roadshow was held in September 2019 to increase awareness of the new guideline and CDSS. An analysis of AP prescription implementation pre- and post-implementation periods from November 2018 to April 2019 and October 2019 to March 2020 respectively was conducted for this study.

Inclusion and Exclusion Criteria

All patients above the age of 21 who underwent imaging-guided RFA and MWA within the study period were included. Patients with either an infection or suspected to have an infection before the IR procedure, who were being treated with antibiotics not intended for prophylaxis prior to the procedure, who had DVIR procedures in conjunction with other surgical procedures, or who

had incomplete documentation of antibiotics, were excluded from the study.

Antibiotic Prophylaxis

2g of intravenous cefazolin was given prophylactically to all patients for its Gram-positive coverage for skin commensals such as *Staphylococcal and Streptococcal organisms* to reduce post-procedural infections(11). No oral or intravenous antibiotics were prescribed post-operatively. For patients with severe beta-lactam allergies, 600mg of intravenous clindamycin was prescribed; patients with high-risk factors received 1.2g of intravenous co-amoxiclav before the procedure, and 1g twice daily for five days following the procedure due to a greater risk of reflux cholangitis(12).

Data collection

Data was extracted from electronic medical records. All percutaneous liver ablation procedures were guided by computed tomography (CT), and their reports were stored electronically. Patient demographics and clinical characteristics collected included age, gender, weight, past medical history, hyperthermic ablation modality, number of tumour(s), maximum diameter of each tumour, prophylactic antibiotics regimen administered, and clinical and laboratory data for inflammatory markers.

Data Analysis

Univariate data analysis was performed using IBM SPSS 26.0 software package (SPSS, Inc., Chicago, IL, USA). Continuous variables were checked for normality using the Shapiro-Wilk test and analysed with the independent t-test. Categorical discrete variables were analysed using the Chi-squared ($\chi 2$) test or Fischer's exact test, where appropriate. All tests for significance were 2-tailed, and $p<0.05$ indicates statistical significance.

RESULTS

Demographics and clinical characteristics

We retrospectively analysed the data of 147 cases of RFA and MWA procedures during the study period. After applying the exclusion criteria, a total of 54 patients were excluded, including 4 patients who were on antibiotics treatment not intended for prophylaxis prior to the procedures, 11 patients who underwent ablation concurrently with other surgical procedures, and 39 patients who had incomplete documentation of the antibiotics prescribed (Figure 1). In total, 87 patients were included in this study. They underwent a total of 93 procedures, including 18 RFA and 75 MWA for 83 (89.2%) hepatocellular carcinomas, 9 (9.7%) liver metastases and 1 (1.1%) liver adenoma. Within the 93 cases of ablation, 70 (75.3%) had one tumour, 19 (20.4%) had two tumours and 4 (4.3%) had three tumours. Among these, 6 (6.90%) patients had undergone ablation twice, and 1 (1.1%) had high-risk factors of biliary-enteric anastomosis. The demographics and tumour characteristics of the two groups of ablation cases between pre-implementation (n=39) and post-implementation (n=54) are summarised in Figure 1. In terms of age, weight, gender, race, methicillin-resistant *Staphylococcus aureus* (MRSA) colonisation, prominent drug and past medical histories, no significant differences were observed between the two groups (Table 1).

Compliance to antibiotics prescribing

Types of AP prescribed to the patients and their compliance with the guidelines are shown in Table 2. Among patients who had their antibiotics regimen extended beyond the procedure (5 pre-implementation and 4 post-implementation), the duration of antibiotics prescribed was not significantly different between the 2 phases [6.4 ± 3.4 days (n=5) vs 7.3 ± 4.1 days (n=4), p=0.729]. Antibiotics prescription was prolonged for 2 (2.2%) patients who had suspected infections of unknown origin, 1 (1.1%) patient who had variceal bleeding, 1 (1.1%) patient who had hospital-acquired pneumonia, and 5 (5.4%) patients without any identified reason. In the post-implementation group, 44 patients (97.8%) followed the guidelines of 2g IV cefazolin,

markedly higher as compared to 12 patients (40.0%) in the pre-implementation group. Compliance with AP guidelines improved significantly (38.5% vs 87.0%; p<0.001); choice of antibiotics selected was more aligned with the guidelines post-implementation (43.6% vs 90.7%; p<0.001) but duration compliance was not significantly different (92.3% vs. 96.3%; p=0.646).

Clinical outcomes

Post-ablative symptoms, including fever, nausea, vomiting, chest pain, and abdominal pain within seven days of the procedure, as shown in Table 3. There was a significant decrease in post-procedural nausea and/or vomiting (15.4% vs. 6.4%; p-value=0.020). No readmissions or deaths related to RFA or MWA infections were identified within 30 days. There were no significant effects on post-procedural fever (7.7% vs. 5.6%; p-value=0.693), chest and/or abdominal pain (5.1% vs. 7.4%; p-value=1.000) or post-procedural hospitalisation stay in hospital (1.9 ± 1.4 days vs. 1.6 ± 1.4 days; p-value=0.372). Among patients with post-ablative symptoms (n=16), 4 (25%) patients had pro-calcitonin measured post-ablation, and none were elevated. Patient outcomes were not adversely affected.

DISCUSSION

There was a significant improvement in compliance with the standardised AP prescription guideline for RFA and MWA procedures. 87% of the patients were prescribed the appropriate choice of AP with the correct duration of prophylaxis, as compared to 38.5% before the implementation of the guideline. The significant increase in compliance of the new AP guidelines resulted in improved homogeneity of prescriptions for patients undergoing RFA and MWA from ceftriaxone and metronidazole to cefazolin. No significant clinical difference noted between both groups regarding clinical outcomes. No ablation-related infections or deaths were reported, and two (33.3%) of the re-admissions in the post-implementation group were due to post-ablation syndrome.

Infections of the surgical site are a leading cause of postoperative morbidity and mortality, considerably increasing the duration of hospitalisation and the cost of postoperative care(13). To decrease the likelihood of surgical site infections, timely administration of antibiotics perioperatively to establish adequate tissue and serum levels of antibiotics is vital(14). However, AP must be stopped within 24 hours of the procedure to prevent the emergence of resistant bacteria(15). Ceftriaxone and metronidazole were commonly used antibiotics, likely due to their indications extending to intra-abdominal infections(16). Even so, third-generation cephalosporins such as ceftriaxone can increase selection pressure for resistant bacteria with extended-spectrum beta-lactamase (ESBL) or AmpC beta-lactamase strains(17). Third-generation cephalosporins are also related to higher risks of *Clostridioides difficile* infection compared to narrow-spectrum first-generation cephalosporins such as cefazolin(18). While cefazolin has lesser gram-negative coverage (19), its ability to affect the skin flora has made it a desirable antibiotic due to the percutaneous nature of RFAs and MWAs(20).

Among the major complications associated with hyperthermic ablation, hepatic abscesses were the most significant infective complication reported in the literature (0.66%)(21). Symptoms include abdominal pain, fever, nausea, and vomiting, which can be fatal if left untreated(22). Level of serum procalcitonin (PCT) was tracked due to its specificity for bacterial infection(23) compared to levels of serum white blood cell count or C-reactive protein, which could be raised due to a systemic inflammatory response elicited by liver ablation procedures (24). It is important to note that symptoms of post-ablation syndrome often resemble those of post-ablation infection; consequently, further clinic imaging and laboratory testing are necessary for its

diagnosis(25). Our study showed no concurrent increase in serum PCT and positive blood cultures suggestive of infective complications in patients with post-ablation clinical symptoms. The newly implemented AP guidelines used in hyperthermal liver ablations did not adversely affect patient outcomes, and no liver abscesses or deaths resulted from the procedure. All patients who experienced clinical symptoms were discharged after close monitoring, and recoveries were uneventful.

There was a significant decrease in post-procedural nausea and vomiting in patients. One possible reason could be due to the choice of antibiotics used. Metronidazole was used commonly in conjunction with ceftriaxone prior to the implementation of AP guidelines. Since metronidazole is associated with a higher rate of nausea and vomiting (10-12%)(26) compared to cephalosporins (<4%)(27), omitting metronidazole from the new guidelines may have contributed to the reduction in incidences of post-ablation nausea and vomiting. Furthermore, combination antibiotics can increase the likelihood of adverse reactions (28).

This study had several limitations. Firstly, this was a retrospective study with a small sample size. Clinically significant conclusions about the effects of the newly implemented AP guidelines on post-ablation infection or mortality could not be drawn based on the small number of patients (n=87) included in the study. Secondly, a considerable number of patients were excluded due to incomplete documentation of the AP prescribed (n=39). Lastly, there was no standardisation in the measurement of laboratory data for inflammatory markers to trend baseline levels to that after ablation procedures in patients with suspected infections. It limited the parameters to analyse clinical outcomes of AP on post-ablative RFA or MWA.

CONCLUSION

Overall, the newly implemented in-house multipronged approach DVIR antibiotic prophylaxis guideline supplemented by electronic prescriptions and documentation improved AP prescribing in patients undergoing RFA and MWA. In the long run, maintaining ease of use and efficiency without compromising effectiveness is vital for sustaining the guidelines(29). There were no adverse effects in safety outcomes following single-dose IV cefazolin prophylaxis for RFA and MWA, and post-procedural nausea and vomiting associated with antibiotic use were reduced.

ETHICS

This retrospective study was approved by the ethics committee in the institution. Centralised Institutional Review Board (IRB) approval was sought (CIRB Ref. No. 2020/3142) and consent from participants was exempted.

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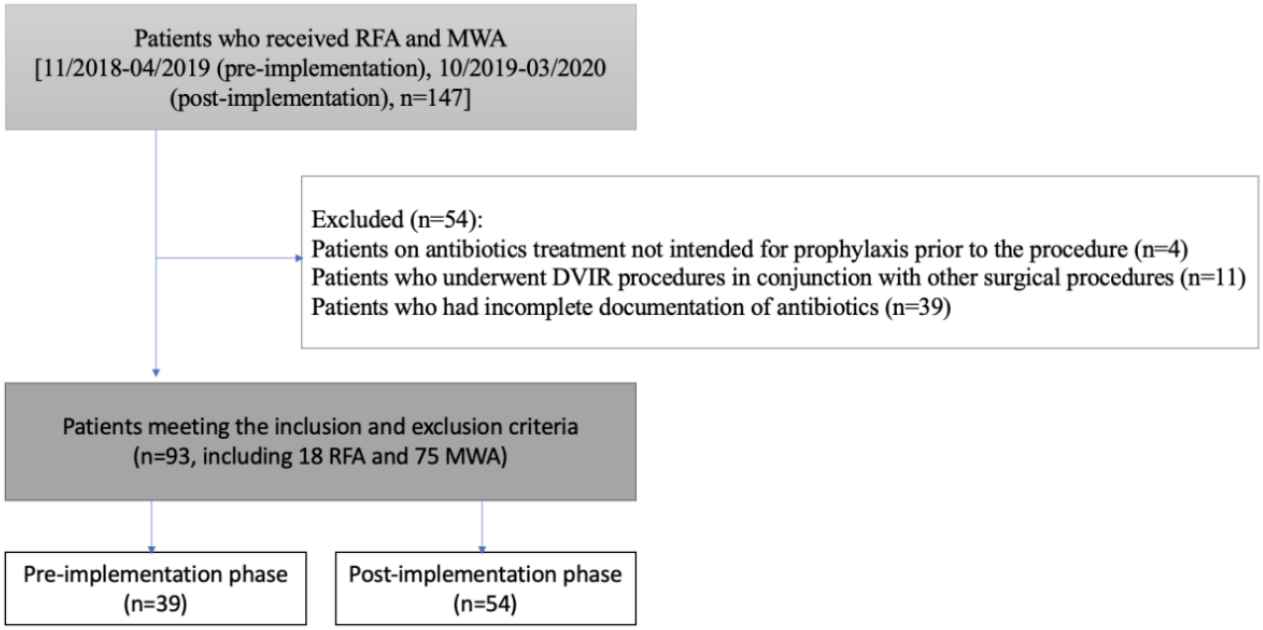
FIGURE LEGENDS:



RFA: Radiofrequency ablation; MWA: Microwave ablation; DVIR: Department of Vascular and Interventional Radiology

Figure 1: Flow diagram of study design

TABLE LEGENDS:

Table 1: Patient demographics and clinical characteristics

	Pre-implementation (n=39)	Post-implementation (n=54)	p-value
Age* (years)	69.5 ± 10.2	70.3 ± 9.9	0.698
Weight* (kg)	66.6 ± 13.2	66.6 ± 13.0	0.992
Gender (Male)	26 (66.7%)	39 (72.2%)	0.564
Race			0.838
Chinese	33 (84.6%)	45 (83.3%)	
Malay	2 (5.1%)	3 (5.6%)	
Indian	0 (0.0%)	1 (1.9%)	
Others	4 (10.3%)	5 (9.3%)	
Number of liver tumours per patient			0.086
Patients with one tumour	25 (64.1%)	45 (83.3%)	
Patients with two tumours	11 (28.2%)	8 (14.8%)	
Patients with three tumours	3 (7.7%)	1 (1.9%)	
Average of maximum diameter of liver tumour* (cm)	1.7 ± 0.7	1.6 ± 0.7	0.924
Diagnosis			0.302
Primary HCC	37 (94.9%)	46 (85.2%)	
Liver metastasis	2 (5.1%)	7 (13.0%)	
Liver adenoma	0 (0.0%)	1 (1.9%)	
Procedure done			0.810
MWA	31 (79.5%)	44 (81.5%)	
RFA	8 (20.5%)	10 (18.5%)	
Beta-Lactam allergy	8 (20.5%)	8 (14.8%)	0.472
Presence of high-risk factors	0 (0.0%)	1 (1.9%)	1.000
MRSA screen positive	2 (5.1%)	0 (0.0%)	0.173
Diabetes Mellitus	21 (53.8%)	32 (59.3%)	0.603
Chronic Kidney Disease	3 (7.7%)	5 (9.3%)	1.000
Chemotherapy in the past 30 days	0 (0.0%)	1 (1.9%)	1.000
History of TACE	6 (15.4%)	12 (22.2%)	0.410

*Data presented as mean ± standard deviation. HCC: hepatocellular carcinoma; MWA: microwave ablation; RFA: radiofrequency ablation; MRSA: methicillin-resistant *Staphylococcus aureus*; TACE: Transcatheter arterial chemoembolization

Table 2: AP prescription and compliance before and after implementation of AP guidelines

	Pre-implementation (n=39)	Post-implementation (n=54)	p-value
Patients with no MRSA, high-risk factors or beta-lactam allergy	30	45	<0.001
Cefazolin	12 (40.0%)	44 (97.8%)	
Ceftriaxone/Metronidazole	17 (56.7%)	0 (0.0%)	
Clindamycin	0 (0.0%)	1 (2.2%)	
Cefazolin/Metronidazole	1 (3.3%)	0 (0.0%)	
Patients with beta-lactam allergy ± positive MRSA	8	8	0.572
Clindamycin	5 (62.5%)	5 (62.5%)	
Ciprofloxacin/Metronidazole	2 (25.0%)	2 (25%)	
Ceftriaxone/Metronidazole	1 (12.5%)	0 (0.0%)	
Clindamycin/Metronidazole	0 (0.0%)	1 (12.5%)	
Patients with positive MRSA only	1	0	-
Cefazolin	1 (100%)	-	
Patients with high-risk factors only	0	1	-
Cefazolin	-	1 (100%)	
Compliance with AP choice	17 (43.6%)	49 (90.7%)	<0.001
Compliance with duration	36 (92.3%)	52 (96.3%)	0.646
Overall compliance with guideline	15 (38.5%)	47 (87.0%)	<0.001
Duration of extended antibiotics* (days)	6.4 ± 3.4	7.3 ± 4.1	0.729

*Data was analysed in 5 patients in the pre-implementation phase and 4 patients in the post-implementation phase; 4 (44.4%) patients with extended antibiotics were considered compliant to duration due to suspicion of infection. Data presented as mean ± standard deviation; MRSA: methicillin-resistant *Staphylococcus aureus*; AP: Antibiotics prophylaxis

Table 3: Comparison of post-RFA/MWA clinical outcomes

	Pre-implementation (n=39)	Post-implementation (n=54)	p-value
Fever (>38°C)	3 (7.7%)	3 (5.6%)	0.693
Nausea and/or Vomiting	6 (15.4%)	1 (1.9%)	0.020
Chest and/or Abdominal Pain	2 (5.1%)	4 (7.4%)	1.000
Post-procedure Hospitalization* (days)	1.9 ± 1.4	1.6 ± 1.4	0.372
30-day Re-admission	1	6	0.232
Post-ablation syndrome	0	2 (33.3%)	
Elective Admission	1 (100%)	0	
Other conditions	0	4 (66.7%)	
30-day Ablation-related Infection	0	0	-
30-day Ablation-related Death	0	0	-

*Data presented as mean ± standard deviation.

MALEFICIENT'S HORN LIKE APPEARANCE MYXOMATOUS FUSIFORM ANEURYSM OF THE RIGHT MIDDLE CEREBRAL ARTERY: AN EVIL CAUSED BY THE ATRIAL MYXOMA

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ABSTRACT:
Atrial myxoma is the most common neoplasm of the heart which consist of 50% of the total cases reported and tend to seed peripherally after operation(1). When the dissemination occurred in the brain, patient normally presented with stroke symptoms due to tumour embolism. However, cerebral aneurysm due to metastatic deposit after atrial myxoma incision is rare.

In a study by M. Anvari et al showed that the most common presentation of atrial myxoma is shortness of breath (63%), followed by chest pain (37%) and neurological symptoms, which is mostly related to stroke (26%)(2). In some cases, patient presented with constitutional symptoms like loss of weigh and appetite and some with anaemic symptoms(2). Size of the lesion mainly related to the local symptoms due obstruction of the blood flow in the heart, but the rate of dissemination is depending on the mobility of the lesion(3). Histologically, mayo clinic has divided the tumour based on its gross anatomy into solid and papillary type. The solid type is normally larger and causing obstructive symptoms, however papillary type is the one that tends to embolise peripherally(4).

Atrial myxoma can be diagnosed by echocardiogram and mostly located within the left atrium, specifically within the fossa ovalis in 75% of the cases (3). In some cases, MRI is needed to confirm the diagnosis because sometimes thrombus, vegetation or primary lymphoma of the heart might mimic the tumour. In a case of brain dissemination, the stroke due to embolization can be detected via plain CT brain as it will show multifocal infarction predominantly at the cortimedullary junction which is not specific to the arterial territory. As the dissemination occurred at the vessel wall, it can lead to aneurysm formation which can be detected by plain CT brain and confirmed by MRI or cerebral angiogram. We are reporting a case of multiple fusiform cerebral aneurysm 9 years after left atrial myxoma operation.

Keywords: Cerebral artery aneurysm, atrial myxoma

CASE REPORT

This is a case of 53 years old lady with previous history of stroke in 2011. She regained full neurological resolution after 1 year of rehabilitation. Echocardiogram done after 1 month noted left atrial myxoma and confirmed by CT pulmonary artery. CTPA shows large hypodense mass occupying the left atrium measuring 4.5 x 4.3 x 4.7cm (AP x W x CC) causing left atrial dilatation and significant narrowing of mitral valve opening (Figure 1). The mass is successfully operated, and patient recovered very well after that.

She presented again 8 years later with intermittent right upper limb numbness associated with headache. Otherwise, there was no weakness, nausea or vomiting and no constitutional symptoms. On examination, power is normal bilateral upper and lower limb, normal reflex and negative cerebellar sign. Plain CT brain showed hyperdense tubular structure at the right sylvian fissure and left ambient fissure with multiple calcifications in the brain. MRI brain was ordered and demonstrated multiple fusiform aneurysms involving right MCA and left PCA.

Patient was then subjected for cerebral angiogram to confirm the diagnosis. Cerebral angiogram which was done 1 month after that showed 2 fusiform aneurysms located at the distal M1 segment of right MCA and P2 segment of left PCA. No contrast blush seen. Patient was stable throughout the procedure. Case was discussed in Neurology conference with primary team and decided for conservative management.

DISCUSSION

Atrial myxoma is a benign cardiac tumour which tend to cause peripheral embolism. Normally, the diagnosis was made either as a sequel of embolization phenomenon in the brain or due to local effect within the heart. Systemic embolization to the brain is normally associated with stroke, however aneurysm is also reported but rare. In this patient, the development of multiple cerebral aneurysms occurred after 9 years of operation.

Even though the actual relationship of atrial myxoma and cerebral aneurysm is not fully understood, few theories were suggested for the formation of fusiform aneurysm in the brain. The first theory is due to embolization of the myxomatous cell to the intracranial vasculature that led to inflammation and subsequently scarring. This leads to hemodynamic changes and pseudoaneurysm formation in a later life. This change occurred slowly over times. In this patient, she developed fusiform cerebral aneurysm only after 9 years of atrial myxoma incision (5).

Second theory is due to infiltration of the vasa vasorum of the intracranial artery by the embolised tumour, thereby destroying the architecture of arterial walls. This is however not really accepted as intracranial artery lack of vasa vasorum as compared to extracranial artery, however it can be seen with the presence of artherssclerotic plaque(6). In fact, there is no report that showing extracranial artery involvement in the case of disseminated atrial myxoma.

The myxomatous aneurysm can be fusiform or saccular, however in Sabolek M et al, 91% of the aneurysm are found to be fusiform (7), as seen in our patient. Intracranial arteries that are commonly involved based on frequency are middle cerebral artery (74.2%) with slight laterality toward the right side, followed by anterior cerebral artery (13%), cerebellar arteries (7%), posterior cerebral artery (5%) and the least is basilar artery (1%) (7). Most of the reported case shows that the aneurysm normally located within the distal branches of the vessel(3). In our case, the right MCA aneurysm located at the distal M1 and PCA aneurysm at the distal P3 segments.

Another theory is due to overproduction of interleukin 6 within the tumour itself lead to inflammatory infiltration of the cerebral vessel wall and formation of aneurysm as described by Koo et al(8). He suggested that IL-6 may promote

invasion of myxomatous cells which can degrade the extracellular matrix as well as the wall integrity. Hence, the level of IL-6 serum can be used to monitor the time course of aneurysm formation.

In terms of imaging, this saccular aneurysm can be seen in plain CT in which it will appears as hyperdense tubular structure normally within the fissure following course of the arteries. Sometimes it might be associated with calcifications as seen in our case. The hyperdensity is due to accumulation of myxoid matrix in the aneurysmal wall (1). In MRI, myxomatous aneurysm sometimes appears as flow void in T1W/T2W due to fast flow of blood within. Contrast enhancement may be seen as the result of enhancing tumoral tissue within the arterial wall(1).

Apart from that the macroscopic appearance of the atrial myxoma can also be evaluated to predict the possibility of tumoral embolization. M Anvari et al describe that papillary type has higher incidence of embolization compared to solid type(2). This is as a result of an irregular or friable villous surface of the tumour. In other had solid type is mainly associated with obstructive symptoms and less systemic embolization is observed.

In term of treatment, myxomatous aneurysm of the cerebral arteries is normally treated conservatively as normally it is fusiform in appearance without neck. However, there has been reported a case of saccular aneurysm of the PICA and coiling was successfully done(5). The theory that suggests tumour infiltration into the wall causing aneurysm led to question whether chemotherapy might be useful as a method of treatment. However, results of doxorubicin therapy were equivocal (4). Once the diagnosis of atrial myxoma is established, it should be completely removed because this will minimize the risk of tumour cell embolization or metastases, however it does not eliminate the risk of delayed aneurysm formation.

CONCLUSION

We concluded that even though histologically, atrial myxoma is a benign tumour, the consequences of the tumour embolized must be taken seriously which may lead to stroke or myxomatous aneurysm of the cerebral arteries. We suggest that monitoring of serum interleukin 6 after atrial myxoma operation is useful to detect any recurrence or cerebral arteries aneurysmal formation due to systemic emboli.

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FIGURE LEGENDS:

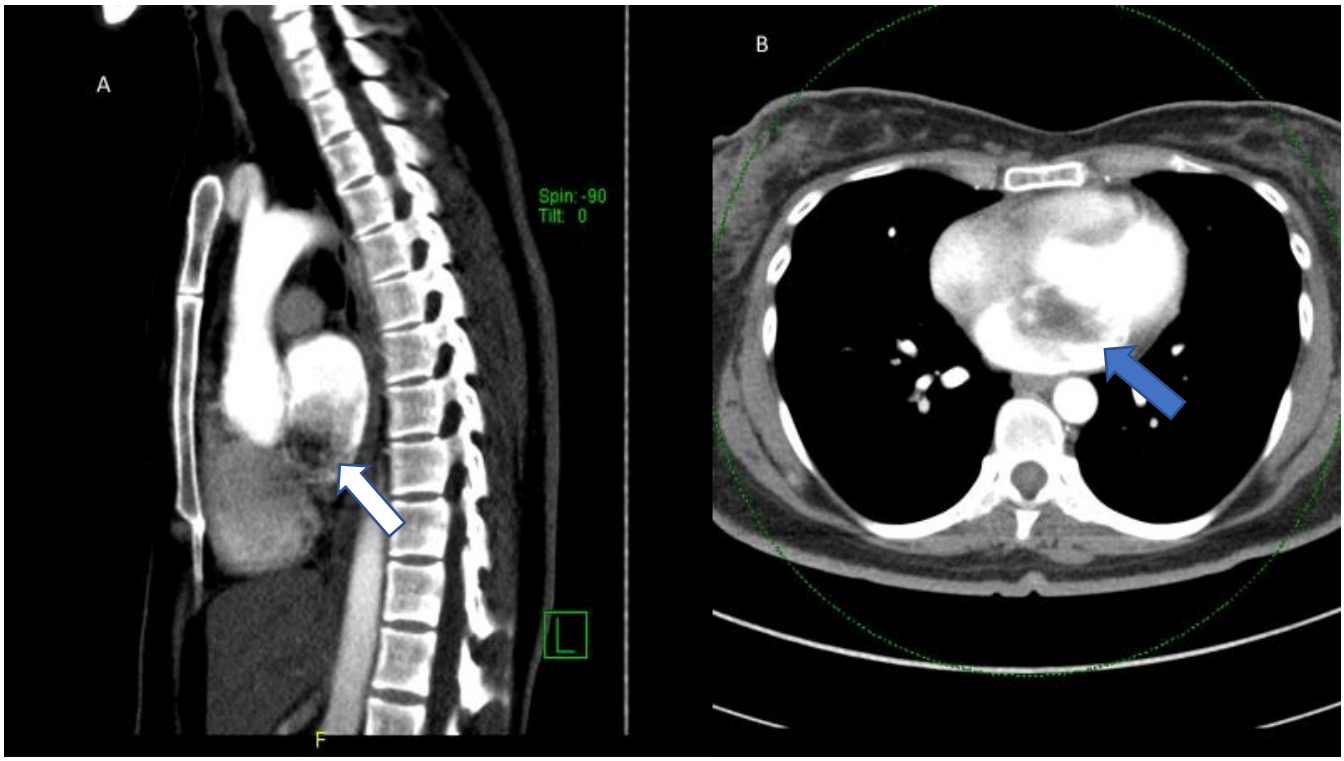

Figure 1A: Reconstructed sagittal image of CTPA showing hypodense mass at the right atrium occupying >50% of right atrial volume (white arrow). B: Axial images showing the mass in the left atrium causing left atrial dilatation and narrowing the left atrial outflow tract (blue arrow). This will lead to reduction of the left ventricular end diastolic volume and subsequently cardiac output.

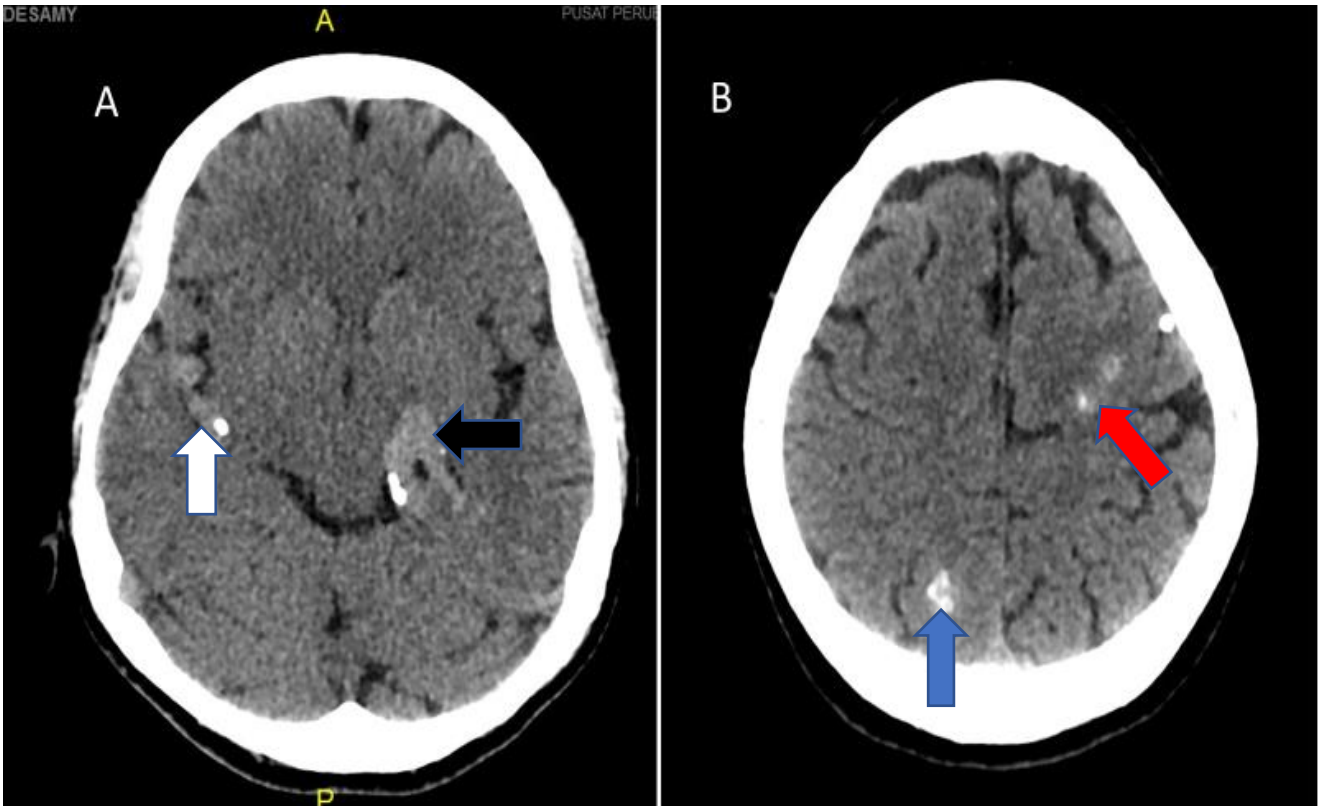

Figure 2A: Plain CT Brain in axial view noted hyperdense tubular lesion at the right sylvian fissure (white arrow) and left ambient cistern (black arrow) adjacent to the medial left temporal lobe associated with peripheral calcification. B: Scattered calcifications in both cerebral hemispheres involving right parietal (blue arrow) and left frontal lobe (red arrow).

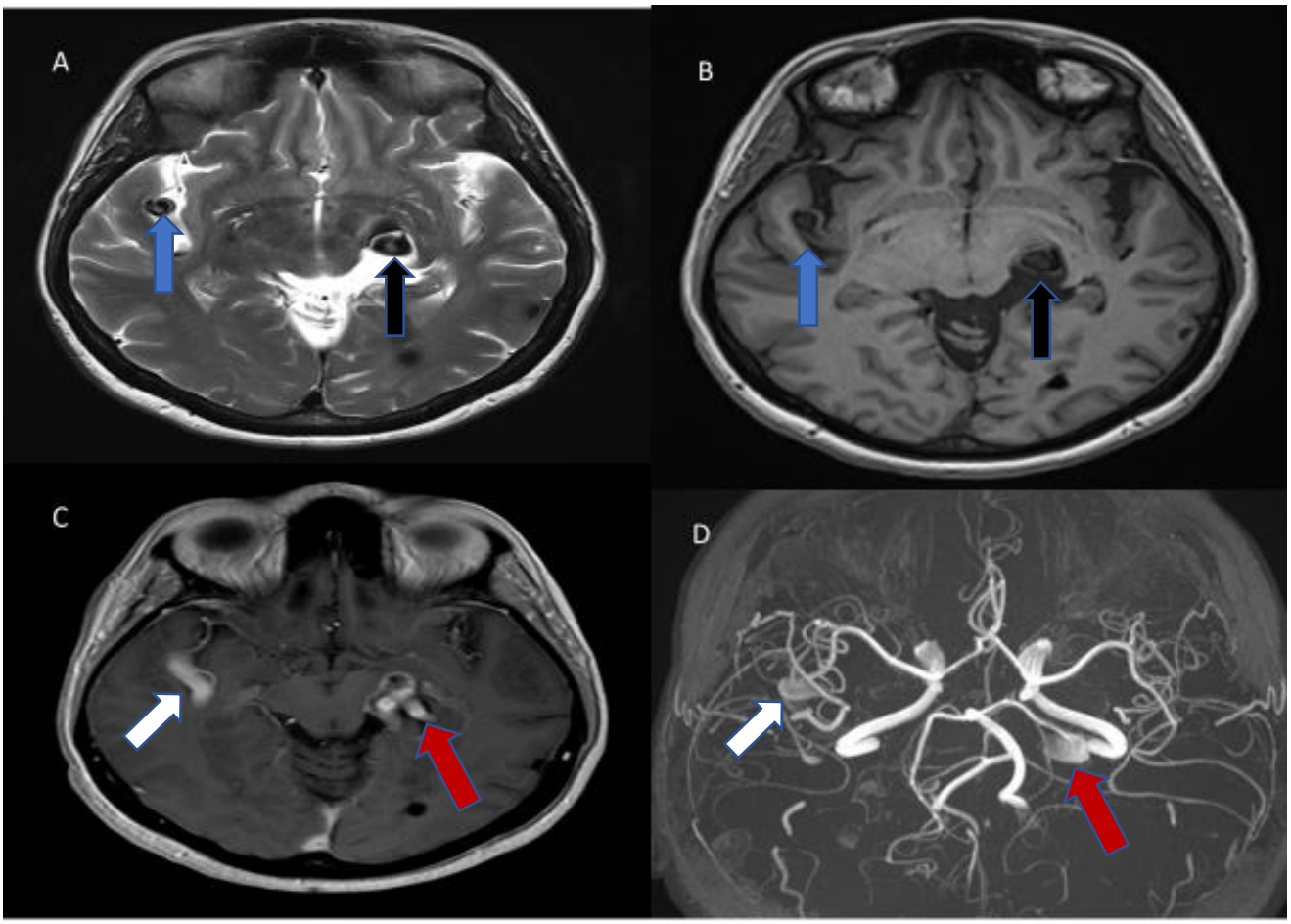

Figure 3: Axial images of MRI brain in T1W(A) and T2W(B) demonstrated signal void at the right sylvian fissure (black arrow) and left ambient cistern (blue arrow). There are also multiple blooming artefacts in SWI in keeping with calcifications as seen in previous CT scan. Figure 3C and 3D: MRA images demonstrated a large fusiform aneurysmal dilatation of M2 segment of right MCA within the right sylvian fissure (white arrow). There is also similar appearing fusiform aneurysm at the P2 segment of left PCA within the ambient cistern (red arrow). No evidence of thrombosis or restricted diffusion in DWI/ADC to suggest acute infarction.

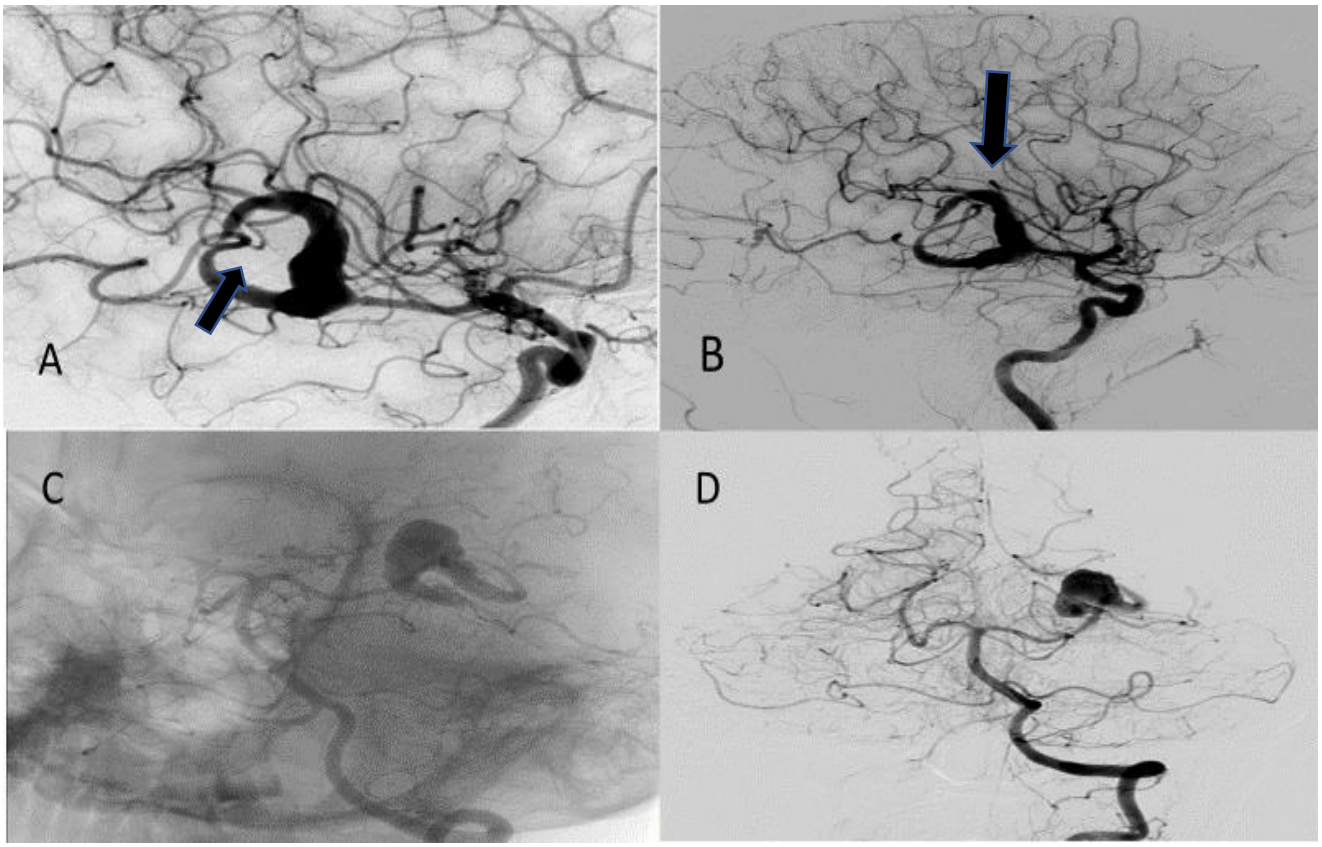

Figure 4A and B: DSA images of cerebral angiogram confirmed the presence of two fusiform aneurysm at the distal M1 segment of right MCA forming Maleficient's horn like appearance as seen in lateral oblique view and lateral view (Black arrow). Figure 4C and D: 3D reconstructed images and AP view DSA of vertebral artery showing smaller similar appearing aneurysm at P2 segment of left PCA.

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OP01

ENDOVASCULAR MANAGEMENT OF IATROGENIC BRACHIOCEPHALIC ARTERY INJURY USING BALLOON TAMPONADE

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Introduction: Arterial puncture is a recognized complication of central venous catheterization. Early recognition and aggressive management are vital in avoiding catastrophic complications. Several removal methods are available, and multiple factors must be considered for decision-making regarding catheter removal. We describe a case of an inadvertent central venous catheter into the brachiocephalic artery, which was successfully removed using a balloon tamponade method.

Report: A 41-year-old lady underwent a central venous catheter insertion and was complicated with iatrogenic brachiocephalic artery injury. She was then referred to interventional radiology for endovascular treatment and underwent balloon tamponade to remove the catheter. A balloon was placed in the subclavian/brachiocephalic artery prior to the catheter removal, and a series of inflations were performed afterward. The procedure was successful without any complications.

Conclusion: Inadvertent placement in the brachiocephalic artery is not common. Open repair and stenting are the methods of choice in treating this complication. Due to its location, pull and pressure technique may pose a danger as this vessel is not easily compressible. Balloon tamponade is a technique described for the management of posttraumatic arterial injuries. However, it has shown promising evidence in treating iatrogenic vascular injuries.

OP02

THE EFFECT OF EYE HEIGHTS ON THE ENTRANCE SURFACE DOSES (ESD) OF SKULL PHANTOMS AT THE RADIOLOGIST AND NURSE LOCATIONS IN PTBD PROCEDURE

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Introduction: Understanding the factors that affect the staff eye doses for those working in angiographic procedures is important. This research explored the effect of eye heights on the ESD measurements at the radiologist and nurse locations in the Percutaneous Transhepatic Biliary Drainage (PTBD) procedure.

Materials and Methods: An upper-body phantom simulating a patient (Kyoto Kagaku PBU-31) was exposed to X-ray radiation using a Siemens Artis Q angiographic system with technical factors for the PTBD procedure in three radiographic projections. The ESD was measured using the nanoDotTM optically stimulated luminescence dosimeters (OSLD) at four eye heights: 135, 145, 155 and 165 cm. Three regions on skull phantoms (simulated staff) were measured: the right and left eyes and the left outer canthus. The recorded radiation doses were read in mGy units and normalised to the dose area product (mGym2) of each exposure. Line graphs and scatter plots were used to analyse the results descriptively.

Results: In posteroanterior (PA) projection, the radiologist phantom had higher ESD values at 135 and 145 cm eye height but lower values at 155 and 165 cm compared to the nurse phantom. In the 25° right anterior oblique (RAO) position, the phantom nurse received higher eye doses than the radiologist phantom. The radiologist phantom's eyes were shielded by the flat panel detector (FD) at higher eye heights in PA projection and all eye heights in the 25° RAO position. However, the radiologist was not shielded and received higher eye doses in the 25° left anterior oblique (LAO) position. Besides, the left regions received higher doses than the right eye for the nurse phantom. There were also decreased eye doses with increased eye heights for both phantoms.

Conclusion: This study found that eye doses of staff are affected by the shielding provided by the FD, eye heights and location of the staff.

OP03

FISH BONE INJURY CAUSING TRAUMATIC ARTERIOVENOUS FISTULA, SUCCESSFULLY TREATED WITH EMBOLIZATION.

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Introduction: An arteriovenous fistula (AVF) is an abnormal direct communication between an artery and a vein, which leads to blood shunting between the two vessels. While some AVFs may be present at birth, many are commonly caused by iatrogenic as a result of increasing number of invasive medical procedures. Non-iatrogenic injuries from penetrating accidents that cause direct arterial trauma can also result in AVF formation. Non-iatrogenic traumatic arteriovenous fistula of the upper extremity is relatively uncommon. We report a case of fish bone injury causing non-iatrogenic traumatic arteriovenous fistula of the ulnar artery and ulnar vein which was successfully treated with embolization.

Materials and Method: 18 G branula, 5 Fr arterial sheath, 5 Fr vertebral catheter, Terumo 0.035' 150cm guidewire, Headway microcatheter 150cm, Boston Transend guidewire and Polidocanol injection.

Report: A 50 year old lady presented to the orthopaedic team with right hand pain and swelling after alleged fish bone puncture to her hand. The swelling at her hand was increasing in size and associated with pain. Her vital sign was stable. Her physical examination of right hand was erythematous swelling noted at the right hypothenar eminence with pulsation felt. MRI right hand shows well defined multilobulated subcutaneous lesion seen at the lateral (ulnar) aspect of the hypothenar eminence of the right hand at its palmar aspect. A diagnostic right upper limb angiogram done revealed highly vascularised lesion seen at the right hypothenar region, approximately measuring 1.9cm x 2.2cm (W x CC) with arterial supply likely from the common palmar digital arteries of the superficial palmar arch (from right ulnar artery). Its venous drainage is likely to the deep palmar venous arches and into the right ulnar vein. No real nidus is seen within the angiogram. After explaining the necessity of the procedure and obtaining the patient's informed consent, the embolization of right hand arteriovenous fistula was done by using polidocanol injection. The polidocanol injection was done through direct puncture at the lesion. Post embolization revealed absence of arteriovenous fistula from angiogram and procedure completed.

Conclusion: Arteriovenous fistulas are typically acquired lesions that lack a nidus discernible on vascular malformation imaging studies. Masses with arteriovenous fistula components, commonly encountered in clinical practice are frequently iatrogenic in origin resulting from prior surgical interventions or trauma. Polidocanol exhibits properties as sclerotherapy agent. Percutaneous embolization is a minimally invasive and efficacious alternative to open surgery for the treatment of AVF.

OP04

A 5 YEAR RETROSPECTIVE STUDY OF POST TRANSARTERIAL EMBOLIZATION FOR GASTROINTESTINAL BLEED IN UNIVERSITY MALAYA MEDICAL CENTRE, MALAYSIA

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Background: Transarterial embolization (TAE) is a minimal invasive treatment for gastrointestinal bleeding. There are limited data on the outcome of TAE in this region. We aimed to study the outcome of TAE. Factors associated with negative outcome (without clinical success), the technical success (cessation of bleeding after TAE) of the procedure itself and TAE associated complications were further evaluated.

Material and Methods: Total of 78 patients were analysed. Retrospective study of all patients who underwent TAE in University Malaya Medical Centre from 2017 to 2021 was conducted. 44 male and 34 female. Mean age was 66 years old. 62 procedures were for upper GI bleed and another 16 procedures were for lower GI bleed. Clinical success was defined as survival or no recurrent bleeding within 30 days.

Results: Technical success and clinical success were achieved in 93.6% and 65.4% of patients respectively. On univariate analysis, patients with coagulation disorders (66.7% vs 41.2%, p=0.032), bleeding from GDA (88.9% vs 68.6%, p=0.047), UGIB (92.6% vs 70.6%, p=0.037) and scope findings of high risk stigmata (77.8% vs 49.0%, p=0.014) were associated with a poor outcome.
On multivariate analysis, only coagulation disorders was found to be the predictive factor of poor outcome (OR 3.19, 95% CI 1.04-9.81, p=0.043). Major complications were detected in 3 out of 78 cases (3.9%) which included the GI perforation and GI ischemia.

Conclusions: Transarterial embolisation (TAE) is a safe and efficient procedure. Patients with coagulation disorders were associated with a poor clinical outcome. Any abnormalities of coagulation levels should be corrected in order to increase the efficiency of the treatment for the long term benefits of the patients.

OP05

Outcomes of Bleomycin Sclerotherapy In The Treatment Of Venous Malformations - A Single Centre Case Series

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Background: Sclerotherapy is the established gold standard, first-line treatment for low flow vascular malformations. Research has shown intralesional bleomycin injection as an effective initial treatment for these conditions, citing its availability, affordability, good response, fast recovery and minimal side effects. There exists a paucity of data examining the outcomes of bleomycin sclerotherapy for the treatment of venous malformations in Malaysia. This study presents 10 venous malformation cases treated with bleomycin sclerotherapy at a tertiary centre in Malaysia from July 2022 to July 2023.

Material and Methods: This is a retrospective review of 10 cases of venous malformations referred for intralesional bleomycin sclerotherapy. The procedures were conducted in the Biomedical Imaging Department of University Malaya Medical Centre between July 2022 and July 2023. Patients were diagnosed clinically with imaging which included ultrasound, CT scan and/or Magnetic Resonance Imaging and treated under fluoroscopic guidance by interventional radiologists.

Results: Average age of patients was 18 years old with the youngest being 2 years of age and oldest being 50 years. Follow-ups ranged from 6 weeks to 23 months and the average follow-up duration was 9 months. Six (60%) patients had lesions in the lower limb, 2 (20%) in the upper limb and 2 (20%) at the neck. All patients had no intraprocedural complications, and reported symptomatic relief of pain, size reduction of lesion and improved range of motion as per the last follow-up. Repeated treatments were performed in 4 patients as maximum dose of bleomycin per session was reached.

Conclusions: Percutaneous bleomycin sclerotherapy of venous malformations is a safe and well-controlled procedure done in real time. There are no major systemic adverse side effects and has shown good efficacy.

OP06

Findings from using catheter venography and cone-beam CT to investigate for Pelvic Venous Congestion Syndrome

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Introduction: Pelvic venous congestion syndrome (PVCS) is a well-recognised entity that causes many women, and few men chronic pain. It is associated with gonadal vein incompetence (GVI) and venous compression syndromes such as May-Thurner and its variants and Nutcracker Syndrome. Patients present with symptoms and signs involving the pelvis and/or the lower limbs.
US, CT and MRI have poor sensitivity and specificity to confirm the diagnosis and catheter venography is regarded as the gold standard. This is in particular true of diagnosing GVI, however catheter venography has poor soft-tissue differentiation required to illicit the aetiology of venous compression if present. Cone-beam CT also known as rotational angiography incorporates CT technology with fluoroscopy to overcome this issue.
Our aim was to assess the findings from using catheter venography and cone-beam CT to investigate for PVCS.

Methods: A single surgeon prospective cohort study was undertaken. All patients who presented with pelvic and/or lower limb symptoms of PVCS were routinely investigated with cone-beam CT.
Siemens DynaCT was used in all cases.

Results: In all, 55 patients (53 female; 2 male) were investigated. The median age was 48 (IQR 23). Lower limb symptoms affected 28 patients (two right, four left, 22 bilateral), pelvic symptoms in 14 patients and both lower limb and pelvic symptoms in 13 patients. GVI was seen in 52 patients (21 left, 7 right and 24 bilateral). Common iliac vein (CIV) compression was seen in 34 patients (19 left, 1 right, 14 bilateral). Nutcracker Syndrome was not identified in any patient.

Conclusion: Cone-beam CT offers the advantages of CT and fluoroscopy in detailing aetiology, level, laterality and severity of CIV compression. Further within the limitations of this observational study, we find that bilateral GVI and CIV compression may be an under-recognised cause for PVCS.

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EP01

UNVEILING A RARITY: A CASE STUDY OF DERMATOFIBROSARCOMA PROTUBERANCE MANIFESTATION, DIAGNOSIS, AND THERAPEUTIC MANAGEMENT

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Abstract: Dermatofibrosarcoma protuberance (DFSP) is a rare soft tissue tumour typically presented in young adult as a slow growing and a firm plaque. However, few patients may have accelerated growth, painful swelling or even in rare cases ulceration, and bleeding in case of large tumour. We report a case of bleeding DFSP in a 27-year-old gentleman with a rapid growing left clavicular lump for 9 months, complicated with bleeding from left chest wall and associated stabbing pain. His MRI reveal a superficial subcutaneous avidly enhancing soft tissue tumour multiple flow void within. Patient underwent pre-operative angioembolisation showing tumour blush from clavicular and pectoral branch of left thoracoacromial artery which was later embolized. Subsequent surgical resection was done with no complication perioperatively. HPE later confirm the diagnosis of Dermatofibrosarcoma protuberance with immunohistochemistry shows spindle cell was positive for CD34. We also discuss the clinical and imaging features, as well as the treatment modalities for DFSP in particular preoperative tumour embolization.

Introduction: Dermatofibrosarcoma protuberance (DFSP) is a low-grade, relatively uncommon, soft-tissue sarcoma that develops in the skin's connective tissue of young adult [1] It was originally described in 1924 by Darier and Ferrand. The term dermatofibrosarcoma protuberans was coined by Hoffman in 1925 to reflect its origin in the skin's connective tissue and its tendency to protrude from the skin [2]. It typically appears as a firm, raised nodule or plaque on the skin that is painless and slow growing. DFSP is mostly found on the trunk, limbs, and head and neck regions of the body. Diagnosis of DFSP typically involves a physical examination of the skin lesion, followed by a biopsy to confirm the diagnosis [3]. Radiological appearance of this tumor has rarely been studied and findings infrequently discussed in the literature as many lesions underwent resection before imaging. However, imaging does play a vital role in the differentiation of this tumor in order to differentiate this from other aggressive soft tissue tumor such as more aggressive sarcomas and hemangioma [1]. While most of DFSP present as plaque, few cases present with bleeding. Bleeding DFSP can be particularly challenging to manage, as it can be difficult to achieve haemostasis during surgery or even during biopsy. We report a case of bleeding DFSP of which pre-operative embolization was performed to ensure good surgical and patient outcome.

Material and Method: We report a case of DFSP in a 27-year-old gentleman with no significant previous medical illness. He initially presented with a rapid growing left clavicular lump for 9 months which started as a small lump, then rapidly increasing in size within 1 month prior to presentation. It is associated with bleeding from the left chest wall and stabbing pain which require multiple admissions. Physical examination reveal a mass over left upper anterior chest wall with bleeding abrasion wound on the surface of the lumps. MRI of the tumour reveal a superficial subcutaneous soft tissue tumour which demonstrates low signal intensity on T1WI, intermediate to high signal on T2WI and avid enhancement on post contrast study with multiple flow void within. The mass abuts the left pectoralis muscle without frank invasion with clear plane between the mass and clavicle, left subclavian vein and arteries. Neurovascular bundle is preserved. CT angiogram (CTA) later showed the arterial feeder from to the mass arising from superior thoracic artery and left thoracoacromial branch of the left subclavian artery. Venous phase of the CTA demonstrates multiple subcutaneous venous varix surrounding the inferomedial aspect of the mass. We performed a transfemoral angiogram of the left subclavian artery and selectively cannulate the branches of the left subclavian artery which were the thyrocervical, dorsal scapula, superior thoracic, lateral thoracic and thoracoacromial artery. The main feeder of the tumour arises from the thoracoacromial artery which branches into the clavicular and pectoral branch. These arteries were embolized using 355-500 polyvinyl alcohol (PVA) particle. Another feeder from the acromial branch was not embolize as it is too tortuous to navigate and has a risk of non-targeted embolization towards the axillary artery and the left upper limb. 24 hours post angioembolization, patient proceeded with wide excision of the tumour and closure of the defect with split thickness skin graft (harvested from patient's right thigh).

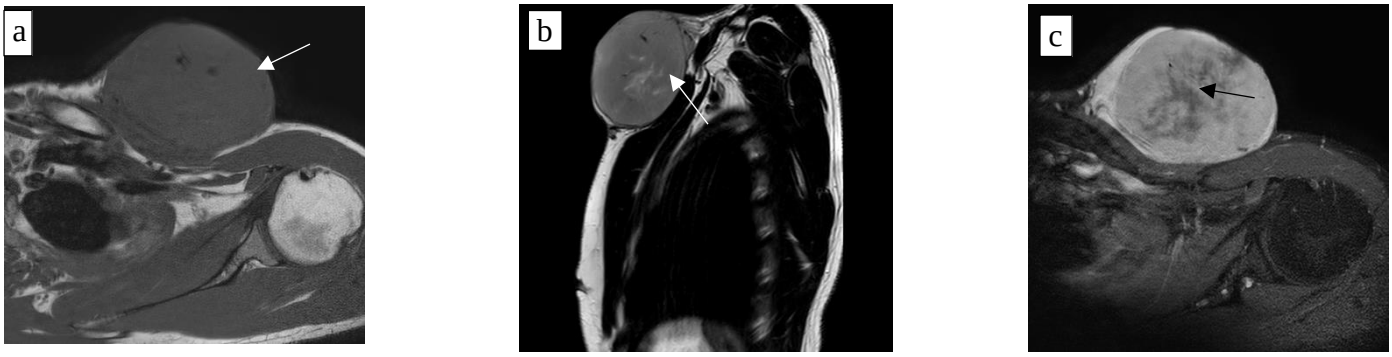

Figure 1

Figure 1: Axial (**a** and **c**) and sagittal (**b**) MR images of anterior chest wall mass which demonstrates hypointense signal on T1WI, intermediate to hyperintense signal on T2WI (*white arrows*) and avid enhancement post contrast with multiple flow void within (*black arrow*).

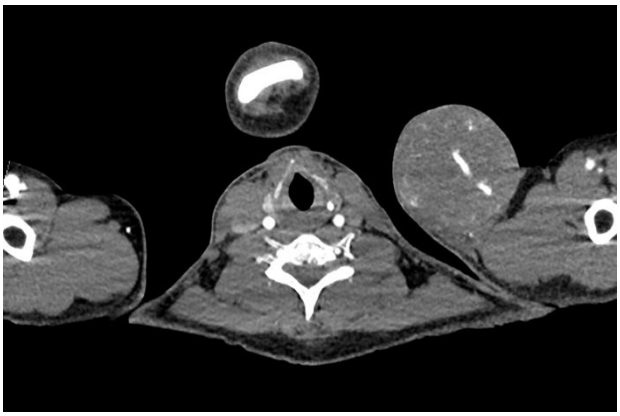

Figure 2: CT angiogram showing arterial feeder suppling the tumour at left upper anterior chest wall (*arrow*).

Results: Prior to angioembolization and wide excision of the tumour, patient's haemoglobin show slight reducing in trend on the day of admission from 14.3g/dl (21.5.2023) to 12.6g/dl (22.5.2023). Post operatively, patient's haemoglobin did not show reducing trend and increased to 13.0g/dl (23.5.2023). Patient's pain was well-controlled, hemodynamically stable and was on antibiotic coverage for the skin graft that is continued until patient discharged to plastic surgery ward on 23.5.2023. Patient was discharged from hospital a week later and recovered well. HPE of the tissue subsequently confirmed the diagnosis of DFSP with immunohistochemistry showing spindle cell was positive for CD34. The resection margin of this tumour shows adequate margin clearance.

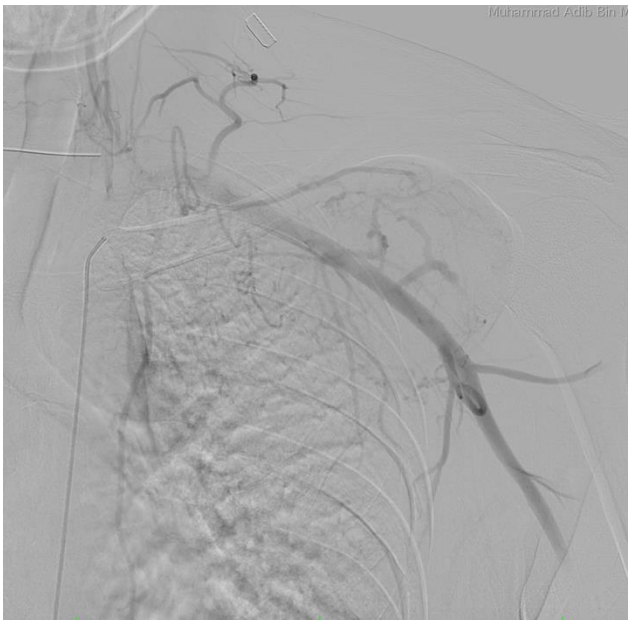

Figure 3: Pre embolization run showing arterial feeder to the tumour.

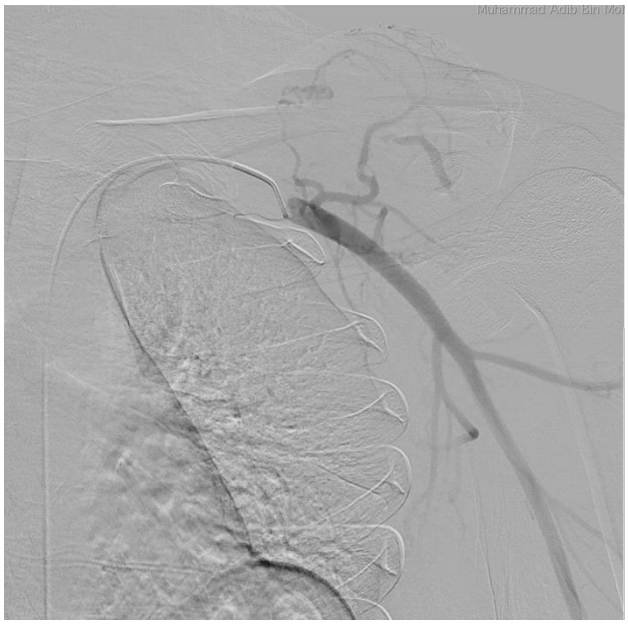

Figure 4: Post embolization run showing reduced arterial feeder supplying the tumour.

Discussion: DFSP is a rare soft tissue tumour and males are slightly more commonly affected with the highest frequency reported between the second and the fifth decades [4,6]. The trunk appears to be the most common site followed by the extremities and the head and neck region [6]. Patients often ignore this tumor due to their slow growth and usually present when tumour has already large enough. Hence, few number of case reports discussed on the early and late imaging appearance of this entity. Local recurrence is a major concern after surgical excision. The frequencies of local recurrences ranged from 20% to 50% [3]. Thus, a proper excision with good safety margin is important in order to reduce the risk of recurrence in this patient. In our case, resection margin of the tumour was adequate for margin clearance. A bleeding DFSP, which one the complication to happen when there are abundant blood supply supplying it, is difficult to manage. Pre-operative embolization of the tumoral mass may help to reduce its size and facilitating the surgical act with minimal bleeding [5]. In our case, patient initially had a reducing haemoglobin trend with anaemic symptoms contributed by multiple bleeding episodes. We applied our expertise in doing embolization of the arteries supplying the tumour which has helped the surgeon to control haemostasis during the operation and easier resection of the tumour.

Conclusion: Bleeding DFSP is challenging to manage and requires a multi-disciplinary team approach. Pre-operative embolization yield a good surgical and patient outcome.

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EP02

MANAGEMENT AND OUTCOMES OF CAROTID CAVERNOUS FISTULAS: A RETROSPECTIVE ANALYSIS OF HOSPITAL KUALA LUMPUR EXPERIENCE

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Introduction: Carotid cavernous fistulas (CCF) are abnormal vascular shunts between the carotid arterial circulation with its branches and the cavernous sinus venous system. In the past, conservative management was somewhat an effective treatment alternative for CCF however recently, multiple endovascular therapy (EVT) of CCF with a variety of embolization material using different approaches have enabled higher occlusion rates with good clinical and functional outcomes. The main purpose of this study is to report the treatment outcomes of CCF using EVT with different neuroendovascular techniques at Hospital Kuala Lumpur (HKL), a tertiary government hospital in Malaysia.

Materials and Methods: This is a retrospective study over a period of 36 months (year 2020 to 2023) at HKL, which assessed the treatment outcomes of patient who underwent EVT of CCF. Patient records and all imaging data including angiograms were reviewed for demographic and epidemiological data, symptoms, fistula type, number of EVTs, complication of EVT, type of embolic materials, occlusion rates and recurrences.

Results: A total of 52 patients between 13 years old and 81 years old were treated in our study. Of these, the aetiology of 31 patients (59.6%) were spontaneous, 19 patients were post-traumatic (36.5%) and the remaining 2 patients (3.8%) were due to ruptured cavernous aneurysms. A majority (76.9%, 40/52) of the cases were completed in one session, with 8 patients (15.3%) needing to undergo additional treatment. The most frequently used access was that of combined (51.9%, 27/52), followed by transarterial (32.7%, 17/52) and transvenous catheterization (15.4%, 8/52). Exclusively coils were used in 34.6% (18/52), and a combination of glue and coils in 21.2% (11/52). Complete obliteration was achieved in 86.5% of patients (45/52) with an intraprocedural-related complication rate of 7.7% (4/52) and no mortality.

Conclusion: Elevated curative response with low rates of morbidity in relation to intraprocedural complications using EVT for CCF have shown safe, positive and effective outcomes, even in complex scenarios.

EP03

HYPERVASCULAR MELANOTIC NEUROECTODERMAL TUMOR OF INFANCY IN THE MAXILLARY REGION SUCCESSFULLY TREATED WITH SUPERSELECTIVE EMBOLIZATION AND EXCISION: A CASE REPORT

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Introduction: Melanotic Neuroectodermal Tumor of Infancy (MNTI) is a very rare benign neoplasm of neural crest origin occurring in infants mainly during the first year of life. Hypervascularization is an unusual feature of MNTI. Treatment is primarily done by surgical excision. Angiography and embolization are rarely performed but could be an option if there is a risk of severe bleeding during surgical intervention. To the best of our knowledge, no prior studies have described preoperative angiography and embolization for hypervascular MNTI in the maxillary region.

Case Report: A 6-month-old male infant was referred from previous hospital with a chief complaint of a mass in the upper gum that progressively increased in size. The mass was initially suspected of being a hemangioma and the infant was referred to our hospital for surgical treatment. Head MRI using T1W, T2W, FLAIR, DWI / ADC, SWI, 3D-CE T1W, and 3D-T1-MPRAGE sequences revealed a mass in the left hard palate that was vascularized by branches of the left maxillary artery and shows imaging features similar to hemangioma. A pathology examination was carried out and the results are consistent with MNTI. Angiography reveals a hypervascularized mass in the left hard palate, supplied by branches of the left maxillary artery. Superselective embolization to the feeding artery was done using gelfoam slurry and polyvinyl alcohol (PVA) combination. Two days after embolization, surgical excision was performed with no severe bleeding occurred. No recurrence and surgical complications were found at the 6-month follow-up.

Conclusion: We reported a rare case of hypervascular MNTI in the maxillary region. In a small number of cases, MNTI could exhibit clinical and radiological findings that mimic hemangioma, and histological confirmation is still required for a positive diagnosis. Superselective angiographic embolization is feasible and effective in reducing the risk of severe bleeding during surgical intervention.

EP04

NAVIGATING COMPLEXITY SUCCESSFUL PRE-OPERATIVE EMBOLIZATION OF CAROTID BODY TUMOR ENHANCING SURGICAL PRECISION AND PATIENT OUTCOMES

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Introduction: Carotid body tumor or paraganglioma is one of the rare neoplasms that occur in the head and neck region. Bilateral presentation is even more infrequent, seen in 5% of the population, and is commonly associated with genetic predisposition.

Report: We report a case of bilateral carotid body tumors in a 38-year-old lady, who presented with painless right neck swelling. Imaging findings show features of bilateral carotid body paragangliomas, in which she underwent pre-operative embolization of the right carotid body tumor with subsequent surgical resection. Histopathological examination validated the diagnosis, with immunohistochemistry was positive for SDHD heterozygous pathogenic variant.

Conclusion: Carotid body tumor is a rare disease that may occur at the head and neck region. Although rare, it has characteristic imaging findings that may point out to this diagnosis. Surgery remains as the mainstay of treatment; however, pre-operative tumor embolization is shown to be a safe and efficacious modality that offers reduced peri-operative morbidity. Its applicability should be determined through thorough medical evaluation and discussions between the patient, interventional radiologist, and the surgeon.

EP05

COIL FRACTURE AND UNRAVELLING: AN UNEXPECTED COMPLICATION

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Introduction: Coil fracture and unravelling are rare complications of coil embolisation of intracranial aneurysms. There has only been a handful of cases found in literature reviews. Hence we describe a case we encountered as well as the management and outcome of this incident.

Results: We report a case of coil fracture and unraveling during embolisation of an aneurysm at the M1/M2 segment of left middle cerebral artery. During the final stage of stent-assisted coil embolisation, there was spontaneous detachment of the coil from its guide wire which was then successfully retrieved. Retrieval was done twice as there was unravelling of the coil fibres, with coil still seen outside of the aneurysm sac raising the concern of partial dislodgement of previously packed coil. Post-retrieval angiogram showed similar appearance of the aneurysm sac as well as the coils within, indicating that the two retrieval attempts were for the same coil which had fractured endovascularly.

Conclusion: Unexpected and rare complications such as endovascular coil fracture can be potentially catastrophic and detrimental to the patient. Hence, awareness of this complication with the skills to promptly manage the situation-in-hand is vital.

EP06

CAROTID ARTERY STENTING (CAS) IN CAROTID ARTERY STENOSIS

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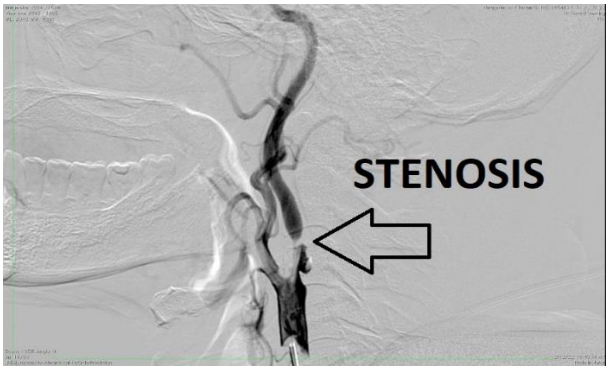
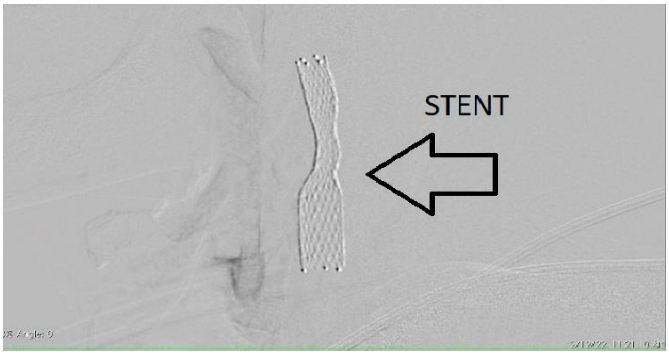
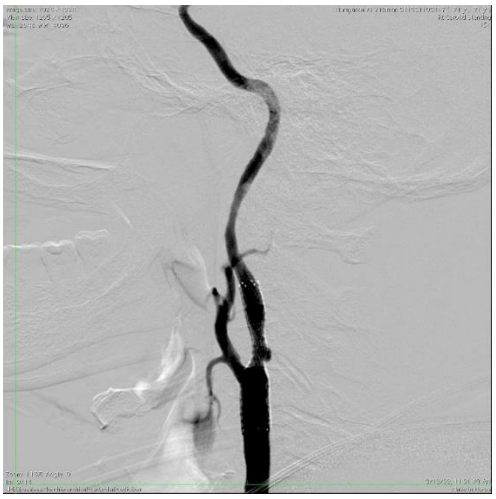
Introduction: Carotid artery stenting (CAS). Rather than removing the material in the carotid artery, as is done with CEA, the other alternative is to insert a metal stent (see section on stents) into the artery to push the material out of the way, creating a larger channel for the blood in which clots are less likely to form. There are a number of stents made specifically for the carotid artery that can be used as an alternative to CEA. In addition, stent treatment can be used in other areas of the carotid artery, from the lowest part deep in the chest up to the base of the brain.

Case report: Our patient is a 71-year-old gentleman with previous history of CVA in 2017 with a recent left parietal stroke in November 2022 with right critical carotid artery stenosis. He is also a high-risk patient in view of his underlying heart failure with reduced EF- LVEF 30%. Where he underwent a successful carotid artery stenting via a transfemoral approach. Patient in supine position. Left groin cleaned and draped. Left femoral artery access under US guidance with LA and cannulated using puncture needle. 6Fr short sheath inserted. Angiogram of bilateral CCA and bilateral subclavian artery performed using JB2 and Vert catheter. Initial angiogram showed total stenosis of the left ICA. Both vertebral arteries origin were occluded however there is reconstitution of the vessels from the collateral, also severe stenosis of the proximal right ICA (About 90%) at the level of L3. The short sheath was exchanged with 6Fr long sheath with the aid of exchange glidewire parked in IMA. The long sheath parked at the distal CCA. The stenotic part of the right ICA was crossed using 0.014" wire and Spider Fx was deployed at the distal cervical ICA. The stenosis was pre dilated with Invatec 4x40 balloon. Angiogram performed. Protégé Rx 8-6x40mm Stent was deployed covering the stenotic ICA. Post stenting angiogram performed, Spider Fx was resheathed and removed. Global CCA angiogram performed which showed significant improvement of caliber of proximal right ICA and intracranial vessel caliber. Hemostasis secured by manual compression. Post procedure patient had no immediate complications and was transferred back to the ward uneventfully.







Subsequently after 5 days of observation in the ward which was relatively uneventful patient was fit for transfer back to IJN for continuation of treatment.

Discussion: Carotid artery stenting (CAS) is a minimally invasive technique for treating carotid artery stenosis. Carotid endarterectomy (CEA) has been shown to reduce the incidence of stroke in patients with symptomatic and asymptomatic carotid stenosis [1,2]. However, if the patient is asymptomatic then Offering routine carotid endarterectomy (CEA) or carotid artery stenting (CAS) to patients with asymptomatic carotid artery stenosis (ACS) is no longer considered as the optimal management of these patients. Equally suboptimal, however, is the policy of offering only the best medical treatment (BMT) [5] to all patients with ACS. It is usually indicated in cases such as the above where the patient is unable to tolerate general anesthesia for CEA such as our case who has a severe underlying heart failure with reduced EF- LVEF 30% and known to have cardiac arrhythmia with recurrent ventricular tachycardia on temporary transvenous pacing. No contraindications seen in this patient such as contrast allergy, unfavorable anatomy, unstable carotid plaque and unstable aortic arch plaque. Carotid stenting is equivalent to CEA in reducing carotid stenosis without increased risk for major complications of death/stroke. Because of shortened hospitalization and convalescence, CAS challenges CEA as the preferred treatment of symptomatic carotid stenosis if a reduction in costs can be achieved [3]. Among patients with asymptomatic carotid stenosis however, stenting has a significantly higher rate of any peri-procedural stroke and peri-procedural minor stroke than CEA, and similar risk of peri-procedural major stroke, peri-procedural ipsilateral stroke, or MI [4].

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EP07

DELAYED PRESENTATION OF POST-TRAUMATIC INTRAHEPATIC ARTERY PSEUDOANEURYSM WITH SUCCESFUL EMBOLISATION USING N-BUTYL CYANOACRYLATE (NBCA)

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Introduction: Hepatic artery pseudoaneurysm is a rare complication of post abdominal blunt injury. Majority of the cases are of extrahepatic in origin which accounts for 80 % of cases with delayed onset. Despite the delay in presentation, it warrants prompt treatment as it could lead to potentially life-threatening complication including pseudoaneurysm rupture (risk up to 14%). Multiple embolic material has been described in the literature for embolization in which coil is the commonly used material. Hereon, we are describing a case of delayed presentation of hepatic artery pseudoaneurysm after an abdominal blunt trauma which successfully embolized with N-Butyl Cyanoacrylate (NBCA).

Report: A 20 year old lady alleged motor vehicle accident and sustained multiple intra-abdominal solid organ injury which was treated conservatively. Post-trauma day 18, she again presented to the hospital with the complaint of hematemesis, epigastric pain, jaundice, and dyspnea. The liver function test was deranged with hyperbilirubinaemia. The CT angiogram of the liver shows pseudoaneurysm arising from a branch of right intrahepatic artery. She was then referred to interventional radiology which findings were confirmed by digital subtraction angiography of the coeliac artery and successfully embolize using glue (N-Butyl Cyanoacrylate) without complication. Follow-up imaging done approximately 3 months post-embolization shows post-embolization changes of the right intra-hepatic artery pseudoaneurysm.

Conclusion: Intrahepatic artery pseudoaneurysm is indeed a rare complication post-abdominal blunt injury which requires timely intervention for the risk of rupture. Endovascular embolization is a safe and effective choice of treatment with N-Butyl cyanoacrylate as a viable choice of embolic agent.

EP08

THE EFFECTIVENESS OF EMPIRIC TRANSARTERIAL GLUE EMBOLIZATION (TAGE) OF GASTRODUODENAL ARTERY (GDA) FOR HIGH RISK BLEEDING DUODENAL ULCER - A RETROSPECTIVE STUDY

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Purpose: To conduct a clinical audit on clinical outcome of empiric transarterial glue embolization (TAGE) of gastroduodenal artery (GDA) for high risk bleeding duodenal ulcers to evaluate treatment efficacy.

Materials and Methods: All patients treated for bleeding duodenal ulcers between June 2019 and June 2023, in a single tertiary center (Penang General Hospital) were identified based on intervention radiological reports. Patients with bleeding duodenal ulcers underwent empiric transarterial glue embolization (TAGE) of gastroduodenal artery (GDA) following endoscopic hemostasis were included. Information was extracted from patients' medical records, endoscopic and radiological reports. Data was computed and analyzed using Statistical Package for Social Sciences (SPSS).

Results: During the study period, a total of 26 patients were planned for empiric transarterial glue embolisation (TAGE) of gastroduodenal artery (GDA) for bleeding duodenal ulcer. The median age was 68 with 68% male (n=18) and 32% female (n=8). A total of 25 patients with duodenal ulcers of Forrest 1a (n=5), 1b (n=12), 2a (n=4), 2b (n=3) and 2c (n=1) who successfully underwent prophylactic TAGE of GDA were included in this study. It has a high technical success rate of 96.2% (n=25) with only one case of failure in cannulation due to tortuous arterial anatomy. Clinical success rate amongst the 25 patients who successfully underwent empiric TAGE of GDA was 84% (n=21) with only four patients developed rebleeding and required repeated endoscopic clipping. One of the four patients succumbed secondary to refractory bleeding.

Conclusion: Empiric transarterial glue embolisation (TAGE) of gastroduodenal artery (GDA) can be a useful adjunct treatment option in high risk bleeding duodenal ulcer with high technical and clinical success.

EP09

CRYOABLATION OF LUNG METASTASES IN AN ADULT WITH DERMATOFIBROSARCOMA PROTUBERANS OF RIGHT THIGH

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Introduction: Lung cancer cryoablation uses extreme cold to destroy cancerous tumors by freezing. Providing high local lesion control, lung cancer cryoablation is associated with good overall long-term survival and minimally significant complications. It provides a curable treatment for medically inoperable lung lesions less than 3cm in size.

Results: A 60-year-old gentleman with underlying dermatofibrosarcoma protuberans of right thigh with lung metastases underwent excision of right thigh tumour and completed radiotherapy to his right thigh. Contrast enhanced CT done shows two lung nodules in the posterior segment of right upper lobe and posterior segment of right lower lobe measuring 2.2x2.5cm and 2.5x1.9cm respectively**.** Ablation was performed under general anesthesia.With CT guidance, two Slimeline CryoProbe (2.4 mm x 15 cm) were inserted into the target lesion and cryoablation was performed applying a three-cycle freeze–thaw phase protocol. Each procedure was monitored with a non-contrast CT imaging at 3 to 5 minutes intervals to visualize the evolving ablation zone with the goal of achieving a circumferential margin beyond the tumor of 5 mm. After cryoablation needles were removed, CT images were obtained to assess the overall ablation zone and any potential complications. Patient-specific follow-up for the study was done within the first week, at 1, 3, 6, and 12 months. Patient was clinically evaluated at 1 month from the last ablation to assess safety of the procedure and its impact on quality of life.

Conclusion: Contrasted CT after 2 years of follow-up showed a complete response of both lung nodules and the shrinkage of the ablation scar. Cryoablation for the treatment of lung metastases in patients with sarcoma for early local tumor control is promising.

EP10

ENDOSCOPIC GUIDED BILIARY EMBOLIZATION FOR BILE LEAK

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Introduction: Bile leak can be caused by iatrogenic injury from surgical procedure; or after blunt/penetrating trauma. We present a case of endoscopic guided biliary embolization for bile leak after initial operation and endoscopic stent placement in a grade V liver injury patient due to road traffic accident.

Results: A 22-years-old patient who alleged road traffic accident and sustained grade V live injury and grade II splenic injury had undergone laparotomy and liver laceration repair. Multiple operations had been performed on this patient as the patient was complicated with burst abdomen and intestinal obstruction secondary to the severe adhesion. During the admission, noted patient had persistent high output from the post-operative drainage tube with bile content. Endoscopic retrograde cholangiopancreatography (ERCP) was performed with plastic stent insertion. However, the drainage output was still persistently high. ERCP and CT were performed and showed bile leak with biloma formation. After multidisciplinary team discussion, proceeded with the hepatobiliary team for biliary embolization during the ERCP. The procedure was successfully performed. Drainage output is reduced. Repeated MRCP showed smaller biloma. And the patient was asymptomatic.

Conclusion: The main treatment for bile leak is endoscopic treatment such as sphincterotomy and endoscopic stent; or percutaneous drainage which helps to divert the biliary flow. If failed in diverting the biliary flow using a stent, biliary embolization under ERCP guidance is another useful method.

EP11

THE UNEXPECTED RAZOR SVC

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Introduction: Patients with end stage renal disease are frequently referred to the interventional radiology team pertaining to their hemodialysis access such as central venous catheter placement and plasty of stenotic AVF vascular segments. Venoplasty is a very common procedure. Complications such as vascular tear, embolism or ruptured balloon may occur, but with a low incidence rate.

Results: Patient with history of left brachiobasilic fistula and SVC stenosis, successful plasty done in 2018, presented with inadequate dialysis. Fistulogram and subsequent central venogram demonstrated narrowing at distal venous limb of AVF and left brachiocephalic-SVC junction. Central venoplasty was performed. However, prior to reaching nominal balloon pressure, there was sudden loss of inflation pressure and contrast dispersion seen in fluroscopy, indicative of balloon rupture. The ruptured balloon was retrievable, and a longitudinal tear was discovered. Re-attempt central venoplasty was done and the similar complication re-occurred. However, this time the balloon was non retrievable despite multiple attempts. Vascular Surgeon was called in and case was posted to Emergency OT for exploration and removal of balloon catheter. Upon retrieval, the balloon was noted crumpled upon itself, suggestive of a circumferential tear. A temporary central venous catheter was inserted the next day and plain CT Thorax done in the same setting revealed a tubular shaped calcified plaque with a tapered edge projecting from brachiocephalic- SVC lateral wall which was likely the cause of our previous ruptured balloons.

Conclusion: Calcified plaque within the SVC is rare. However, a clinical suspicion should be raised when a balloon catheter ruptures during a central venoplasty procedure. Although factors such as operator technique and manufacture defect can be a possible aetiology, the patient's underlying morphology is also a crucial cause that needs to be considered to avoid further complications and unnecessary invasive interventions.

EP12

CONCURRENCE CASE OF RECURRENT ARTERY OF HEUBNER ANEURYSM WITH PLANUM SPHENOIDALE MENINGIOMA

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INTRODUCTION: The association between meningioma and aneurysms is a rare event and usually is incidentally diagnosed. We present a concurrence case of recurrent artery of Heubner aneurysm with planum sphenoidale meningioma, in which the aneurysm was successfully treated with endovascular embolization.

CASE REPORT: A 53-year-old lady presented with blurring of vision. MRI brain showed avidly enhancing meningioma at planum sphenoidale with incidental and suspicious finding of aneurysm at right A1 region. Cerebral angiogram was done which showed a saccular aneurysm at the A1 segment of right anterior cerebral artery, likely arising from the recurrent artery of Heubner. After comprehensive pre-treatment planning and discussion with the neurosurgery team, the decision to proceed with endovascular treatment was made prior to the meningioma excision. Embolisation was done using MicroPlex coils (7mm × 22cm, 3mm × 10cm, 2mm x 4cm), Optima Helical coils (2mm x 8cm, 2mm x 6cm), Target Helical coil (3mm x 8cm) and EV3 coil (5mm x 15cm). Post coiling angiogram showed successful embolization with complete occlusion of the aneurysm. The patient was discharged well after 2 days post embolization with no neurological deficit.

CONCLUSION: The isolated occurrence of the recurrent artery of Heubner is already a rare case, and the simultaneous presence of the aneurysm with a meningioma is an even rarer occurrence.
The recurrent artery of Heubner was successfully treated with endovascular treatment. Staged embolization of the aneurysm prior to the tumor excision can be performed depending on the clinical presentation and anatomical relation of the aneurysm to the tumor.

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EP13

PREDICTORS AFFECTING ARTERIOVENOUS FISTULA PATENCY AFTER SUCCESSFUL PERCUTANEOUS TRASLUMINAL BALLOON ANGIOPLASTY

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Introduction: This study aims to assess the post-intervention patency and investigate the predictors affecting the arteriovenous fistula (AVF) patency after a successful percutaneous transluminal angioplasty.

Materials and Method: This is single center retrospective study of 88 hemodialysis patients who underwent percutaneous transluminal angioplasty (PTA) due to AVF stenosis. Variables of a clinical, anatomical, and technical factors were subjected to analysis. We used both univariate and multivariate analyses to evaluate the post-intervention patency of PTA by follow-up and explore the potential predictors.

Result: Postintervention primary and secondary patency rates at 12, 24, 36 months were 40%, 20%, 8%, and 71%, 41% and 26% respectively, with a mean total patency duration of 20.3 ± 11.5 months. Cox survival multivariate analysis indicated that the factors associated with post-intervention primary patency of AVF included race and age of fistulas while for post-intervention secondary patency of AVF included race and use of antiplatelet.

Conclusion: This study demonstrated that the risk factors associated with reduced post-intervention patency of AVF included race while the use of antiplatelet and older age of fistulas were found to be a protective factor for AVF patency post-intervention.

EP14

MIND YOUR ANGLE: RUPTURED CATHETER DURING CEREBRAL DSA

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Introduction: Cerebral vascular malformation covers wide variety of pathology with various presentations. It can originate from arteries or veins. Hence, to differentiate between them, there have been increase utilization of various imaging techniques including CT angiography (CTA), MR angiography (MRA) and digital subtraction angiography (DSA). Due to the increased application of imaging techniques, few complications develop post-procedure. Hereon, we presented a case of fracture catheter because of acute angle vascular sheath catheter which anticipated from multiple factors.

Report: A 24-year-old boy presented with recurrent headache for past 2 years. The headache was generalized and intermittent requiring analgesic to resolve symptoms. No neurological deficits. No history of trauma prior onset. CTA brain performed demonstrates linear enhancing hyperdensity in keeping with vessel in right frontal region. No communication between lesion with adjacent anterior cerebral arteries. No perilesional hypodensity to suggest cerebral oedema. There is little to none mass effect onto right frontal lobe. Subsequently, cerebral DSA performed to confirm type of vascular malformation. Initial vascular access via right radial artery puncture performed. However, there was no available small catheter to gain access through the right upper limb vessels. Eventually, right femoral artery was punctured to get access. Cerebral DSA was performed. Findings showed multiple tortuous beaded converging deep veins involving the right fronto-parietal lobes giving the appearance of caput medusa during venous phase and draining into branches of right internal cerebral vein. The normal cerebral arteries are well opacified with no feeding arteries into the tortuous beaded deep veins. These findings are in keeping with developmental venous anomaly. Unfortunately, during removal of glidewire, distal glidewire was fractured at level right common femoral artery. The vascular sheath inserted in right inguinal region is almost perpendicular to the vessel considering patient has a large torso as well as thick subcutaneous tissue above the vessel. Another puncture performed on left common femoral artery to gain access. A snare was used via left common femoral artery puncture and the fractured catheter was removed.

Conclusion: Fractured catheter is common complication in angiography procedure. Few complications in fractured wire during procedure as it can be a source of thrombosis or infections. Hence, a fractured catheter must be removed to avoid further morbidity. Considering the patient has a large size body, radial puncture should be considered with availability of small caliber catheter. With big size patient, one should be careful during femoral puncture and observe needle angle avoiding a steep angle. A diagnostic catheter is a delicate catheter which requires an operator to maneuver with care and anticipate complications.

EP15

CT Guided Intervention for Treatment of Pudendal Neuralgia

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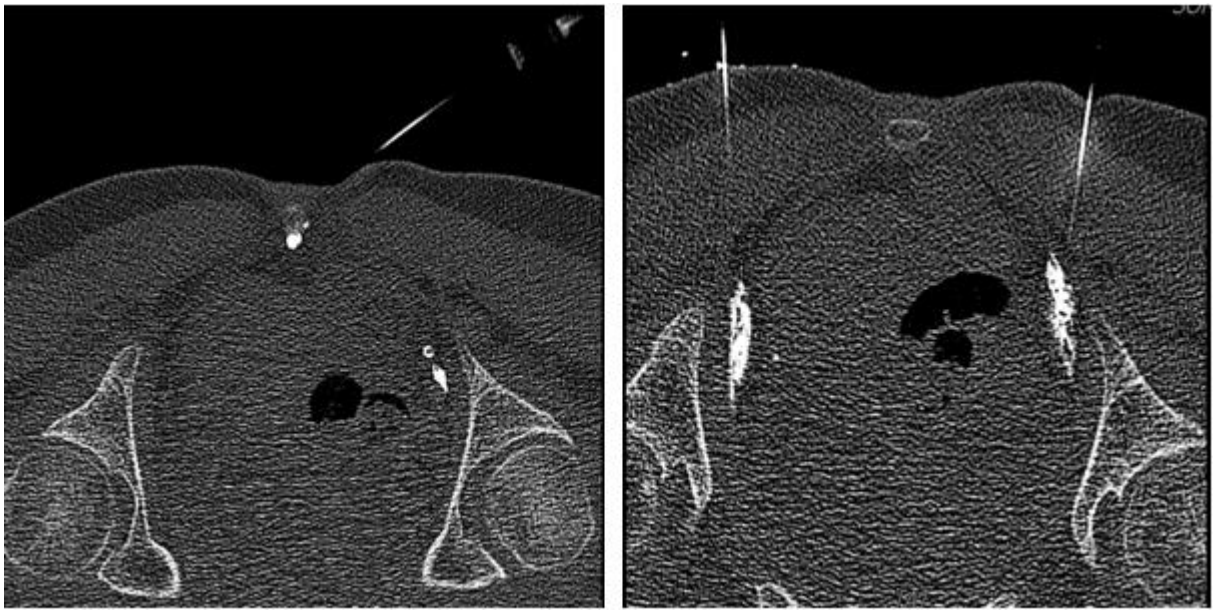
Introduction: Pudendal neuralgia (PN) manifests as chronic pelvic and perineal pain syndrome that originates from damage, inflammation, injury or irritation of the pudendal nerve. It is commonly a bilateral process with a characteristic perineal pain aggravated by sitting, which is present in over 50% of affected patients. There is a lack of certainty regarding the etiology and pathophysiology of PN, thus, remains a diagnosis of exclusion. Patients with symptoms of PN have traditionally been offered medical therapy consisting of anticonvulsant drugs and neuroleptic agents or more complex pelvic surgeries in severely symptomatic cases/ refractory to medical management. Today, CT guided Impar ganglion and pudendal nerve trunk steroid injection and CT guided pulsed radiofrequency (RF) of the pudendal nerve branches have emerged as minimally invasive treatment options for PN.

Materials: 22G spinal needle, Shincort 40mg, Lignocaine 5mg, Marcaine 5mg

Case Report: A 72-year-old lady, para 4, LCB 32 years ago, complains of pain in the perineum since the past 6 months. Pain was present around the urethra, vagina and anus. The pain was described to be on and off throughout the day, pain score 10/10, radiating in nature to both lower limbs with no definite relieving factors. Patient had a vaginal pessary inserted for prolapse in 2016, which was removed in 2022 because of discomfort. Local examination was unremarkable. MRI pelvis and colonoscopy were performed which revealed no significant abnormalities. A diagnosis of pudendal neuralgia was made, and the patient was subjected to CT guided Impar ganglion and pudendal nerve trunk steroid injection (Fig 1) which produced partial treatment response. There was an interval reduction in pain (score of 5-6/10) after the steroid injection. Three weeks later, in view of persistent symptoms, the patient was then planned for CT guided pulsed RF of bilateral pudendal nerves. There was significant improvement in symptoms (pain score of 2-3/10) post procedure. Oral medications were gradually tapered down and patient had satisfactory pain control post intervention. The patient is predisposed to long term follow up with no further deterioration of clinical condition.

Conclusion: CT guided intervention has emerged as a viable treatment option for PN in patients non-responsive or contraindicated to oral medications and unwilling for complex surgical methods. This approach has shown a positive response to pain control in managing a case of PN.



A B

Figure 1: Contrast opacifying the Impar ganglion (A) and pudendal nerves (B) in both sides of pelvis

EP16

PERCUTANEOUS LYMPHANGIOGRAPHY WITH SUCCESSFUL THORACIC DUCT EMBOLISATION IN CHYLE LEAKAGE FOLLOWING NECK SURGERY

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Introduction: Chyle leakage following lymphatic injuries in neck surgery is known as one of the rare potential complications. Although rare, chyle leakage can lead to serious problems, such as chylothorax, hypovolaemia, electrolyte imbalance, nutritional deficiency and immunosuppression. Conservative management includes adequate drainage, pressure dressings and dietary modifications. Secondary surgical management is to be considered should conservative management fail. Lipiodol lymphangiography is an option for diagnostic and therapeutic treatment with promising results, in addition to conservative and surgical intervention approaches.

Reports: 73 years old female diagnosed with papillary thyroid carcinoma with nodal and lung metastases. Total thyroidectomy with right modified radical neck dissection was done. Subsequent PET CT shows FDG uptake hence the patient underwent left modified radical neck dissection and right re-modified radical neck dissection. The second surgery was complicated with persistent chyle leakage which did not resolve with conservative management. She then underwent neck exploration which shows evidence of lymphatic injuries; however this also failed to resolve her persistent chyle leakage. Case was subsequently referred to Interventional Radiologist for diagnostic and therapeutic lipiodol lymphangiography. Lipiodol lymphangiography and concurrent lipiodol embolisation was done which shows evidence of thoracic duct leakage. Follow-up shows improving chyle leakage drainage which subsequently ceased. Patient then discharged well.

Conclusion: Chyle leakage due to lymphatic injuries is one of the rare complications that can develop after thyroid or neck surgery. There are limited studies on lymphatic embolization performed in cases of chyle leak post neck surgery. Lymphangiography may be used as a diagnostic and potential therapeutic approach for chyle leakage. Thoracic duct lipiodol embolization is an option for chyle leakage after neck surgery which has shown to be successful in this case study.

EP17

CASE REPORT: AN UNEXPECTED DETECTION OF A THYROID ARTERIOVENOUS MALFORMATION (AVM) IN A YOUNG LADY WITH THYMOMA

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Introduction: Vascular malformations of the thyroid gland are very rare and often accidentally diagnosed. In this poster, we present a case where this young lady presented with new symptoms while she awaited her operation for her recently diagnosed thymoma.

Results: This is a 22-year-old female with no previous illness. Initial presentation in March 2022 with hemoptysis for a month with occasional dyspnoea. She was then diagnosed with a thymoma (HPE proven) measuring up to 15cm. While she was planned for thymectomy, she developed new onset hoarseness of voice with increasing anterior neck swelling from July 2022. On examination noted left vocal cord palsy and she was subsequently diagnosed to have a large thyroid AVM with mass effect onto the trachea. A multidisciplinary discussion was made and decided for embolization of the thyroid AVM prior to total thyroidectomy, before eventually proceeding with thymectomy. Thyroid embolization was done by embolising bilateral superior thyroid artery, left inferior thyroid artery, and feeder branch from right internal thoracic artery using Histoacryl 20%. Also performed embolization of possible thymic artery arising from the arch of aorta using PVA 355-500 micrometer and Nester microcoil 4mm x 7cm. Post-embolization angiogram showed a near total occlusion of nidus, with patent bilateral draining veins and bilateral internal carotid arteries. Subsequently, total thyroidectomy and thymectomy were performed in stages and the patient is currently well.

Conclusion: Thyroid AVM is a considerably rare condition. In this case, the patient was initially diagnosed with another pathology, which is the thymoma with no neck symptoms. The subsequent development of new onset neck symptoms led to the diagnosis of the thyroid AVM which impeded the initially planned thymectomy. The embolization was successful and led to the subsequent completion of total thyroidectomy and thymectomy.

EP18

CORRELATION BETWEEN ULTRASOUND FEATURES, CYTOLOGICAL CLASSIFICATION AND TECHNICAL DIFFICULTY TO OBTAIN SAMPLE IN PATIENTS WITH THYROID NODULES: THE AL-SULTAN ABDULLAH HOSPITAL EXPERIENCE

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Purpose: Nodules in the thyroid are common especially with increasing use of imaging in patients with thyroid-associated symptoms and signs. We aim to correlate ultrasound findings based on thyroid imaging and reporting data system (TIRADS) with cytological findings (Bethesda classification) and difficulty to obtain satisfactory samples (number of attempts).

Materials and Methods: Retrospective study on 111 patients who underwent ultrasound assessments followed by fine needle aspiration cytology (FNAC) of the thyroid nodules. A total of 132 nodules with sufficient cytological assessment were analysed.

Results: There was weak positive correlation between the TIRADS and Bethesda scores (r = 0.167). Malignant risk of TIRADS 3, TIRADS 4 and TIRADS 5 nodules were 9%, 6% and 21% respectively. Most of the nodules are solid (74%), with low malignant risk of 9%. Mixed solid-cystic nodules had 20% risk of malignancy. Most of these solid-cystic nodules had punctate echogenic foci within. Hypoechoic nodules have 18% malignant risk in our series compared to 3% malignant risk in hyperechoic nodules. 15% of nodules with punctate echogenicity showed malignant changes. Nodules without calcification showed 8% malignant risk. There was poor correlation between the TIRADS and width of the nodules (r = 0.04). The percentage of increased attempts of aspiration (>3 times) was almost similar 20% for solid-cystic nodules (20%) and solid nodules (19%). Nodules without calcification (12%) required less aspiration attempts compared to nodules with calcification. Percentage of nodules with macrocalcification, rim calcification and punctate echogenic foci needing more than 3 aspiration attempts were 25%, 25% and 20% respectively.

Conclusions: Poor correlation was observed between the TIRADS and Bethesda systems. However, ultrasound features with higher malignant risk such as hypoechoic nodules as well as solid cystic nodules with punctate echogenic foci should have FNAC performed.

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EP19

DAVF CHRONICLES: THE TALE OF RECURRENCE AFTER EFFECTIVE ENDOVASCULAR MANAGEMENT

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Introduction: Endovascular embolization with Onyx has been increasingly used to treat intracranial and spinal dural arteriovenous fistulas (DAVFs). Several case series have been published in recent years reporting high DAVF cure rates with this technique. Although it is seldom reported, DAVF recurrence may occur despite initial "cure." We reported a case of a recurrent DAVF after successful transarterial Onyx embolization.

Case Report: Patient presented with neurological deficit which imaging shows presence of intracranial haemorrhage. 1 year post incident, patient presented back with worsening neurological deficit which urgent imaging of CT and MRI confirms presence of DAVF. Urgent intervention using Onyx was performed with successful outcome. Follow up imaging and angiogram 2 months post intervention shows no residual DAVF with improving clinical conditions. However, 7 months post intervention, patient presented with seizure and follow up imaging shows suspicious evidence of recanalization which was confirmed with cerebral angiogram assessment. Successful endovascular treatment of the recurrent DAVF was achieved using Onyx.

Conclusion: Despite adequate Onyx penetration into the fistula and draining vein, this case demonstrates that DAVF recanalization may reappear with filling from newly recruited arterial feeders. We are highlighting the need for awareness of this possible phenomenon and suggest that follow-up angiography should be considered in patients treated with catheter embolization.

EP20

SPONTANEOUS OCCLUSION OF TRAUMATIC CAROTICOCAVERNOUS FISTULA (CCF) DURING ICA STENTING FOR SUPRACLINOID ICA ANEURYSM

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Introduction: Endovascular coil placement, stent deployment and assisted coiling has been part of the neurointerventional procedure for treatment of intracranial internal carotid artery (ICA) aneurysm which can pose complications such as aneurysmal rupture, arterial injury, thromboembolism and vessel thrombosis. Less known and reported complication of these treatments is direct caroticocavernous fistula (CCF). Our case is to highlight traumatic CCF that occurred during ICA stenting can be treated conservatively given the patient is asymptomatic.

Case Presentation: 60 years-old lady presented with severe headache and non-contrasted CT revealed subarachnoid haemorrhage with right supraclinoid ICA aneurysm that is further confirmed on cerebral angiogram. Right ICA stenting was performed, in which new direct caroticocavernous fistula (CCF) was noted during intraprocedural angiogram, drains into the cavernous sinus and inferior petrosal sinus. Post stenting angiogram showed CCF persists with no cortical venous reflux. Patient discharged well with no signs and symptoms of CCF, hence managed conservatively with close follow up and continuation of double antiplatelet. This patient remained asymptomatic during follow up with repeat angiogram three months post stenting showed obliteration of the supraclinoid ICA aneurysm and spontaneous occlusion of the direct CCF.

Discussion: Traumatic CCF during ICA endovascular treatment is less reported and most cases reported was subjected to immediate endovascular treatment. Although not well understood, spontaneous occlusion can be attributed to the clot formation by iodinated contrast material at the injured vessel wall, thrombosis of the cavernous sinus and stasis of the venous drainage system. Given patient is asymptomatic and antegrade fistulous flow, there is role for conservative treatment.

Conclusion: In the emergent endovascular treatment for ICA aneurysm, our case demonstrates that direct CCF can occur as part of treatment complication. Although direct CCF commonly treated as an emergency, this case highlights that conservative treatment and close follow up can be considered in the context patient is asymptomatic.

EP21

PSEUDOANEURYSM OF SUPERFICIAL FEMORAL ARTERY: A TALE OF CATASTROPHIC COMPLICATION POST ILIZAROV FIXATION

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Introduction: Vascular injury post Ilizarov fixation of femur is rarely described in literature. The process of inserting pins and wires through the bones and distraction force impose the risk of vascular or nerve injury. We hereby report a case of pseudoaneurysm of superficial femoral artery post Ilizarov fixation which was successfully treated by a covered stent in our centre.

Case Presentation: A 41 year-old gentleman sustained comminuted fracture of mid shaft left femur from a motor vehicle accident. Percutaneous stabilisation was done using an Ilizarov external fixator. He presented with left thigh swelling for 1 weeks and bleeding around the Schanz pins proximal to the fracture site post procedure. Computed tomography angiography (CTA) done showed a pseudoaneurysm arising from the distal left superficial femoral artery inferior to the 3rd pin site. Digital substraction angiography revealed a large wide necked pseudoaneurysm at the left mid superficial femoral artery. A covered stent was deployed and successfully resolved the pseudoaneurysm.

Discussion: The classical symptoms are persistent bleeding and swelling from either the wound or the pin/wire site. In this case, the complication was resolved early but delayed presentation up to several weeks or years has also been described. It is usually due to a spike of fractured bone, protruding cortical screw tip or over-penetration by a drill-bit leading to catastrophic injury and disruption of the arterial wall.

Conclusion: Pseudoaneurysm of the superficial femoral artery following orthopaedic procedures are rare occurrence. A high index of suspicion is vital for early recognition and managing the catastrophic complication. Endovascular embolization is safe and effective approach to reduce the morbidity and mortality associated with this condition.

EP22

PERCUTANEOUS EMBOLIZATION OF PROFUNDA FEMORIS ARTERY PSEUDOANEURYSM IN WARFARIN-INDUCED OVERANTICOAGULATION

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Introduction: Profunda femoris artery (PFA) pseudoaneurysms are rarely encountered. Most of the reported cases are related to trauma or iatrogenic injuries. Anticoagulant use and hypertension are risk factors for developing a femoral artery pseudoaneurysm. The deep anatomical location of PFA can make clinical evaluation challenging; hence, imaging is crucial in the diagnosis of PFA pseudoaneurysms. Interventional radiological treatment has become the preferred treatment strategy for managing pseudoaneurysms in recent years. The preferred treatment approach is endovascular. The percutaneous approach can be used in specific circumstances.

Results: We present a case of PFA pseudoaneurysm that developed spontaneously due to overdose of warfarin. Computed tomography (CT) and conventional angiography confirmed a pseudoaneurysm arising from collateral vessel from the right PFA. The patient was successfully treated with percutaneous embolization of the right PFA pseudoaneurysm using coils and gelform with no complications.

Conclusion: PFA pseudoaneurysms are very uncommon and can be caused by trauma or iatrogenic injuries. Conventional angiography is the gold standard diagnostic tool for pseudoaneurysms, in addition to treatment planning. The preferred treatment strategy is minimally invasive radiological intervention. The approach and materials used in managing pseudoaneurysms depend on a number of factors. Endovascular approach is the preferred mode of treatment. In certain conditions, such as in our case, the percutaneous technique can be employed.

EP23

EMERGING FROM THE DEPTHS: RENAL EMBOLIZATION'S LIFESAVING TOUCH IN POLYARTERITIS NODOSA

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Introduction: Spontaneous subcapsular renal hematoma is an infrequent medical condition. Polyarteritis nodosa (PAN) is characterized by necrotizing vasculitis, which leads to the formation of nodules in small and medium-sized arteries. PAN often affects the kidneys, with kidney involvement seen in over 70% of PAN patients. Common symptoms of PAN with kidney involvement include hematuria, proteinuria, and kidney failure. The occurrence of spontaneous perirenal bleeding due to PAN is rare and was initially documented by Schmidt in 1908. This complication is observed in approximately 4-13% of PAN cases and can manifest unilaterally or bilaterally. Consequently, the mortality rate, renal prognosis, and appropriate treatment strategies remain incompletely understood.

Case Presentation: We describe a case of an 80-years-old male with a background history of stage three chronic kidney disease who presented with a three-day history of abdominal pain and severe anemia. A computed tomography revealed a right renal subcapsular active bleed with large right retroperitoneal hematoma. Soon after, an emergency angiography was performed which revealed numerous microaneurysm and multiple points of contrast blush from the upper, mid and lower pole segmental arteries. Diagnosis of polyarteritis nodosa was made from imaging. Due to the extensive point of bleeding, he was then subjected to right main renal artery embolisation. He was discharged well 10 days later with renal replacement therapy on board.

Conclusion: When an initial manifestation of classic polyarteritis nodosa is the occurrence of an unanticipated perirenal hematoma, there is a higher probability of encountering a delay in achieving the accurate diagnosis. Angiography offers the advantage of not only enabling a prompt diagnosis but also facilitating therapeutic embolization. For individuals with classic polyarteritis nodosa and bleeding from a ruptured aneurysm, angiography could serve as a main therapeutic option instead of surgery.

EP24

DEFYING THE ODDS: ILEAL ANGIODYSPLASIA EMBOLIZATION IN A COMPLEX OVARIAN CANCER PATIENT WITH RECURRENT LOWER GI BLEEDING

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Background: Ileal angiodysplasia, a rare vascular anomaly in the ileum, is challenging due to recurrent lower gastrointestinal (GI) bleeding. Managing it in patients with complex medical histories, like ovarian cancer and multiple surgeries, requires timely intervention.

Case Report: A 55-year-old female with ovarian cancer, multiple surgeries, and recurrent GI bleeding was referred after a severe episode. Despite transfusions, her hemoglobin dropped significantly. A contrast-enhanced CT scan showed contrast extravasation in the distal ileum. Selective angiography of the superior mesenteric artery (SMA) showed no obvious contrast extravasation. However, super-selective catheterization of the ileal branch revealed a contrast blush**.** The hypervascular blush was successfully embolized using gelfoam. Post-embolization imaging showed resolution. She was discharged in stable condition seven days post-embolization.

Conclusion: Ileal angiodysplasia embolization effectively managed recurrent lower GI bleeding in a patient with ovarian cancer and a complex surgical history. This case underscores the importance of prompt diagnosis and minimally invasive embolization techniques, even when subtle angiographic findings necessitate super-selective catheterization**.**

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EP25

ORBITAL MARVELS: A MODERN APPROACH TO VENOUS-LYMPHATIC MALFORMATION

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Introduction: Orbital venous-lymphatic malformation is a benign condition resulting in cosmetic and functional dysfunction. Surgical resection or ablation of the tumour remains the mainstay of treatments, but it can be very challenging and complicated due to its infiltrative and vascular nature with high recurrence rate. We hereby report a case of percutaneous sclerotherapy of an orbital venous-lymphatic vascular malformation done in our centre.

Case Report: A 16-year-old girl presented with 1-month history of left eye proptosis associated with blurring of vision and pain during eye movement. Examination revealed a restricted left eye movement, reduced visual acuity of the left eye with positive relative afferent pupillary defect (RAPD) and a hyperemic left optic disc. Left orbital venous-lymphatic malformation was diagnosed with MRI. Patient was referred to interventional radiology for pre-operative embolization prior to surgical resection by the ophthalmologist. Percutaneous sclerotherapy using Bleomycin was performed and the patient was reviewed in interventional radiology clinic three weeks later. There is improvement in terms of left eye pain and left eye vision. Reassessment ultrasound and MRI showed smaller lesion. She is currently awaiting her date for surgical resection of the lesion.

Discussion: Less invasive procedure is the preferred treatment method in most of the conditions nowadays. Percutaneous sclerotherapy of venous-lymphatic malformation can be adjunctive and even the sole treatment for selected cases. The common sclerosants used in the literature are Bleomycin, sodium tetradecyl sulfate (STS) and ethanol. Bleomycin has both antineoplastic and antibiotic properties and is proven to have higher efficacy in comparison to STS with few sessions needed to treat the lesson and lower recurrence in low flow vascular malformation.

Conclusion: To date, few studies have been done to show the efficacy of percutaneous sclerotherapy in orbital venous-lymphatic vascular malformation. This is a field worth exploring.

EP26

TRANSBRACHIAL ENDOVASCULAR EXCLUSION: UNVEILING A MINIMALLY INVASIVE APPROACH FOR PROXIMAL ANASTOMOTIC AXILLOFEMORAL BYPASS PSEUDOANEURYSM IN A PATIENT WITH PACEMAKER

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Introduction: Anastomotic pseudoaneurysm, is a rare complication of arterial bypass procedures, particularly in the upper limbs. It can be attributed to various factors such as postoperative infection, suture fatigue, poor suture material, trauma, or mechanical obstruction. The turbulent blood flow within the anastomotic region is believed to gradually weaken the arterial wall, leading to anastomotic leaks. Over the past decade, the management approach for this condition has undergone a significant transformation, shifting away from conventional surgical methods towards minimally invasive endovascular techniques. This paradigm shift offers a less invasive and more refined approach to treating anastomotic pseudoaneurysms. Here, we would like to present a peculiar case of proximal anastomotic axillofemoral bypass pseudoaneurysm in a patient with pacemaker which was successfully treated with placement of a covered stent.

Case Report: A complex case of a 58-year-old gentleman, with history of bilateral above-knee amputations and past medical history of infrarenal abdominal aortic mycotic aneurysm in 2021, which was surgically treated by aneurysmal ligation and axillobifemoral bypass graft placement. The surgery was complicated several times by graft infection and thrombosis; hence it was revised and a left axillofemoral graft was placed. The patient also had a concurrent symptomatic complete heart block treated with the placement of permanent pacemaker in August 2022. He presented this time again with swelling, bleeding and pus discharged from the left anterior chest wall adjacent to the axillary region. A contrasted CT angiography done revealed presence of left axillofemoral graft pseudoaneurysm at the proximal anastomotic side adjacent to the pacemaker. An angiogram was done at the subclavian artery via transbrachial approach to measure the size of the aneurysm. Subsequently a Covera Plus vascular-covered stent was placed at the aneurysmal side. Post-placement angiogram showed stent in situ with resolved pseudoaneurysm.

Conclusion: By adopting minimally invasive endovascular interventions, healthcare professionals can achieve successful outcomes while minimizing patient discomfort and recovery time. These advanced techniques have opened up new possibilities for managing anastomotic pseudoaneurysms, providing improved patient care and long-term outcomes.

EP27

RECURRENT LARYNGEAL NERVE PALSY: AN UNEXPECTED COMPLICATION OF RADIOFREQUENCY ABLATION OF LUNG METASTASIS

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Introduction: The usage of radiofrequency ablation (RFA) therapy is now more widespread to involve many types of tumors. Despite its good safety profile, minor complications involving recurrent laryngeal nerve injury is rare and not well-recognized by interventional radiologists leading to treatment delay.

Case Report: We present a case of a 65 year old female patient with underlying caecal adenocarcinoma complicated with isolated lung metastasis in which two nodules were unresponsive to chemotherapy and treated with RFA. RFA of the right apical upper lobe nodule has inadvertently resulted in recurrent laryngeal nerve injury. Patient was initially planned for injection laryngoplasty (IL) however, her symptoms resolved spontaneously within three months after procedure.

Conclusion: We would like to emphasize on the importance of recognizing this rare complication, thus a more constructed informed consent could be done to patients and better preparation towards preventive methods could be applied, as disastrous outcomes may be inevitable.

EP28

"BROKEN PIECES": A CASE SERIES

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Introduction: The insertion of catheters for diagnostic and therapeutic purposes are widely regarded as reliable and safe. However, risks of fractured or dislodged catheters still exist, and these risks are unforeseen. We present case series of fragmented catheters during interventional angiography and discuss technical details of each case.

Report:

Case 1: 50 years old gentleman with left temporal lobe arteriovenous malformation underwent cerebral angiogram complicated with fragmented catheter at left CCA-ICA junction with secondary fracture and its segments migrated to mid-segment right ICA. The fragmented piece was successfully retrieved by React Aspiration catheter 0.071. On follow up, no neurological deficit.

Case 2: 75 years old gentleman with hepatocellular carcinoma underwent transchemoembolization complicated with fragmented catheter. The shorter fragment lodged at small branch of the left profunda femoris artery. The longer fragment lodged at left middle segmental renal artery. Few attempts of retrieval via Snare 6Fr, flower loop and micro snare however unsuccessful. On follow up, no renal impairment or lower limb disability.

Case 3: 76 years old gentleman underwent central venogram and plasty for central venous occlusion. Noted fractured catheter tip during manipulation, fractured fragment was in right atrium. Trial of snare using modified snare 0.035" x 150cm guide wire. Fragment dislodge to pulmonary trunk, flush aortogram performed with pigtail catheter. Retrial snare using pigtail catheter, En Snare 6Frx120cm and was successful with Multisnare 4Frx125cm. Central venoplasty was successful.

Conclusion: To summarize, while endovascular procedures appear to be safe, intravascular fragmented catheter complications needs to be highlighted. It can be mitigated with proper device selection, precautions and knowledge of such retrieval techniques is at utmost priority.

EP29

SUCCESSFUL ENDOVASCULAR APPROACH OF COMPLEX IATROGENIC FEMORAL ARTERY INJURIES

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Introduction: Iatrogenic injuries to the femoral artery have become more common in recent years due to the increase in percutaneous transfemoral catheterization procedure. Among all manifestation of vascular injuries, femoral artery pseudoaneurysm represent the most common iatrogenic femoral vascular injury. Interventional radiological treatment has evolved and replaced surgical intervention.

Case Report: We reported a case of 36 years old patient who underwent femoral vein catheterization attempt for dialysis vascular access complicated with complex iatrogenic bilateral femoral artery injuries. Patient developed right bilobed pseudoaneurysm arising from the right superficial femoral artery and left pseudoaneurysm arising from medial circumflex artery, branching from the left common femoral artery with arteriovenous fistula involving the left superficial femoral artery and left femoral vein. Successful closure of these bilateral complex femoral artery injuries by using endovascular stent placement, coiling and gelfoam embolization.

Conclusion: Radiology offers effective minimally invasive techniques to treat vascular injuries. A practical imaging examination to localize the injury and to assess the surrounding structures and vascular anatomy is essential for deciding on the intervention technique. The endovascular approach has proven beneficial in the treatment of femoral vascular injuries and reduces morbidity and mortality rates.