# IVC Filter Removal Technique: A Case Report and Systematic Review of the Hangman's Wire Loop Technique

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**ABSTRACT:**
Inferior vena cava (IVC) filters are critical tools in preventing venous thromboembolism (VTE) in patients with contraindications to anticoagulation. However, prolonged filter dwell times can lead to complications such as tilt, embedded hooks, and caval wall penetration, making retrieval challenging. Advanced techniques like the Hangman's wire loop method have emerged as effective solutions for these complex cases. We present a case report detailing the successful use of the Hangman's wire loop technique to remove an embedded IVC filter and review the literatures comparing its success rates to other advanced retrieval methods. The Hangman's technique consistently demonstrates high success rates (81.8%–100%) and minimal complications, making it a valuable tool for interventional radiologists managing difficult IVC filter retrievals.

**Keywords:** Inferior Vena Cava Filters, Hangman's Wire Loop, Venous Thromboembolism

## INTRODUCTION

Inferior vena cava (IVC) filters are widely used to prevent pulmonary embolism (PE) in patients at high risk for venous thromboembolism (VTE), particularly those with contraindications to anticoagulation therapy [1]. While effective in acute settings, prolonged retention of IVC filters can lead to complications such as filter tilt, migration, fracture, caval thrombosis, and strut penetration into adjacent structures [2-7].

Retrieval of IVC filters becomes increasingly difficult with longer dwell times due to tissue overgrowth, intimal hyperplasia, and embedding of filter components into the caval wall. Routine snare techniques often fail in cases with severe tilt or embedded hooks, necessitating advanced retrieval methods [4,6,8-11].

The Hangman's wire loop technique is a specialized method designed for challenging cases involving tilted or embedded filters. It involves creating a strong wire loop between the filter neck and caval wall using a pigtail catheter and snare device. By forming a strong wire loop around the filter neck, this technique facilitates the release of embedded hooks and allows safe removal of the filter, illustrated in Figure 1. This setup applies sufficient traction to release embedded hooks while minimizing trauma to surrounding tissues. This manuscript presents a case report illustrating the use of this technique and reviews its performance compared to other advanced retrieval methods [4,8,10,12-16].

## CASE REPORT

A 77-year-old female with locally advanced right breast invasive carcinoma and a history of right lower limb DVT required a retrievable IVC filter placement due to an upper gastrointestinal bleed while on anticoagulants. Several months later, her clinical condition improved, and retrieval was attempted via a right internal jugular vein approach using a 12-Fr Check-Flo Performer® sheath (Cook Medical). Initial venography revealed the filter was severely tilted, with the retrieval hook embedded within the caval wall, preventing engagement with a standard snare.

To facilitate retrieval, a 5-Fr pigtail catheter was introduced through the sheath and maneuvered through the struts of the tilted filter to create a loop around its neck. A 0.035-inch hydrophilic Glidewire (Terumo) was advanced through the pigtail. The pigtail's curved tip allowed for precise directional control, maintaining a safe distance of approximately 3 - 5 mm from the caval wall to avoid mechanical injury. The retrieval device was then used to snare this wire loop, forming the "Hangman's loop". Gentle cephalad traction was applied, providing the mechanical leverage to displace the filter from the wall and successfully dislodge the embedded hook from the intimal hyperplasia tissue. Once coaxial alignment was restored, the filter hook was snared and removed en bloc using traditional methods. The procedural steps was shown in Figure 2. Post-procedural imaging confirmed no evidence of caval injury or thrombus formation. The patient recovered uneventfully and remained free from VTE recurrence during follow-up.

## METHODOLOGY

A systematic search was conducted using PubMed, EMBASE, and other databases for articles published between 2012 and 2025 on advanced IVC filter retrieval techniques focusing on Hangman's wire loop modifications. Keywords included "Hangman technique," "IVC filter removal," "wire loop," "embedded hook," and "tilted filter." Studies were included if they reported procedural outcomes using this technique or its modifications.

## RESULTS

The success rates among different modifications are summarized in Figure 3 and Table 1. The literature includes several studies describing variations of the Hangman's wire loop technique:

1. **Original Hangman Technique** [17]:
    - Success rate: 81.8% (Al-Hakim et al.)
    - Indications: Severe tilt (mean tilt: 13.3° ± 3.9°), prolonged dwell times (mean: 194 days)

- Complications: None reported

2. **Low-Profile Hangman Technique** [18]:
   - Success rate: Initial 95.6%, overall 100%
   - Advantages: Uses an 11-F sheath instead of larger systems, reducing procedural risks
   - Complications: None reported
3. **Other Modified Techniques**:
   - Success rate: Initial 85%, overall 90%
   - Methods: Combined use of wire loops with balloon displacement or forceps dissection
   - Complications: <1%

## DISCUSSION

The findings of our literature review suggest that the low-profile modification of the Hangman's technique consistently demonstrates superior success rates compared to both the original technique and other advanced methods [17, 18]. A key advantage of the low-profile approach is the use of smaller sheaths, which reduces the risk of access-site trauma while maintaining efficacy.

A critical component of this success is the pigtail catheter's curved design. Unlike standard straight or angled catheters, the 360-degree distal curve allows for precise maneuvering through filter struts in a non-coaxial plane [8,19]. This curvature acts as a protective "bumper" against the caval wall. Furthermore, the pigtail serves as a fulcrum; when traction is applied to the wire loop, the catheter's curve helps translate the pulling force into lateral displacement, effectively 'peeling' the filter hook away from the intima without damaging the caval wall [8,10].

This method is specifically indicated for filters with severe tilt or those with hooks completely incorporated into the caval wall [12, 13]. However, in cases of extreme strut penetration into adjacent structures (e.g., aorta or vertebrae), alternative methods like balloon-assisted displacement might be preferable to avoid excessive focal force on the venous wall [16]. Additionally, acute thrombus within the filter remains a relative contraindication [5, 6].

Other methods, such as endovascular forceps dissection, often require specialized equipment available only at quaternary referral centers [9,11]. In contrast, the Hangman's technique is a 'real-world' solution utilizing standard pigtail catheters and snares [8,10,17], making it accessible and cost-effective for standard interventional practices.

## CONCLUSION

Advanced techniques like the Hangman's wire loop method provide effective solutions for retrieving challenging IVC filters complicated by tilt or embedding within caval walls. The low-profile modification offers significant advantages in terms of safety and feasibility while achieving high success rates comparable to other advanced methods.

Future research should focus on multicenter trials evaluating long-term outcomes post-retrieval using these techniques to refine clinical guidelines for complex IVC filter removal scenarios, which in turn will benefit the patients.

## CONFLICTS OF INTEREST

The authors have no potential conflicts of interest to disclose and are in agreement with the contents of the manuscript.

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**TABLE LEGEND:**

Table 1: Success rates across Hangman's Wire Loop Technique Modifications

| Technique | Initial Success Rate (%) | Overall Success Rate (%) | Complication Rate (%) |
|---|---|---|---|
| Original Hangman Technique | 81.8 | 81.8 | 0 |
| Low-Profile Hangman Technique | 95.6 | 100 | 0 |
| Other Modified Techniques | 85 | 90 | <1 |

**FIGURE LEGEND:**

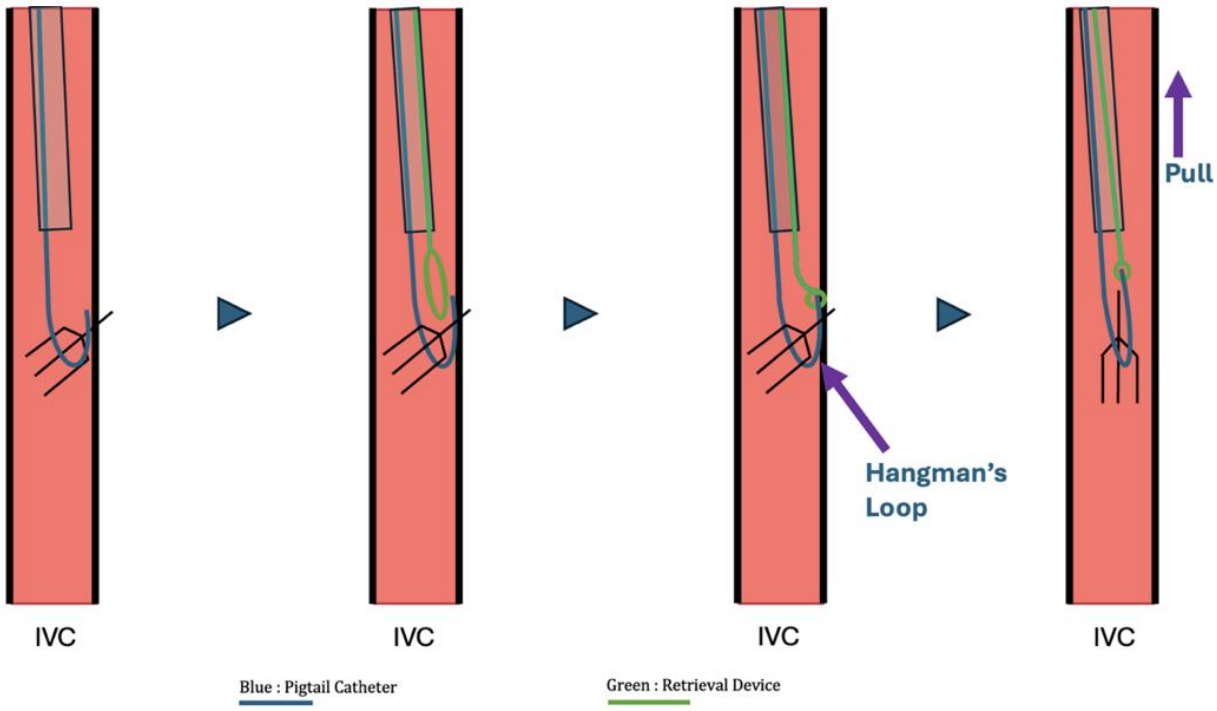


Figure 1: Schematic Diagram showing step by step of Hangman's wire loop technique for IVC filter removal

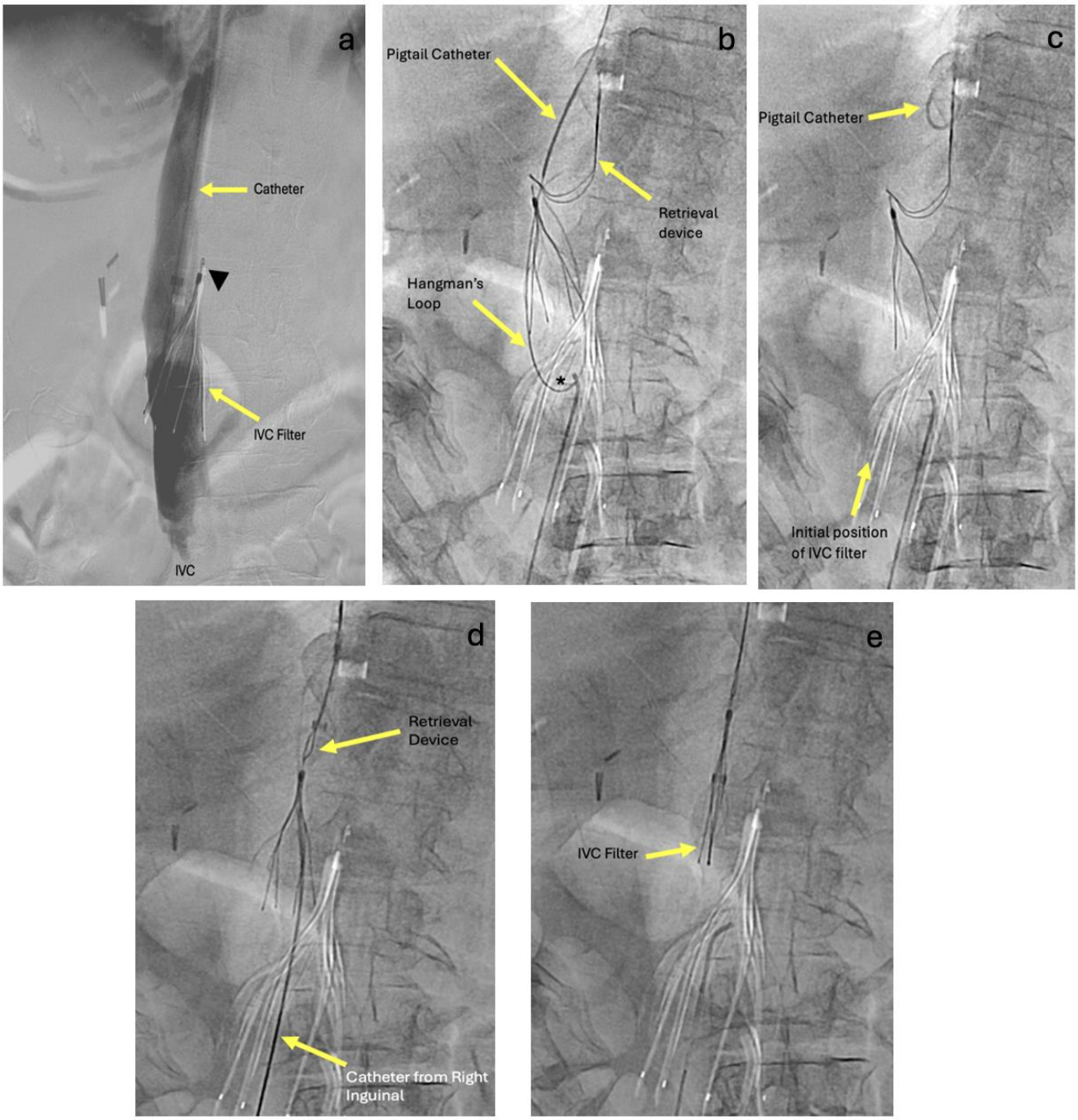


Figure 2: Procedural steps of the Hangman's wire loop technique. DSA showing the IVC filter in situ with the hook embedded within the caval wall (arrowhead) **(a)**. Formation of the Hangman's loop **(*)** by snaring the pigtail catheter tip **(b)**. Position of the filter before and after the application of the technique, demonstrating restoration of coaxial alignment **(c)**. Following the release of the filter from the caval wall using the Hangman's loop, the hook is successfully captured and retrieved via standard snaring **(d–e)**

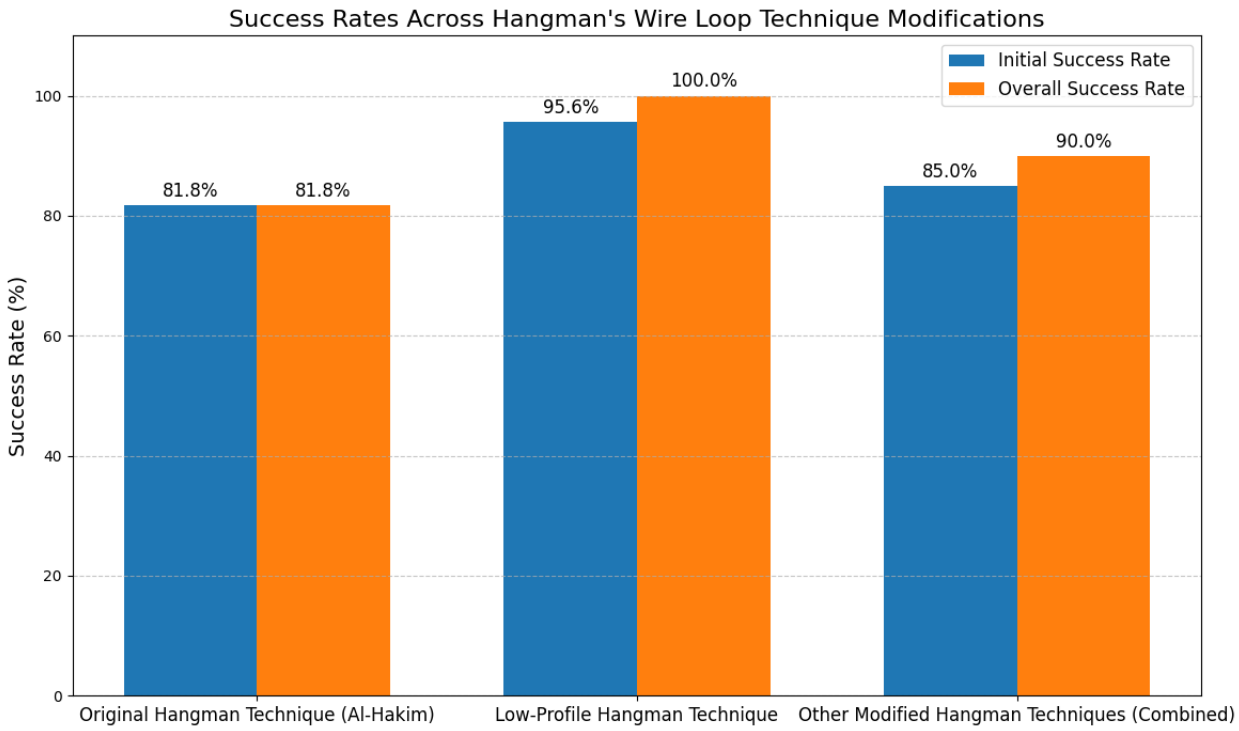


Figure 3: Success rates across Hangman's Wire Loop Technique Modifications

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# PRE - OPERATIVE EMBOLIZATION OF PHYLLODES BREAST TUMOR IN PREGNANT PATIENT: PRE-PROCEDURE SIMULATION PROTOCOL AND RADIATION SAFETY MEASURES

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Phyllodes tumour is a rare and benign connective tissue breast tumors with malignant potential. We report a case of a 40-year-old female pregnant at 16 weeks with an enlarging, large left phyllodes breast tumor (>20 cm). Patient was referred for pre-operative embolization prior to mastectomy. Given the potential risks of ionizing radiation to the developing fetus, pre-procedure simulation was performed to formulate radiation protection measures as well as estimate fetal dose to facilitate counseling. A phantom was created with lead apron to protect the "fetus". Dose to "fetus" and left breast was measured using real time dose monitoring system during fluoroscopic screening (10 seconds, 1 minute and 5 minutes), angiographic runs (10 seconds) and cone beam computed tomography (CBCT). During simulation, there was nil dose to "fetus" during screening from radial approach while dose of 0.016 mSV was detected via femoral approach. Continuous screening of 5 minutes incurred dose of 2.598 mSv to the breast while dose to "fetus" was 0.018 mSv. Cone beam CT incurs low dose to "fetus" (0.018 mSv). A multidisciplinary team consisting of interventional radiologist, radiographer, medical physicist, surgeon and obstetrician collaborated for counselling and implementation of radiation protective measures such as radial approach, abdominal shielding, short fluoroscopic times, low-dose fluoroscopy settings, pulsed fluoroscopy, low acquisition frame and strategic collimation. Left radial approach embolization was performed and fetal monitoring post-procedure showed no signs of distress. The estimated dose during embolisation was 0.104 mSv to fetus. Total exposure remained well below the 50 mGy threshold associated with deterministic effects. This case highlights the importance of radiation dose data to enhance patient understanding and support shared decision making in sensitive cases involving pregnancy. Radial approach, appropriate shielding and short fluoroscopic times are critical to ensure low dose during procedures in pregnancy.

# ENDOVASCULAR TREATMENT OF INADVERTENT CAROTID ARTERY PUNCTURES: A CASE SERIES FROM PPUKM EXPERIENCE

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This case series examines the endovascular management of iatrogenic common carotid artery injuries secondary to central venous catheterization. Immediate recognition and appropriate intervention are essential to mitigate the risk of catastrophic complications, including cerebral ischemia, hemorrhage, and death. The first case involved closure of a carotid-jugular fistula using a self-expanding covered stent, restoring vessel patency without the need for open surgical intervention. The second case presented with direct arterial perforation and active extravasation, managed by deployment of a covered stent to maintain luminal patency and achieve hemostasis. The third case encompassed a complex case of near bifurcation injury involving the brachiocephalic and right common carotid arteries, necessitating simultaneous placement of kissing stents to preserve both cerebral and peripheral flow. Technical challenges included the dynamic mobility of cervical vessels, necessitating meticulous device selection, sizing, and deployment under angiographic guidance. Particular attention was directed toward minimizing baroreceptor-mediated hemodynamic disturbances during balloon angioplasty near the carotid sinus. No major peri-procedural adverse events were observed. These findings underscore the efficacy of endovascular techniques as first-line therapy in the management of iatrogenic carotid injuries, offering definitive treatment with reduced morbidity compared to open surgical repair.

# SPONTANEOUS REGRESSION OF CAVERNOMA: A RARE PHENOMENON ON SERIAL MRI BRAIN IMAGING

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**Introduction:** Cavernomas are vascular malformations that usually remain stable or enlarge due to hemorrhages. Spontaneous regression is extremely rare. Recognition of such behavior is crucial for appropriate management strategies.

**Case Report:** A 38-year-old male presented with focal seizures. Initial MRI demonstrated a right parietal cavernoma characterized by a "popcorn" appearance and blooming artifact on GRE sequences. Serial follow-up MRIs at six and twelve months showed progressive lesion shrinkage without any intervention. The patient remained seizure-free with medical management alone.

**Conclusion:** Spontaneous regression of cavernomas, though rare, can occur. Serial imaging plays a vital role in monitoring lesion dynamics and helps avoid unnecessary surgical interventions in asymptomatic patients.

# OPTIMIZING RADIOGRAPHER INVOLVEMENT IN TACE PROCEDURES USING EMBOLIZATION GUIDANCE: A COMPARATIVE ANALYSIS

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**Introduction:** Transarterial Chemoembolization (TACE) is a critical interventional procedure in the management of hepatocellular carcinoma (HCC), requiring precision in the delivery of therapeutic agents. The adoption of embolization guidance software, such as Embolization Plan, has significantly improved procedural accuracy and safety. Radiographers are central to the success of these advancements, optimizing imaging protocols and assisting with feeder vessel identification. This comparative analysis evaluates the effect of Embolization Plan on procedural time and radiation dose during TACE, and to highlight the enhanced role of radiographers in interventional radiology workflows.

**Method:** A retrospective analysis was conducted comparing data from:
2024: TACE without Embolization Plan (n=3)
2025: TACE with Embolization Plan (n=3)
Samples were randomly selected using different angiography machines. Average procedure times and radiation doses were analyzed.

**Result:**

| Year | Embolization Plan Used | Average Procedure Time (minutes) | Average Radiation Dose (mGy) |
|---|---|---|---|
| 2024 | No | 71.1 | 2243.4 |
| 2025 | Yes | 37.27 | 1634.07 |

Key Findings:
Procedure Time Reduction: 47.6%
Radiation Dose Reduction: 27.2%

**Conclusion:** Implementation of Embolization Plan during TACE procedures substantially decreases both procedural duration and radiation exposure. Radiographers, through advanced imaging techniques and technological proficiency, are instrumental in achieving these improvements. Ongoing professional development and adoption of image-guidance tools are essential for future interventional radiology practices.

# UPPER ARM CHEMOPORT PLACEMENT IN BREAST CANCER PATIENTS: TECHNICAL FEASIBILITY AND PATIENT-CENTERED OUTCOMES

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**Introduction:** Central venous access is critical for administering chemotherapy in breast cancer patients. Traditional chest wall ports may not be ideal for patients with bilateral breast cancer ,for reasons such as surgical reconstruction, radiation therapy, or lymphedema. Upper arm chemoports have emerged as a viable alternative.

**Case Series:**
Case 1: A 54-year-old woman with metastatic breast cancer has undergone left mastectomy and axillary clearance with adjuvant chemotherapy and radiotherapy. Later, she experienced inflammatory changes over her right breast and left neck which require a chemoport implanted in her right arm for further chemotherapy.
Case 2: A 59-year-old lady was diagnosed with right breast carcinoma, underwent right mastectomy and axillary clearance with chemotherapy. However, post-operative had persistent right axillary nodes, which require further radiotherapy to right axilla and chest wall. Noted lesion/lipoma adjacent to left jugular vein. Left upper arm chemoport inserted for her adjuvant chemotherapy.
In our centre, upper arm chemoport placement is performed under local anesthesia. Using ultrasound guidance, the basilic vein is accessed, and catheter is advanced into the superior vena cava under fluoroscopic guidance with help of glidewire. A subcutaneous pocket is then created on the mid upper arm on top of the biceps muscle for easy access and needling.

**Results:** Both patients reported overall comfort with upper arm chemoports, particularly appreciating the discreet placement away from the chest and surgical sites. The location allows for improved mobility, easier dressing changes and self-care, and minimal interference with daily activities such as sleeping or wearing undergarments. They experienced mild discomfort and brusing at the port site post procedure however resolved within the first week. This technique lowers the risk of local complications, avoids surgical fields and radiation zones

**Conclusion:** Arm chemoports represent a technically feasible, safe, and patient-preferred alternative for breast cancer patients especially in bilateral disease.

# CONTRAST STAINING POST-THROMBECTOMY: A DIAGNOSTIC PITFALL MIMICKING HEMORRHAGIC TRANSFORMATION

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Contrast staining can mimic intracranial hemorrhage following mechanical thrombectomy, posing a diagnostic challenge. We present a case of a 70-year-old woman who underwent mechanical thrombectomy for acute left middle cerebral artery (MCA) territory infarct. Post-procedure imaging revealed a hyperdense area in the left basal ganglia, initially suspected to be hemorrhagic transformation. However, delayed imaging confirmed contrast staining, highlighting the importance of differentiating between these entities. This distinction is critical for appropriate clinical decision-making, avoiding unnecessary interventions and delays in initiating anticoagulation. As contrast staining is a transient and benign phenomenon that typically resolves within 24-48 hours, careful interpretation of post-thrombectomy imaging is crucial to optimize patient management.

# WUNDERLICH SYNDROME IN PREGNANCY: NAVIGATING THE DIAGNOSTIC AND THERAPEUTIC DILEMMAS

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**Introduction:** Wunderlich syndrome is characterized by spontaneous non-traumatic renal haemorrhage which is commonly caused by a myriad of aetiologies with tumours such as renal angiomyolipoma (AML) being the commonest cause. Pregnancy has been identified as a risk factor for AML rupture due to its hormonal and physiological influences, presenting a unique challenge when it comes to their management.

**Report:** A pregnant patient in her 30s presented with sudden left abdominal pain at 15 weeks of gestation with no history of previous trauma. Ultrasound showed a large well defined hyperechoic lesion in the mid pole of the left kidney with surrounding perinephric hematoma. MRI abdomen showed a heterogenous lobulated renal mass arising from the mid pole of the left kidney with surrounding acute perinepheric hematoma, supplied by segmental arteries in keeping with an actively bleeding AML. The patient underwent angioembolization at 15 weeks of pregnancy with limited radiation exposure to the fetus and has recovered well post-procedure. She continued with her pregnancy and is due to deliver June of 2025.

**Conclusion:** In cases of bleeding AML in pregnant patients, an individualized approach with multidisciplinary team management is necessary to ensure both maternal and foetal safety while optimizing the outcomes in this unique patient population.

# LATE, BUT NOT TOO LATE: REAL-EXPERIENCE OF EXTENDED WINDOW THROMBECTOMY

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Stroke is a major public health issue in Malaysia, ranked as the third leading cause of death. In 2019, approximately 47,911 new stroke cases were recorded, resulting in 19,928 fatalities. Mechanical thrombectomy (MT) is a standard treatment for acute ischemic stroke (AIS) due to large vessel occlusion (LVO), typically performed within six hours of symptom onset. For acute occlusion of a major artery with extended time window (6–24 hours), mechanical thrombectomy has been shown to offer greater benefits than medical treatment, particularly in patients with a mismatch between clinical symptoms and the ischemic core. However, the efficacy of MT is not fully explored in practical settings for extended time window. This study aims to present our center's experience with endovascular thrombectomy (EVT) beyond the extended time window. Baseline imaging including non-contrast CT brain, CTA brain, and CT brain perfusion were done prior to MT. Stroke severity was assessed with the National Institutes of Health Stroke Scale (NIHSS). Patient clinical outcomes such as functional recovery, mortality, and complications like intracranial hemorrhage, were evaluated through serial CT brain imaging and assessment. We reported 3 case series of mechanical thrombectomy in extended time window more than 24 hours with variable outcome.

# A SILENT VASCULAR TIME BOMB: A RARE PULMONARY ARTERY PSEUDOANEURYSM FROM METASTATIC ELBOW EPITHELOID SARCOMA IN A YOUNG ADULT TREATED WITH AMPLATZER PLUG EMBOLIZATION

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Pulmonary artery pseudoaneurysm (PAP) is an exceedingly rare condition with high mortality rate if left untreated. Often detected incidentally on imaging, PAPs can present with massive haemoptysis upon rupture. Trauma and infectious diseases are the most common causes, while less frequent etiologies include vasculitis, neoplasm, congenital disease, and pulmonary hypertension. CT angiography remains diagnostic gold standard, aiding in treatment planning. We present a potentially life-threatening case of an intratumoral PAP in an 18-year-old man with underlying metastatic right elbow epithelioid sarcoma. He presented with shortness of breath and tachypnoea due to malignant pleural effusion secondary to lung metastases. Contrast-enhanced CT thorax incidentally revealed a large necrotic right lung mass with an intratumoral pseudoaneurysm arising from the right interlobar pulmonary artery. Although PAPs can be clinically silent, they typically manifest with symptoms like dyspnoea, chest discomfort, or massive haemoptysis. Rupture can lead to catastrophic pulmonary haemorrhage, necessitating timely intervention. Definitive treatment comprise of surgical resection and endovascular embolization. In this case, the pseudoaneurysm was successfully embolised using an Amplatzer vascular plug, .Post-procedural imaging confirmed complete sac exclusion with no active haemorrhage. We will like to discuss our technique in achieving a successful delivery of a vascular plug to the site of pseudoaneurysm.

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# PATIENT FOLLOW UP PROCEDURE FOR TISSUE REACTION EFFECT IN INTERVENTIONAL RADIOLOGY: HOSPITAL SUNGAI BULOH EXPERIENCE

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**Introduction:** Radiation exposure in Interventional Radiology (IR) procedures is often high, particularly involving complex procedure such as Neuro Interventional. It is important to monitor the patient post-procedure condition by knowing the patient's radiation dose value by observing the tissue reaction effect that may appear on patients. The follow up procedure for tissue reaction effect has been established in Hospital Sungai Buloh and few cases have been identify since. The aim of this study is to share experience of the implementation the follow up procedure and rectify any improvement that may be useful in strengthen the program.

**Method:** Patient's Cummulative Dose Air Kerma (CDAK) were being monitored. Any patients received CDAK of 3Gy were notified and patient follow up procedure for tissue reaction effect were being initiated. The result of monitoring was recorded into the Hospital Information System during the ward staying and Interventional Radiology Clinic. Analysis on the radiation doses was conducted by considering the tissue reaction effect and the patient's condition.

**Result:** Between 2022 and 2024, it is reported that 86 patients received CDAK exceeding 3Gy. Among the patients, 3 were reported to demonstrate tissue reaction effect with minimum radiation doses of 6Gy. All reported tissue reaction effect were able to recover within the recovery phase and monitored regularly during IR clinic appointment.

**Conclusion:** It is concluded that the patients follow up procedure in this need to be revise with few improvements; to increase the alert level to 5Gy for each of the plane and to 8Gy for dermatology referral since most of the tissue reaction effect were fully recovered within the recovery phase.

# SONOGRAPHY GUIDED CORE NEEDLE BIOPSY OF THE ABERRANTLY POSITIONED SUPRASTERNAL THYMOMA VIA SUPRASTERNAL ROUTE

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Thymoma is a rare epithelial malignancy of the thymus, in which typically develop in anterior mediastinum. A pre-operative biopsy of the thymic tumour play an important role in multi-disciplinary teams' management, as treatment approach could differ drastically according to the histologic subtype of the tumour. Here we report a case of an exceeding rare aberrantly positioned suprasternal thymoma. A 34-year-old radiology resident doctor was initially presented with thyrotoxicosis with evidence of Graves' thyroiditis. Ultrasonography of the thyroid gland was performed for Grave's disease showing incidental finding of hyperechoic mass inferior to left thyroid lobe and suprasternal region. Subsequent computed tomography detected a 12.2cm soft tissue mass in anterior mediastinal with suprasternal extension. In view of limited biopsy window and atypical location, ultrasonography guided percutaneous core needle biopsy was done via suprasternal approach in consideration of the vascular structures. Histopathology examination was concerning for both type B1 thymoma and thymic hyperplasia. She ultimately underwent modified sternostomy and thymectomy as diagnosis uncertainty persisted. The anomalously positioned thymus could lead to diagnostic uncertainties. This case highlighted the unique challenge in sonography guided core needle biopsy of ectopic thymus through the suprasternal route, especially useful in case of limited window for parasternal biopsy.

# TRANSARTERIAL PRESSURE-COOKER TECHNIQUE EMBOLIZATION OF A COMPLEX DURAL ARTERIOVENOUS FISTULA THROUGH SINGLE FEEDER CATHETERIZATION: TECHNICAL SUCCESS IN A SINGLE SESSION

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The pressure-cooker technique (PCT) is a known endovascular approach for treating dural arteriovenous fistulas (DAVFs), offering better patient outcome. We report a case of successful embolization of a complex DAVF using this technique. A 68-year-old Malay gentleman presented with sudden-onset giddiness upon awakening, associated with multiple episodes of vomiting. CT brain revealed acute intraventricular hemorrhage and subarachnoid hemorrhage at the basal cisterns and tentorium cerebelli. Cerebral angiography confirmed a complex right occipital DAVF with multiple feeders from the right occipital, posterior auricular, superficial temporal, and posterior cerebral arteries, draining into dilated, tortuous cortical veins, internal cerebral vein, vein of Galen tributaries, and left superficial middle cerebral vein. Transarterial embolization was performed with tandem superselective cannulation of the distal branches of the right superficial temporal artery using Sonic and Headway microcatheters. The Headway microcatheter tip was placed proximal to the Sonic microcatheter, between the first and second markers. Two coils were deployed via the Headway catheter, followed by slow, controlled injection of 2.6 mL Squid liquid embolic agent into the fistula through the Sonic catheter. Post-embolization angiography confirmed complete occlusion of the fistula with no early venous drainage. This case highlights the efficacy of PCT via single feeder catheterization in complex DAVFs.

# ADVANCEMENTS IN FORENSIC INVESTIGATION: CLINICAL POST-MORTEM CT GUIDED BIOPSY AS ADJUNCT DIAGNOSTIC TOOL IN COVID-19 PNEUMONIA DEATH

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Coronavirus disease (COVID-19) has caused significant increase in the number of death worldwide with at least 3 million reported death. On 11 March 2020, COVID-19 is declared as pandemic by WHO. Clinical post-mortem (CPM) CT guided biopsy is a rare tool that is being utilized by the forensic department which may provide additional information in COVID-19 pneumonia death. We conducted CPM CT guided biopsy to a 57-year-old man with no comorbid, initially presented to emergency department (ED) with cough for 3 days and shortness of breath for 1 day. He was intubated at ED for impending respiratory collapse and diagnosed as COVID-19 pneumonia based on rapid test kit swab. Incidentally, his blood result showed significantly elevated Troponin T (5842) and he was co-treated as NSTEMI. He succumbs after 24 hours despite receiving intensive care. Clinician in charge requested CPM CT guided biopsy to rule out NSTEMI as the cause of death. Procedure was performed with family consent and histopathological examination (HPE) report of the lungs showed both exudative and organizing diffuse alveolar damage in keeping with organizing phase of acute respiratory distress syndrome (ARDS) induced COVID-19. Polymerase chain reaction (PCR) test and immunostaining of biopsy specimens are positive for COVID-19. COVID-19 pneumonia death is concluded by forensic department. Subsequently, HPE report of the left ventricle later revealed area of necrotic tissue likely to be contributed by old infarct. Correlating with his initial elevated Troponin T level, myocardial infarction is a consideration for other cause of death. Nevertheless, post-mortem percutaneous needle biopsy able to provide additional information in the event of COVID-19 pneumonia death and effective in reducing the risk of contagiousness than conventional autopsy.

# TARGETED EPIDURAL BLOOD PATCH VIA POSTERIOR TRANSFORAMINAL APPROACH IN VENTRAL CSF LEAK: A CASE-BASED PERSPECTIVE

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**Introduction:** Cerebrospinal fluid (CSF) leaks can manifest as persistent, debilitating headaches post-lumbar puncture or spontaneously, particularly when ventral in location. When conservative management fails, an epidural blood patch (EBP) offers a minimally invasive, image-guided intervention that is both diagnostic and therapeutic. Despite its long-standing history, the modern evolution of EBP—especially via transforaminal targeting of the ventral epidural space—has revitalized its role in precision neurointervention.

**Case Report:** We present a case of a 34-year-old Malay female with persistent postural headache following diagnostic lumbar puncture. MRI confirmed a ventral CSF leak. Under fluoroscopic guidance, an epidural blood patch was performed via the right L2-3 posterior transforaminal approach, delivering 15cc of autologous blood precisely to the ipsilateral third of the ventral epidural space.

**Results:** The patient reported significant symptom relief immediately post-procedure, with complete resolution within 24 hours. Pain score improved by approximately 30% within the first hour following the procedure. No complications were observed. The case emphasizes the efficacy and safety of targeted EBP, particularly in ventral leaks where interlaminar access may be insufficient.

**Conclusion:** Epidural blood patching, when executed with precision and under image guidance, remains a fascinating and evolving technique. Transforaminal approaches represent a significant advancement, especially in treating elusive ventral CSF leaks. This case demonstrates the value of strategic access planning, emphasizing the intersection between radiological expertise and clinical neuroscience.

# PREDICTIVE VALUE OF FLAIR HYPERINTENSE VESSELS SIGN FOR LARGE VESSEL OCCLUSION IN HYPERACUTE STROKE

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**Introduction:** Early identification of Large Vessel Occlusion (LVO) in hyperacute stroke is crucial for timely intervention. This study investigates the predictive value of Fluid-Attenuated Inversion Recovery (FLAIR) Hyperintense Vessels Sign (FHVS) for LVO in hyperacute stroke patients.

**Method:** A retrospective cohort study was conducted at Hospital Pengajar Universiti Putra Malaysia, analyzing data from 102 patients with hyperacute stroke who underwent MRI within 6 hours of symptom onset between May 2020 and January 2025. FHVS presence on FLAIR imaging was correlated with LVO confirmed by subsequent vascular imaging.

**Results:** FHVS was present in 48 of 50 cases with confirmed LVO. The sensitivity of FHVS for predicting LVO was 96%, with a specificity of 100%. Multinomial logistic regression indicated a strong correlation between FHVS and severe stenosis in the M1 segment of the middle cerebral artery.

**Conclusion:** FHVS demonstrates high sensitivity as a predictor of LVO in hyperacute stroke, supporting its potential as a valuable non-invasive screening tool for early LVO detection.

# IMAGE-GUIDED BLEOMYCIN SCLEROTHERAPY WITH POPESCU SUTURING IN TWO PAEDIATRIC CASES OF LOWER LIP VASCULAR MALFORMATIONS

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Vascular malformations are congenital vascular anomalies that can be further classified based on flow dynamics and vascular anatomy. Vascular malformations of the lip, commonly venous in nature, are highly vascular lesions associated with significant cosmetic concerns. Treatment of lip venous malformation is often challenging. Percutaneous sclerotherapy has now become the preferred treatment modality, with various protocols and sclerosing agents proposed. Among the widely used agents are ethanol and 3% sodium tetradecyl sulfate. However, both are associated with higher complication risks. Bleomycin has recently emerged as a promising alternative, offering a more favourable safety profile and fewer complications. However, due to the high vascularity and rapid venous drainage of the lip venous malformation, the local sclerosant agents are often cleared rapidly into the systemic circulation, causing reduced local efficacy and increased risk of systemic complications. This poses a challenge in achieving effective and safe sclerotherapy. The Popescu suturing technique introduced in 1985, addresses this issue by compartmentalizing the lesion through a series of intratumoral strangulating sutures. This method restricts venous outflow, allowing for prolonged local retention of the sclerosing agent. It enhances localized drug concentration while minimizing systemic dissemination, as the lesion is divided into isolated compartments by strangulating suture loops. We present two cases of lower lip vascular malformations in a 5-year-old girl and a 13-year-old boy, both treated with image-guided intralesional bleomycin injection in combination with the Popescu technique. Both patients showed significant clinical improvement and achieved satisfactory aesthetic outcomes.

# TRANSARTERIAL BLEOMYCIN TREATMENT FOR LIVER HEMANGIOMA

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Although typically benign, giant liver hemangiomas can lead to significant symptoms and torrential bleeding, warranting appropriate treatment. This case report highlights selective transcatheter arterial chemoembolization (TACE) with bleomycin–lipiodol emulsion as a treatment approach. A 54-year-old male was diagnosed with a giant hepatic hemangioma and underwent TACE between November 2023 and March 2024. Initially, the patient was subjected to bland transarterial embolization (TAE) with polyvinyl alcohol (PVA). After two sessions, the hepatic hemangioma remained similar in size despite selective embolization. Hence, we decided to infuse a bleomycin-lipiodol emulsion. After two additional sessions, follow-up imaging showed a size reduction of more than 50%. This report demonstrates that selective TACE with bleomycin–lipiodol emulsion is a safe and effective non-surgical option for managing giant liver hemangiomas. With no procedure-related mortality and significant tumor shrinkage, the technique shows promise and warrants further investigation through more extensive prospective studies.

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# BLUNT INTRAORAL TRAUMA LEADING TO DELAYED ISCHEMIC STROKE IN A CHILD: A RARE CASE OF TRAUMATIC CAROTID DISSECTION AND VENOUS THROMBOSIS

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**Introduction:** Blunt cerebrovascular injury (BCVI) is a rare but critical cause of ischemic stroke in children, often underrecognized due to subtle presentations and delayed symptom onset. Traumatic internal carotid artery dissection (ICAD) from intraoral injury is exceedingly uncommon, especially in previously healthy children.

**Case Report:** A previously healthy 4-year-old boy sustained a low-impact intraoral injury after colliding with a metal structure in a supermarket. He developed headache the following morning and subsequently exhibited acute left lower limb weakness. Non-contrast CT brain revealed an acute infarct in the right middle cerebral artery (MCA) territory, with a dense MCA sign and an air locule extending from the oropharynx to the distal cervical internal carotid artery. MRI with diffusion and FLAIR sequences confirmed the infarct, and MRA demonstrated absent flow in the right ICA, consistent with dissection. CT angiography further identified a long-segment right ICA occlusion with concurrent thrombosis of the right internal jugular vein. The patient was managed conservatively with antithrombotic therapy and close neurological monitoring.

**Discussion:** This case illustrates an unusual mechanism of pediatric ischemic stroke: blunt intraoral trauma causing ICAD and thromboembolic MCA infarction. In children, the extracranial ICA is anatomically predisposed to trauma-induced dissection due to its mobility and lack of surrounding bony protection. Radiological features such as the dense MCA sign, FHVS, flow voids, and air locules in the carotid sheath are key diagnostic clues. Timely recognition is imperative, as early antithrombotic therapy can prevent secondary embolic events. Treatment remains controversial in pediatric populations, with no clear consensus on anticoagulation versus antiplatelet use.

**Conclusion:** This case underscores the necessity of maintaining high clinical suspicion for BCVI in children with neurological deficits following oropharyngeal trauma. Early imaging, particularly with CTA and MRA, plays a pivotal role in diagnosis. Multidisciplinary management and further research are required to guide therapeutic decision-making in pediatric ICAD.

# FLUOROSCOPIC GUIDED JUGULAR CATHETER INSERTION FOR HEMODIALYSIS: COMPARISON OF OCCUPATIONAL DOSE BY ACCESS SITE AND POSITION DURING PROCEDURE

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**Introduction:** Exposure to radiation during fluoroscopically guided procedures poses radiation health risk not only to patients but to medical staff. Furthermore, stochastic effect such as oncogenesis has long latent period. Fluoroscopic guided jugular catheter insertion is perceived to be of high radiation dose to the operator due to proximity with image intensifier. This study sought to analyse the occupational radiation dose during catheter insertion for haemodialysis with variations in access side (right or left internal jugular vein) and position of medical personnel during the procedure.

**Method:** Thymoma Occupational dose (µSv) measurement of the operator, 1st assistant and 2nd assistant as well as the table panning radiographer using RaySafe i3 Real-time Dose Monitoring System worn outside of the lead gown at chest level was done for 10 adult patients who undergone jugular catheter insertion in the month of December 2024. Patient dose parameters of dose area product (DAP) (Gy.cm2) and air kerma (AK) (Gy) were also measured.

**Results:** There was no significant difference between right or left sided approach in dose received by operator 1 (p=0.629). Dose to first and second assistants were near background radiation. If the radiographer is positioned less than 50 cm from the tube without shielding, the dose is markly higher compared to other positions. Series with more than 6 exposures per series produces significantly higher dose to the operator (p=0.010). A single exposure run with exposure DAP less than 4 mGy.cm2 produces low radiation dose to the operator (<7 µSv) which is near to background radiation.

**Conclusion:** Awareness of potential radiation risks and factors that increase the dose to medical personnel is essential towards mitigating strategies for better radiation safety at work. Radiation dose to personnel in the angiographic suite is near background radiation with proper distancing, shielding and exposure duration.

# CASE REPORT : PARENT ARTERY OCCLUSION FOR LEFT SUPRACLINOID ICA PSEUDOANEURYSM

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Internal carotid artery (ICA) pseudoaneurysms are rare but potentially life-threatening often requiring parent artery occlusion (PAO) when reconstructive options are not feasible. This case report describes an 18-year-old patient with a traumatic left supraclinoid ICA pseudoaneurysm. Under angiographic guidance, vascular access was obtained. Vessel navigation was achieved with a 0.035" glidewire and 4Fr Vert catheter while distal access was facilitated using a 6Fr Navien catheter, an SL-10 microcatheter and a Traxcess 14 microguidewire. Embolization was performed with three ev3 Axium Prime coils—one 2 mm x 8 cm coil placed distal and two 3 mm x 8 cm coils placed proximal to the pseudoaneurysm for complete isolation. Post-procedural digital subtraction angiography (DSA) confirmed total occlusion of the pseudoaneurysm, with preserved perfusion to the left anterior and middle cerebral arteries through cross-flow from the right ICA. No procedural complications were observed. This case highlights PAO with targeted coil embolization as a safe and effective treatment for ICA pseudoaneurysms when adequate collateral circulation is present, emphasizing the importance of pre-procedural planning and cross-flow assessment.

# SEALING THE ESCAPE: HEPATIC VEIN BALLOON OCCLUSION ENABLING SAFE TACE IN AV SHUNTING HEPATOCELLULAR CARCINOMA

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Hepatocellular carcinoma (HCC) is a leading cause of cancer-related mortality globally. Transarterial chemoembolization (TACE) is a standard treatment for unresectable HCC; however, arteriovenous (AV) shunting complicates treatment by increasing hepatopulmonary shunt fractions, limiting options like radioembolization, and heightening pulmonary risks. Temporary balloon occlusion of the hepatic veins presents an innovative approach to reduce AV shunting during embolization. We report a case of large HCC (>10 cm) in a 63-year-old male with Child-Pugh A, predominantly involving segment VIII. Patient was not eligible for selective internal radiation therapy (SIRT) due to significant AV shunting identified during pre-treatment angiography, thus planned for conventional TACE. He subsequently underwent TACE via a left distal transradial approach. During hepatic angiography, large AV shunting into the left hepatic vein was noted. The shunt was too large and distal to be occluded by gelfoam or coils. Selective catheterization and chemoembolization of the tumor-feeding artery with intermittent temporary balloon occlusion of the left hepatic vein was performed. Chemoembolisation with 10mls lipiodol-5mls Doxorubicin mixture sandwiched with 9 mls alcohol-lipiodol (33%) mixture was used. Post-procedure cone-beam CT showed partial lipiodol uptake within tumour without lipiodol deposition in the lungs. There was no difficulty in breathing or chest pain in the 3 days post procedure to suggest lipiodol pneumonitis. Patient was discharged without complications. Patient was recommended immunotherapy to decrease the tumor size and AV shunting. Eligibility for SIRT or TACE would be assessed 3 months after immunotherapy, considering the presence of AV shunting. This case highlights the feasibility and safety of hepatic vein balloon occlusion during TACE in patients with HCC and AV shunting, where standard embolization techniques may pose significant risks.

# ENDOVASCULAR APPROACH TO ACUTE HIGH FLOW GASTRIC VARICEAL BLEED SECONDARY TO HEPATOCELLULAR CARCINOMA ASSOCIATED ARTERIOPORTAL SHUNTS

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Cerebrospinal fluid Arterioportal (A-P) shunts are frequently observed in patients with advanced Hepatocellular carcinoma (HCC) particularly the one associated with tumoral thrombus. In a patient with existing portal hypertension and a well-developed gastric varix, this combination can be lethal as the arterialization of hepatic venous pressure gradient can lead to torrential uncontrollable variceal bleed. Here we report a case 50-year-old gentleman who presented with acute upper gastrointestinal bleeding (UGIB). Multiple endoscopic treatments done to temporary secure the bleeding. Subsequently Computed Tomography (CT) revealed presence of HCC, AP shunt and tumoral thrombus within the main portal veins with dilated gastric varices. Complex endovascular treatment was performed via trans-arterial embolization of AP shunt followed by transhepatic balloon occluded retrograde transvenous occlusion (BRTO) of gastric varices to control the bleeding. This case demonstrates the challenges in understanding the complex physiology and alteration of flow dynamic followed by the treatment options available that can be offered to help to control and prevent torrential bleeding.

# EMBOLISATION OF BLEEDING GASTROESOPHAGEAL JUNCTION TUMOR

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Gastrointestinal tumour rarely presented with upper and lower gastrointestinal bleed. It is difficult to manage endoscopically due to its high recurrence rates. It causes dilemma in management of patient with gastrointestinal bleed. Embolization of the tumour has a crucial importance to prevent the gastrointestinal bleed, and its vital role are rarely reported. Presented to us a 65 year old gentleman known case of oesophageal adenocarcinoma diagnosed a year ago and refused operation and defaulted follow up was presented with hematemesis and melenic stool. Computed tomography (CT) thorax, abdomen pelvis and CT angiography was done which shows tumour at gastroesophageal junction with no active bleeding. In ward, patient was treated conservative but still passing melenic stool and blood haemoglobin is still dropping despite transfusion, hence he was referred for embolization. We proceeded with angiogram which revealed tumoral blush surrounding the gastroesophageal tumour from the left gastric artery. Embolization was done to the left gastric artery using polyvinyl alcohol (PVA). Post embolization, there was no bleeding and haemoglobin was static. Patient underwent 1st chemotherapy and subsequently succumbed due to neutropenic sepsis.

# LIFE SAVING ENDOVASCULAR COIL TRAPPING EMBOLIZATION FOR AN INTRACRANIAL MYCOTIC ANEURYSM

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Intracranial mycotic aneurysms are rare but life-threatening complications of infective endocarditis (IE), typically resulting from septic emboli causing vessel wall destruction and aneurysm formation. We report a case of a 43-year-old woman with prior MSSA IE in 2019 who presented with headache, fever and altered behavior. Blood cultures grew Borderline oxacillin-resistant Staphylococcus aureus (BORSA). Echocardiography revealed mitral and aortic valve IE. Initial CT brain noted intracranial bleeds. MRI brain suggested meningoencephalitis with possible septic emboli, but MR angiography showed no aneurysm. Digital subtraction angiography revealed a fusiform aneurysm at the P3 segment of the left posterior cerebral artery, suggestive of a ruptured mycotic aneurysm. Due to the distal location and small calibre of the artery, endovascular coil trapping with parent artery occlusion was chosen, as other options such as flow diverter were not feasible. A total of six coils were used to completely occlude the aneurysm and the parent vessel. The patient made a full recovery with a Modified Rankin Scale (mRS) score of 0. Early diagnosis is key, especially in ruptured aneurysms where endovascular treatment is usually preferred. In some cases, particularly with small and distal arteries, parent artery occlusion may be necessary when the benefits outweigh the risks.

# TRANSARTERIAL INDOCYANINE GREEN LOCALIZATION PRIOR TO VIDEO ASSISTED THORACOSCOPIC SURGERY: A SINGLE CENTER EXPERIENCE

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**Introduction:** Video assisted thoracoscopic surgery (VATS) is now a minimally invasive technique for diagnostic and curative resections of small low grade lung tumors. Combined with fluorescence imaging using indocyanine green (ICG), this method has revolutionized VATS and enhances the safety and detection rates of tumors, and improves margin clearance. We describe our technique and initial experience in our center of using ICG prior to VATS.

**Method:** Technical aspects related to positioning and approach were discussed with a multidisciplinary team prior to procedure. Procedure was performed under general anesthesia just prior to surgery. Pre procedure imaging used to analyze and calculate trajectory as well as determine length of needle. Under CT guidance, a 22G spinal needle was used to skewer the lesion.
Total of 0.2ml to 0.4 ml of ICG was injected into the lesion. Post injection, spinal needle stylet was reintroduced prior to removal. Post procedure scan then performed to ensure no moving of needle. After the injection, patient was sent to operation theater for VATS. Intra-operative imaging enables direct visualization of site of tumor and adequate resection done.

**Results:** Total of 11 patients of ICG localization performed from September 2022- April 2025. Of these cases, 8 were right lung lesions and 3 were left lung lesions. 7 patients were performed supine and 3 patients were performed prone. Spillage of indocyanine green noted in 2 patients. All lesions showed adequate resection margins with no tumor at the periphery.

**Conclusion:** CT guided ICG localization prior to VATS is a safe and effective method to ensure good operative success of tumor resection for low grade lung tumors.

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# A RARE CASE OF SUBCAPSULAR HEMATOMA WITH MULTIPLE PSEUDOANEURYSMS AT NON BIOPSY RELATED SITES FOLLOWING RENAL BIOPSY

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**Introduction:** Renal biopsies are a common diagnostic tool for evaluating renal pathology. Subcapsular hematoma is a known complication. However, the occurrence of multiple cortical pseudoaneurysms at non biopsy related sites is exceptionally rare and warrants attention due to its potential for serious morbidity

**Case Report:** We reported a case of a 66-year-old female who presented with worsening renal function and was suspected to have nephrotic syndrome. An ultrasound-guided renal biopsy was performed at lower pole. The procedure was uneventful, however within hours post-biopsy, the patient developed a significant drop in hemoglobin levels with acute hemodynamic instability. A CT Angiogram of mesentry revealed the presence of a large subcapsular hematoma with foci of cortical pseudoaneurysms involving mid and lower poles and evidence of active arterial blush, indicative of ongoing hemorrhage. Immediate renal angiogram confirmed the presence of four pseudoaneurysms in the mid and lower poles of the left kidney. Superselective embolization was successfully performed and patient was subsequently discharged.

**Conclusion:** This case highlights a rare but critical complication of renal biopsy, where subcapsular hematoma can lead to multiple cortical pseudoaneurysms even at non biopsy sites. Prompt recognition and intervention are essential in preventing further complications and preserving renal function.

# CUMULATIVE RADIATION DOSE IN A LIVER CANCER PATIENT UNDERGOING YTTRIUM-90 RADIOEMBOLIZATION: A DOSIMETRIC CASE STUDY

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This case study presents a cumulative dosimetric analysis of a 70-year-old male with rectosigmoid adenocarcinoma and liver metastases who completed chemotherapy and proceeded with local therapies, including Transarterial Chemoembolization (TACE) and Yttrium-90 (Y-90) Selective Internal Radiation Therapy (SIRT). The treatment targeted liver segments II/III and VII/VIII and was preceded by multiple imaging procedures including CT multiphase liver scans, Tc-99m MAA lung shunt studies, and FDG PET-CT. The cumulative effective dose from diagnostic imaging was approximately 95 mSv. Additionally, fluoroscopy-guided interventions contributed to significant radiation exposures, measured using dose area product (DAP). Final Y-90 delivery resulted in absorbed doses of 173.37 Gy to segment II/III and 161.56 Gy to segment VII/VIII, with an average liver dose of 74.61 Gy. This case underscores the importance of organ-specific dosimetry, cumulative dose tracking, and patient-specific planning. Tools like Radimetrics at IKN have proven essential in facilitating integrated dose monitoring, enabling real-time tracking across modalities and supporting safer, precision-guided treatment decisions.

# A VASCULAR SURPRISE : THE CASE OF THE HEPATIC ARTERY PSEUDOANEURYSM

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Hepatic artery pseudoaneurysm (HAP) is a rare but potentially fatal vascular complication that typically arises following trauma, hepatobiliary surgery, or interventional procedures. Due to its nonspecific clinical presentation and potential for catastrophic hemorrhage, early recognition is critical yet often challenging. We present a case of 75-year-old male who developed a hepatic artery pseudoaneurysm following endoscopic retrograde cholangiopancreatography (ERCP), highlighting the diagnostic challenges and the pivotal role of imaging in early detection. Endovascular stenting was successfully performed, resulting in a favourable outcome. This case underscores the importance of maintaining a high index of suspicion for HAP in patients presenting with post-procedural abdominal pain or gastrointestinal bleeding, and it emphasizes the effectiveness of minimally invasive therapeutic strategies.

# AI-ASSISTED DETECTION OF HYPERINTENSE VESSEL SIGN ON FLAIR MRI: A NOVEL TRIAGE TOOL FOR ACUTE ISCHEMIC STROKE MANAGEMENT

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**Introduction:** The Hyperintense Vessel Sign (HVS) on FLAIR MRI is a subtle yet critical marker of arterial occlusion in acute ischemic stroke. Its timely detection can influence decisions regarding thrombolysis or thrombectomy eligibility. However, manual HVS identification is time-intensive and prone to inter-observer variability, especially in high-pressure emergency settings. We present a novel deep learning-based triage tool designed to assist radiologists by automating HVS detection with high computational efficiency and clinical reliability.

**Method:** A total of 300 FLAIR MRI datasets were retrospectively collected from Hospital Sultan Abdul Aziz Shah (HSAAS), UPM, obtained using a standardized protocol on a 3T scanner. A deep learning model based on the nnU-Net architecture was developed to detect HVS with pixel-level precision. The model was trained using 5-fold cross-validation and tested against annotations by three board-certified neuroradiologists (gold standard). Inference was conducted on an RTX 4080 GPU with an average runtime of 30 seconds per scan. Novel features included the integration of explainable AI (XAI) techniques to enhance model transparency and improve radiologist trust in AI outputs.

**Results:** The model achieved a sensitivity of 89%, specificity of 84%, and Dice score of 0.78 ± 0.11 compared to radiologists' consensus annotations (accuracy: 95%). While radiologists outperformed the model diagnostically, the tool reduced average triage decision time by 40%, prioritizing high-risk cases for review without compromising safety. Importantly, XAI visualizations provided interpretable heatmaps highlighting regions of interest, which radiologists reported as valuable for cross-verification during time-critical scenarios.

**Conclusion:** By reducing decision-making time while maintaining diagnostic accuracy, this approach has the potential to transform stroke workflows in resource-limited or high-volume settings. Future work will focus on integrating this tool into real-time clinical pipelines and expanding its application to multi-modal imaging data for comprehensive stroke assessment.

# IMAGING IN ACUTE STOKE CARE: EFFICACY, LIMITATIONS AND OPPORTUNITIES – A SYSTEMATIC REVIEW

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**Introduction:** The global incidence of stroke is escalating, impacting millions annually, with acute ischemic stroke (AIS) constituting a significant proportion of cases. Modern imaging techniques have revolutionized stroke care, enabling the identification of patients eligible for reperfusion therapies, including mechanical thrombectomy (MT). However, variations in imaging workflows across healthcare systems pose challenges, leading to inconsistent clinical outcomes and treatment delays. This systematic review aims to evaluate the efficacy, limitations, and opportunities associated with recent advancements in various imaging modalities for AIS management.

**Method:** A rigorous and transparent systematic review was conducted following established guidelines, employing the PICO (Population, Intervention, Comparison, Outcomes) framework. The search strategy focused on articles pertaining to acute stroke patients undergoing thrombectomy, workflow and techniques for radiographers, imaging modalities (CT and MRI), and patient selection and clinical outcomes. Scopus was utilized to identify relevant articles, and study selection and screening were managed using Rayyan, a web-based application. Inclusion and exclusion criteria were applied to screen articles, with a focus on studies published between 2021 and 2024.

**Results:** The initial search yielded 157 articles, with 10 ultimately meeting the inclusion criteria after a systematic screening process. The review highlighted several key findings. Non-contrast CT (NCCT) was found to be as effective as CT perfusion or MRI for patient selection in the late window for mechanical thrombectomy. MRI acceleration techniques were identified to make MRI feasible for acute stroke imaging while retaining quality, enabling a transition from CT to MRI-based workflows. However, MRI showed lower functional independence rates compared to CT, with similar mortality and haemorrhage outcomes. CT perfusion demonstrated moderate volumetric agreement with follow-up DWI infarct volume, with significant overestimation in certain methods. The review also emphasized the importance of workflow optimization and multidisciplinary collaboration in optimizing imaging techniques.

**Conclusion:** This systematic review underscores the crucial role of imaging in acute stroke management, highlighting both advancements and challenges. CT, CT perfusion, and MRI each offer unique benefits depending on the clinical situation, resource availability, and patient-specific factors.

# WHEN THE CURE TURNS CATASTROPHIC: DELAYED ANEURYSM RUPTURE AFTER FLOW DIVERTER STENTING

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**Introduction:** Flow diverter stenting is a popular treatment option for intracranial aneurysms. Although delayed rupture after stenting is rare, it can be catastrophic. We present a case of delayed aneurysmal rupture post flow diverter stenting.

**Case Report:** A 38-year-old male presented with sudden onset of headache and vomiting. CT brain revealed diffuse subarachnoid haemorrhage. Digital subtraction angiography (DSA) identified a multilobulated aneurysm at M1 segment left middle cerebral artery, measuring 2.60mm (neck), 10.37 mm (height), and 13.86 mm (width). After two weeks, the aneurysm was treated with flow diverter embolisation following antiplatelet therapy. A follow-up DSA performed three months post-procedure demonstrated reduction in aneurysm size. However, at fourth month post-embolization, the patient developed left frontoparietotemporal intraparenchymal haemorrhage. Sadly, the patient passed away the same day.

**Discussion:** Delayed rupture of aneurysm following flow diverter stenting has been reported in approximately 0.6% to 4% of cases. Contributing factors may include increased intra-aneurysmal pressure, weakening of the aneurysm wall due to thrombus formation, persistent residual flow within the aneurysm, large aneurysms, and mechanical irritation from the device itself. Currently, no definitive preventive strategies have been established.

**Conclusion:** This case highlights the critical importance of appropriate patient selection and necessity of comprehensive pre-procedural counselling.

# RUPTURED ANEURYSM OF THE ARTERY OF DAVIDOFF AND SCHECHTER IN FALCOTENTORIAL DURAL ARTERIOVENOUS FISTULA: A CASE REPORT

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**Introduction:** The artery of Davidoff and Schechter (ADS) is a rare meningeal branch originating from posterior cerebral artery (PCA), often found in pathology like dural arteriovenous fistulas (DAVFs). We report an unusual case of ADS aneurysm found during an episode of subarachnoid haemorrhage (SAH), which aggravated a high-grade falcotentorial DAVF.

**Case Report:** A 45-year-old man with no significant medical history experienced a sudden tonic seizure followed by severe headache. Non-contrast CT of the brain showed extensive SAH in the basal cisterns. CTA indicated a potential left PCA aneurysm and a complex vascular malformation. DSA confirmed a high-grade, high-flow DAVF at the midline occipital region near the falcotentorial junction, with drainage into the vein of Galen, consistent with Galenic subtype of tentorial DAVF. Vertebral artery angiography revealed a large, 5.6 mm irregular aneurysm arising from the P1 segment of the left PCA, suspected to be a pathologically dilated left ADS.

**Discussion:** Treatment involved coil embolization of the aneurysm and parent artery sacrifice, as well as liquid embolization of the DAVF. The patient tolerated the endovascular procedure well without complications.

**Conclusion:** This case illustrates the rarity of ADS aneurysms, highlighting the need for high suspicion of ADS in complex vascular malformation, which influences treatment strategies.

# TEMPERING THE TUBE: HEAT ASSISTED MODIFICATION OF PIGTAIL CATHETER

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**Introduction:** Pigtail catheters are essential in percutaneous drainage procedures, yet the high cost and limited availability of commercially pre-modified catheters remain significant barriers, especially in resource-limited settings. To optimize drainage performance, interventional radiologists often modify these catheters by creating additional side holes. However, conventional mechanical methods such as scalpel or needle perforation pose risks of catheter wall damage, inconsistent hole quality, and reduced structural integrity. A heat-assisted modification technique may offer a more precise and reproducible alternative.

**Method:** This technique utilizes the blunt trocar of an 18G Chiba needle, heated using a torch lighter until it glows cherry red. Under aseptic conditions, the heated trocar is applied to the wall of thermoplastic polyurethane pigtail catheter. Controlled perforations are made at pre-marked locations, with 1–2 cm spacing between holes. The applied heat cauterizes each opening, reducing the risk of fraying and maintaining catheter structure. Following the procedure, catheters are flushed with saline to confirm patency and inspected for uniformity in hole shape and size.

**Discussion:** The heat-assisted method successfully produced uniform, circular side holes measuring approximately 1.0–1.5 mm in diameter. The openings were smooth and cauterized, with no evidence of structural damage or deformation. Compared to traditional mechanical techniques, this method showed improved consistency and safety. It requires minimal equipment, making it suitable for low-resource environments. However, the technique demands precise temperature control; excessive heat may compromise the catheter material, while insufficient heating may result in incomplete perforations. Additionally, flow efficiency and potential for turbulence at punched sites warrant further evaluation.

**Conclusion:** The heat-assisted modification technique is a practical, cost-effective alternative for customizing pigtail catheters. With proper technique and training, it enhances procedural adaptability where pre-modified catheters are not readily available. Further studies are needed to optimize outcomes and assess long-term efficacy.

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# OUTCOME OF BLEOMYCIN SCLEROTHERAPY IN PAEDIATRIC CYSTIC HYGROMA: A SINGLE CENTRE CASE SERIES

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Cystic hygroma is a benign congenital tumor of lymphatic origin which develops around the 6th gestational week. The most common location is the head and neck region and it often requires early intervention due to complications such as respiratory distress, recurrent infection or cosmetic concerns. Bleomycin is an antineoplastic glycopeptide antibiotic agent with sclerosing properties. Other methods of sclerotherapy include ethanol or doxycycline injection. In this case series, we describe the therapeutic use of bleomycin in paediatric cystic hygroma as an alternative to surgical excision. A total of four patients with cystic hygroma were treated with intralesional bleomycin injection at a dosage of 0.5 mg/kg (max dose of 15mg per session) between the period of 2 to 5 months). Followup evaluations showed significant volume reduction (min:90%, max:99% and average percentage 94.5%) in the cystic component of the cystic hygroma in the treated patient with markedly improved clinical symptoms. No major side effects were reported. Minor side effects such as swelling discolouration of the skin were not reported. This demonstrates the safety and effectiveness of bleomycin sclerotherapy as first-line treatment. This case series contributes to the growing body of evidence which supports bleomycin sclerotherapy as a standard management approach for paediatric cystic hygroma.

# ENDOVASCULAR EMBOLISATION OF A TRAUMATIC INTERNAL ILIAC ARTERY PSEUDOANEURYSM WITH HIGH FLOW ARTERIOVENOUS FISTULA FOLLOWING BONE MARROW ASPIRATION IN A CHILD- A RARE COMPLICATION OF A COMMON PAEDIATRIC PROCEDURE

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**Introduction:** Bone marrow aspiration and trephine biopsy (BMAT) is a very common investigative procedure in paediatric population for haematological disorders. A known but rare complication of this procedure is injury to pelvic vasculature.

**Case Report:** We report a case of a 4-year-old boy with underlying B-cell acute lymphoblastic leukaemia who underwent BMAT using standard technique which led to a traumatic tap. Patient deteriorated and an urgent CT scan revealed extensive retroperitoneal haematoma, secondary to a complex pseudoaneurysm arising from the bifurcation of the right internal iliac artery complicated with a high-flow arteriovenous fistula to the right internal iliac vein.

**Discussion:** Constructive endovascular repair was not feasible due to the complex nature of the injury as well as non-availability of appropriate covered stent for this age group. Emergency endovascular embolisation was performed using multiple coils at the bifurcation of right internal iliac artery, obliterating the pseudoaneurysm and arteriovenous fistula. The patient tolerated the procedure and recovered well.

**Conclusion:** To our knowledge, no case reports of traumatic injury following BMAT leading to both pseudoaneurysm and arteriovenous fistula in paediatric population have been published at the time of this report. Endovascular embolisation can be safely performed in paediatric population and offers an excellent alternative to open surgical repair.

# TRIUMPH OVER LYMPH: A CASE REPORT ON THE EFFICACY OF LYMPHATIC EMBOLIZATION IN MANAGING POST-RENAL TRANSPLANT LYMPHOCELE

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**Introduction:** A lymphocele is a collection of lymphatic fluid that occurs as a complication following surgical procedures involving lymph node dissection, such as renal transplantation, pelvic surgery, or lymphadenectomy. It leads to the accumulation of lymphatic fluid in surrounding tissues. Small, asymptomatic lymphoceles may resolve spontaneously and can be managed conservatively. In cases where the lymphocele increases in size, initial intervention usually involves percutaneous catheter drainage. If the lymphocele persists or recurs after drainage, lymphatic embolization or sclerotherapy can be considered. Surgical fenestration or lymphovenous bypass may be considered if minimally invasive treatments fail. In refractory cases, lymphocelectomy may be necessary.

**Case Report:** A patient underwent successful pre-emptive renal transplant. Post-operative evaluations indicated good renal function and excellent kidney perfusion. Two weeks post-operatively, a routine ultrasound revealed perinephric fluid collection. By six weeks post-operatively, the collection had increased and readmission was required for drainage. Persistent high amounts of drainage fluid were noted during follow-up. The patient was readmitted again and underwent right inguinal intranodal lymphangiography and lymphatic embolization with Lipiodol and Histoacryl glue. Drainage fluid ceased 4 days post-embolization, and the drainage catheter was removed. A follow-up ultrasound at 3 weeks showed no recurrence of the pelvic fluid collection.

**Conclusion:** Lymphatic embolization is a safe and effective minimally invasive treatment option for managing post-operative pelvic lymphoceles. The procedure led to the successful resolution of the patient's symptoms without the need for surgical intervention, and no complications were observed post-procedure. This case highlights the efficacy of lymphatic embolization in treating persistent or recurrent lymphoceles following initial drainage.

# THE OUTCOME AND FACTORS INFLUENCING THE SUCCESS OF MECHANICAL THROMBECTOMY IN PATIENT WITH ARTERIOVENOUS FISTULAE THROMBOSIS IN HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA

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**Introduction:** The Hyperintense Vessel Sign (HVS) on FLAIR MRI is a subtle yet critical marker of arterial occlusion in acute ischemic stroke. Its timely detection can influence decisions regarding thrombolysis or thrombectomy eligibility. However, manual HVS identification is time-intensive and prone to inter-observer variability, especially in high-pressure emergency settings. We present a novel deep learning-based triage tool designed to assist radiologists by automating HVS detection with high computational efficiency and clinical reliability.

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# RIGHT CAROTICAVERNOUS FISTULA WITH PREDOMINANT CONTRALATERAL OCULAR SYMPTOMS: A RARE PRESENTATION

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**Introduction:** The Caroticocavernous fistula (CCF) is an abnormal arteriovenous connection between the carotid artery and cavernous sinus (CS). Typically, symptoms such as ophthalmoplegia, redness and pulsatile proptosis present ipsilateral to the site of CCF; however, contralateral manifestations, though rare, can occur with only one case reported in literature

**Case Report:** We present the case of a 76-year-old, female who sustained traumatic multiple intracranial haemorrhages. Three months later, she developed bilateral cranial nerve VI palsy, which was managed conservatively as repeated imaging was unremarkable. One month after, she developed left-sided eye redness and pulsatile proptosis. Computed tomography angiogram revealed bulky bilateral CS and dilated left superior ophthalmic vein (SOV). Digital subtraction angiography demonstrated right-sided direct CCF with dilated left SOV.

**Discussion:** The transarterial embolization of right CCF led to symptoms improvement. Severity and distribution of symptoms depend on CCF drainage pattern, with commonest route being anteriorly via the ophthalmic veins. Contralateral drainage via intercavernous connection is rare. It is hypothesized that extensive intercavernous sinus connections, allows increased pressure transmission between the paired CS, leading to contralateral CCF.

**Conclusion:** This case highlights the progressive nature of CCFs and importance of long-term monitoring in post-traumatic patients. Prompt recognition and intervention are crucial in preventing complications and ensuring favourable clinical outcomes.

# RUPTURED HEPATOCELLULAR CARCINOMA (HCC) POST CHIROPRACTIC MANIPULATION

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Spontaneous rupture of hepatocellular carcinoma (rHCC) is a life-threatening complication, occurring in 3–15% of HCC cases. This report describes a 41-year-old male with congenital hepatitis B who had defaulted on HCC surveillance. He experienced crampy abdominal pain for one day and sought chiropractic manipulation, during which he developed epigastric pain. He later had a syncopal episode, nausea, vomiting, and hypovolemic shock. Contrast-enhanced CT confirmed rHCC in the caudate lobe. He underwent transarterial embolization (TAE) and was discharged with oncology follow-up. Hepatectomy was not feasible, and palliative therapy was initiated. The exact mechanism of rHCC remains unclear but likely involves venous congestion, vascular injury, and the small room hypothesis. Overall, this case may represent a spontaneous rHCC, potentially exacerbated by chiropractic manipulation. Two key take-home messages emerge from this case: First, chronic hepatitis patients should adhere to annual surveillance for early HCC detection. Second, while chiropractic techniques are unlikely to directly cause tumor rupture, excessive mechanical stress may increase the risk in specific conditions. Therefore, patients with HCC should consult a healthcare professional before undergoing chiropractic care or deep tissue massage to avoid potential complications.

# CHEMORADIOTHERAPY IN LUNG CANCER: A DOUBLE-EDGED SWORD – A CASE REPORT AND LITERATURE REVIEW OF SUPERIOR VENA CAVA OBSTRUCTION AS AN UNEXPECTED COMPLICATION

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Superior vena cava syndrome (SVCS) is a condition which arises from superior vena cava obstruction (SVCO) secondary to direct invasion by malignancies such as lung cancer. While chemoradiotherapy is standard treatment for SVCS due to malignancies, it is also a rare cause of SVCO, through chemoradiotherapy-induced fibrosis. We present the case of a 47-year-old male with advanced lung adenocarcinoma, who developed SVCO following multiple cycles of chemoradiotherapy. Imaging confirmed SVC stenosis with extensive collateral formation with no evidence of left lung mass invasion. Emergency tracheostomy and successful SVC stenting led to symptoms improvement. Despite multiple interventions, the patient developed tracheoesophageal fistula leading to respiratory decline, infection and eventual demise. This case underscores the complexities of managing advanced lung adenocarcinoma and its complications. Traditionally, chemoradiotherapy was employed for treatment of SVCO secondary to mass effect from malignancies. However, six literatures identified worldwide have linked SVCO to chemoradiotherapy. An inflammatory response from chemoradiotherapy is believed to cause increased vascular permeability and subsequent fibrosis leading to SVCO, which was the likely causative factor in our case. Hence, clinicians should maintain a high index of suspicion for treatment-related SVCS and ensure close monitoring for early detection and timely intervention to optimize patient outcomes.