

Management considerations for acute limb ischaemia complicating invasive squamous cell lung cancer

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Summary. Management of acute limb ischaemia (ALI) in patients with significant, but not yet terminal, medical co-morbidities can be challenging. This case highlights the management considerations for a patient with a locally invasive squamous cell lung carcinoma, who developed unilateral ALI while receiving in-hospital treatment for pneumonia. There were limited options for pain relief due to the inherent risk of respiratory complications. Treatment option for the ALI was likewise limited. Surgical thrombo-embolctomy was successfully performed under local anaesthesia. This offered full resolution of symptoms and allowed the patient to have one good night's sleep at last.

Key words: acute limb ischaemia, lung carcinoma, surgery, thrombo-embolctomy

«CONSIDERAZIONI SULLA GESTIONE DELL'ISCHEMIA ACUTA DELL'ARTO COME COMPLICAZIONE DEL CARCINOMA POLMONARE INVASIVO A CELLULE SQUAMOSE»

Riassunto. La gestione terapeutica dell'ischemia acuta dell'arto (ALI) nei pazienti con co-morbilità significativa, ma non ancora terminale, può essere complicata. Questo caso mette in luce le considerazioni relative alla gestione di un paziente con carcinoma polmonare squamo-cellulare localmente invasivo, che ha sviluppato un'ischemia acuta dell'arto unilaterale in seguito a trattamento per polmonite in ospedale. Le opzioni per alleviare il dolore si sono presentate limitate a causa del rischio intrinseco alle complicazioni polmonari. È stata eseguita con successo una trombo-embolctomia chirurgica in anestesia locale. Ciò ha consentito una risoluzione completa dei sintomi ed ha permesso al paziente di trascorrere almeno una buona notte di sonno.

Parole chiave: ischemia acuta dell'arto, carcinoma polmonare, chirurgia, trombo-embolctomia

Case report

A 63 year old man with an established diagnosis of squamous cell carcinoma involving the right main bronchus and the upper lobe of right lung presented to the hospital with symptoms consistent with right lower lobe pneumonia. He also complained of a new onset dysphagia which made feeding difficult. There was no other significant past medical history apart from significant past cigarette consumption (80 pack years). The patient has fairly restricted distance of

ambulation in recent times due to dyspnoea, but there was definitely no history of lower limb claudication. He recently completed the first course of palliative chemotherapy. Although the prognosis was poor, his condition at the time of presentation was not yet terminal.

At admission, he was clinically dehydrated and cachexic; there was no sign of systemic sepsis. His blood tests revealed hypo-albuminaemia (26 g/L), hypercalcaemia (adjusted calcium = 3.08 mmol/L), neutrophilia ($13.1 \times 10^9/L$), anaemia (9.0 g/dL), and

high serum C-reactive protein (CRP, >160 mg/L). CT scan showed extensive cavitation (Figure A) and mediastinal lymph nodes without evidence of distant metastasis. Full active medical therapy was investigated for treatment of pneumonia.

On the same evening of hospital admission, he experienced sudden onset of left foot paraesthesia and pain, which rapidly progressed to anaesthesia of the foot and severe pain extending up the left calf. Cardiovascular examination revealed sinus rhythm without cardiac murmurs; there were normal femoral popliteal pulses on the right limb, with normal perfusion to the right foot. The left foot was pale and cold, with venous pitting and delayed capillary return. All arterial pulses were absent in the left lower limb, including the left iliac arterial pulse. The clinical diagnosis of acute limb ischaemia (Rutherford stage IIB) was evident.

Prior to the onset of ischaemic limb symptoms, the treating physician had been hopeful that he would make a recovery from the acute infective episode. Full active therapy was therefore considered appropriate at this stage. Mostly importantly, the patient expressed explicit wish to receive active treatment and declined

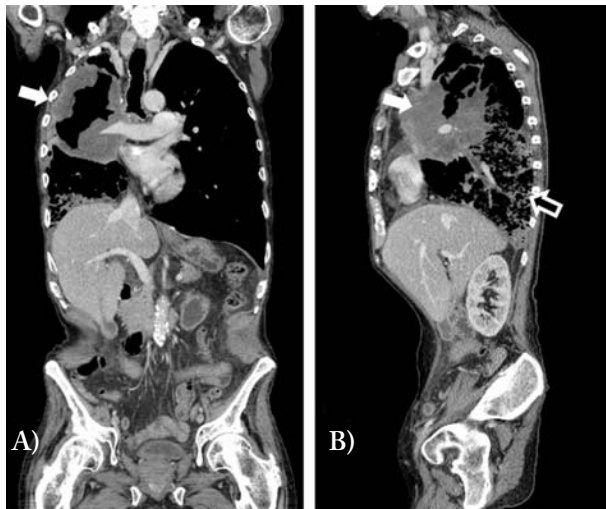


Figure 1. Coronal (A) and sagittal (B) views on the computerised tomography (CT) scan of the chest and abdomen. There is a right upper lobe lesion with extensive cavitation (white arrow). Extensive right lower lobe consolidation and ground glass opacification is consistent with pneumonia (black arrow). There is clear evidence of overall cachexia.



Figure 2. Surgical retrieved embolus. Histology confirmed the presence of recently formed laminated thrombus, with no evidence of infection or neoplasm.

palliative management at this stage. After a frank discussion with the patient regarding the treatment options, he was adamant to proceed with surgical exploration with the hope to relieve pain.

Exploration of left femoral artery was performed under local anaesthetic infiltration, with no additional sedation. Retrograde and antegrade thrombo-embolectomy of the ilio-femoral arterial segment was performed via a transverse arteriotomy in the left common femoral artery. A long segment of embolus (Figure 2) was retrieved from the left iliac artery and this immediately re-established pulsatile arterial inflow. Small amount of thrombus was retrieved from the femoral popliteal segment and good retrograde perfusion was also achieved. Primary closure of the arteriotomy was performed. Reperfusion of the left limb was achieved within 4 hours of the onset of ischaemic symptoms. Minimal compartment signs were observed after the procedure and this avoided the need for fasciotomies.

After the procedure, there was immediate resolution of his limb pain and full recovery of neurovascular function. At the ward round the next morning, the patient was extremely grateful to have had a good night's sleep. However, very shortly after he suffered a pulseless electrical activity cardiac arrest. Given the patient's prior directive not for acute cardio-respirato-

ry resuscitation (CRP), he was made comfortable for the last few minutes of his journey.

Discussion

This case highlights several learning issues for doctors working in the hospital environment.

Firstly, it is worth considering the aetiology for ALI in this case. In view of his background history of prolonged dehydration, in-situ arterial thrombosis could have occurred due to systemic hypotension in the presence of underlying left limb atherosclerotic disease. However, immediate fluid resuscitation did not lead to any improvement of his symptoms. Another common cause of ALI for patients receiving in-hospital treatment is iatrogenic arterial injury secondary to arterial access for blood tests or percutaneous interventions (1), but there was no such history preceding his symptom onset. In the presence of locally advanced carcinoma, paraneoplastic syndrome precipitating extensive venous thrombosis is another potential diagnosis of acutely painful white limb (phlegmasia alba dolens) (2); however, proximal arterial pulses are usually present in such cases. In this case, the most likely aetiology to account for his ALI was an embolus to the left iliac artery. The common proximal source of embolus are cardiac or thoraco-abdominal aorta (3), lung cancer was another potential source of systemic emboli (4).

Pain management was the critical consideration in this case and presented significant dilemmas. Analgesia options for this patient were limited, as administration of opioids would be associated with significant risk of acute respiratory compromise (5). In the context of providing full active medical management for a potentially reversible illness (aspiration pneumonia), the use of opioid analgesia also risked the effects which would only be intended by palliative care regimes.

Reperfusion of the acutely ischaemic limb was the only non-palliative option to achieve analgesia in this patient. Without prompt revascularisation, the acute ischaemic limb would have become unsalvageable and lead to the patient's ultimate demise. Broadly, reperfusion strategies for ALI could be grouped into minimally invasive or open surgical techniques.

Minimally invasive options for treatment for arterial embolus included endovascular catheter based thrombo-embolectomy or thrombolysis (3). These options require appropriate infrastructure support, which was not available in this particular setting. Further, catheter guided thrombolysis, or the use of systemic anti-coagulant, is contra-indicated in the presence of a locally invasive lung carcinoma (6).

Open surgical exploration of the left limb arterial tree was the only treatment option available at the time. His extensive co-morbidity and borderline respiratory reserve presented extreme risk for the use of sedatives and any form of general/regional anaesthesia (7). Surgical exploration may further reveal other pathologies which may otherwise require more extensive revascularisation procedures in addition to simple thrombo-embolectomy, and would not have been in the patient's best interest in this case.

Focused open surgical exploration under carefully administered local anaesthesia, with the hope to retrieve a culprit embolus, was the best and only hope for pain relief for this patient. Fortunately, surgery brought prompt reperfusion of his limb and resulted in effective analgesia. Although the patient only lived for another 12 hours after the procedure, he was truly grateful to have had one good night's sleep, at last.

Learning points

1. The most common aetiology of ALI in hospital patients include: embolism, iatrogenic arterial injury, and in-situ thrombosis of a diseased vessel precipitated by hypercoagulable states.
2. A recent meta-analysis showed survival benefits in lung patients treated with anticoagulation in terms of survival at 1 and 2 years, but not at 6 months. Anticoagulation reduced the risk of venous thromboembolism (VTE) in lung cancer patients without other indication for anticoagulation. Furthermore, subcutaneous heparin was found to be superior than vitamin K agonist because of smaller risk of major bleeding (8).
3. Reperfusion strategies for ALI include non-invasive catheter directed techniques and open

surgical techniques. The availability of a treatment strategy depends on the local infrastructure.

4. Prompt reperfusion of an ischaemic limb is the most effective analgesia treatment in non-terminal patients.
5. When the underlying diagnosis of ALI is acute embolism, surgical thrombo-embolectomy of the affected limb can be performed safely and effectively under local anaesthesia. Patients should not be denied the option of open surgical exploration simply on the grounds of significant co-morbidity.

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References

1. Derham C, Davies JF, Shahbazi R, Homer-Vanniasinkam S. Iatrogenic limb ischemia caused by angiography closure devices. *Vasc Endovascular Surg* 2006; 40 (6): 492-4. Epub 2007/01/05.
2. Donati MB. Cancer and thrombosis: from Phlegmasia alba dolens to transgenic mice. *Thromb Haemost* 1995; 74 (1): 278-81. Epub 1995/07/01.
3. Creager MA, Kaufman JA, Conte MS. Clinical practice. Acute limb ischemia. *N Engl J Med* 2012; 366 (23): 2198-206. Epub 2012/06/08.
4. Imaizumi K, Murate T, Ohno J, Shimokata K. Cerebral infarction due to a spontaneous tumor embolus from lung cancer. *Respiration* 1995;62(3):155-6. Epub 1995/01/01.
5. Jungquist CR, Karan S, Perlis ML. Risk factors for opioid-induced excessive respiratory depression. *Pain Manag Nurs* 2011; 12 (3): 180-7. Epub 2011/09/07.
6. Van den Berg JC. Thrombolysis for acute arterial occlusion. *J Vasc Surg* 2010; 52 (2): 512-5. Epub 2010/05/04.
7. Horwood J, Ratnam S, Maw A. Decisions to operate: the ASA grade 5 dilemma. *Ann R Coll Surg Engl* 2011; 93 (5): 365-9. Epub 2011/09/29.
8. Zhang J, Zhang YL, Ma KX, Qu JM. Efficacy and safety of adjunctive anticoagulation in patients with lung cancer without indication for anticoagulants: a systematic review and meta-analysis. *Thorax* 2013; 68 (5): 442-50. Epub 2013/01/17.

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