

# Anterior spinal artery syndrome after the embolisation of bronchial arteries to control hemoptysis - a warning

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## Abstract

Spinal cord ischaemia following embolisation of bronchial arteries to control hemoptysis is reported. This rare complication occurred despite lack of visualisation of blood supply to the spinal cord during preliminary arteriography.

## Case report

A 60 year old female was admitted to the Baragwanath Hospital following several episodes of hemoptysis due to pulmonary tuberculosis.

After bronchoscopy the patient was referred for bronchial artery embolisation. Using the Seldinger technique the right femoral artery was cannulated. Two left bronchial arteries were catheterised using 4-French Simmons and multipurpose (Cordis) catheters. Omnipaque 300 was used as a contrast material.

Both left bronchial arteries were hypertrophied and showed abnormalities with pericavity vascularity and evidence of arteriovenous shunting. There was no active contrast media extravasation.

Both bronchial arteries were carefully examined on antero-posterior and lateral projections to see if they contributed to the blood supply of the spinal cord.

There were no anterior or posterior spinal or radicular arteries detected before or after the embolisation.

Successful embolisation of both left bronchial arteries was achieved using 500-710 microns PVA particles (Contour-ITC).

The patient tolerated the procedure well and was examined neurologically at the end of the procedure. No neurodeficit was detected. Blood pressure was monitored and there was no episode of hypotension during the procedure.

However, five hours after the procedure the patient developed weakness of both legs, predominantly on the left side, sensory loss in both legs and urinary retention. Neurological examination showed normal tone, normal power of the face, neck and upper limbs. Power of the left leg was 2/5 and the right leg 3-4/5 in an upper motor neuron distribution. There were brisk reflexes of the upper limbs

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and knees, absent ankle reflexes, no plantar response and absent superficial abdominal reflexes. There was complete loss of pinprick and light touch sensation below the level of T3 with normal proprioception and vibration. There was also minimal decrease in anal sphincter tone. The patient reported normal bladder sensation but was unable to pass urine.

The above clinical picture represented incomplete anterior spinal artery syndrome at the level of T3.

The patient was treated with a five day course of Prednisolone 1g/day IV and physiotherapy was started.

Five weeks later the patient had normal tone in both legs, power of the right leg was 5/5 and the left leg 4/5. Reflexes were the same as initially. Pinprick and light touch returned completely. Bladder function returned completely.

There were no episodes of hemoptysis 20 weeks following embolisation and the patient is able to walk.

## Discussion

Serious complications after bronchial artery embolisations are rare.

Most of the reported cases of transverse myelitis have been the result of contrast toxicity rather than inadvertent embolisation and predate the introduction of low osmolar contrast media. Accidental spinal cord injury resulting in transient or permanent paraplegia has been reported following spinal cord angiography, aortography or bronchial arteriography.<sup>1,2,3</sup> This complication is attributable to the damage (mechanical injury following forceful injection of contrast media or damage due to the contrast toxicity) of the anastomotic branches to the spinal cord which usually are

on the right side from the third to the seventh intercostal arteries, and on the left from the seventh intercostal to the second lumbar arteries. The bronchial artery, particularly on the right, often gives off important spinal cord branches.

Anatomical studies have established that the thoracic part of the spinal cord at the T4-T6 level is a critical zone which is poorly supplied by blood<sup>2</sup> and is regarded as a watershed zone between descending spinal branches from the vertebro-basilar segment and ascending branches from the lower dorsal region.

Prior to the embolisation procedure it is mandatory to obtain a selective angiogram of excellent quality to

determine if there are any branches to the spinal cord. There are no absolute contraindications to bronchial artery embolisation.<sup>4,5</sup> If the spinal artery arising from the bronchial or intercostal artery is identified, special care has to be taken. It is theoretically possible that fast flowing blood in the hypertrophied bronchial artery will direct embolic material to the abnormal intrapulmonary circulation rather than into the spinal artery. Using large particles (larger than 250 microns) can prevent obstruction of the spinal vessels.<sup>4,5</sup> This particle size effectively occludes the bronchial artery but is too large to allow particles to enter small spinal feeders sparing the spinal cord from injury.<sup>4</sup>

### Illustrative images from another patient

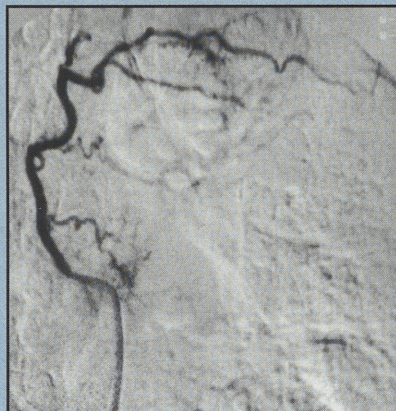


Figure 1: Selective angiogram of the intercostal artery. Late phase showed network of distal abnormal vessels contributing to hemoptysis.



Figure 3: Complete embolisation of intercostal artery with PVA.

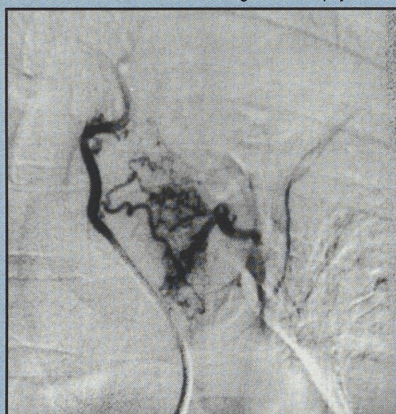


Figure 2: Intercostal artery following partial embolisation showing network of proximal small abnormal vessels and arterio-venous shunt. This was not seen on the control angiogram.

There is better visualisation of the proximal small arterial vessels following distal embolisation of the intercostal artery. By a similar mechanism, small spinal arteries may become visible.

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Complications have occurred when small particles or liquid agents such as alcohol or bucrylate were used.<sup>6</sup>

Recent development in microcatheters allow them to be placed distally to the origin of the spinal arteries for safe embolisation.

However, spinal and other small arteries may only become visible during embolisation or following embolisation when there is preferential flow into these vessels (Figures 1-3). There are two reports in the literature of spinal cord infarction following bronchial artery<sup>7</sup> and intercostal artery<sup>8</sup> embolisation where preliminary angiography failed to show spinal arteries. In both cases, authors emphasise the significant role which angiographically invisible small vessel collaterals can play in the blood supply to the spinal cord. Small vessels to the spinal cord may be seen angiographically only after peripheral embolisation.

Pre-embolisation angiograms to assess spinal vascular supply may be inadequate due to the preferential flow into the low pressure pulmonary circuit.

We recommend that after an initial injection of embolic material has diminished run-off into the lungs, repeat arteriogram is necessary to exclude radiculomedullary branches to the spinal cord.

However, even using the most meticulous angiography technique, there is a risk of spinal cord ischaemia. As with any diagnostic or therapeutic test the risk of spinal ischaemia must be weighed against that of untreated bronchial haemorrhage.

## Acknowledgement

Thanks to Prof P Fourie (Pretoria Heart Hospital) for assistance with the manuscript.

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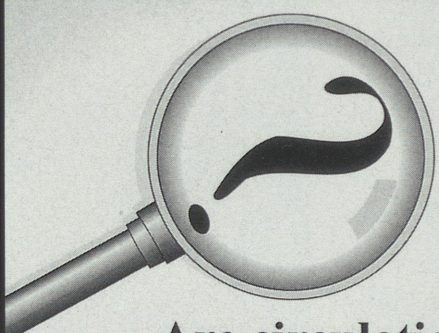
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