**Ischaemic sequelae following glue embolization of type 2 endoleak involving multiple lumbar arteries**

Dear Editor,

We wish to report an unusual but important complication of embolisation of a lumbar type 2 endoleak using N-butyl cyanoacrylate (NBCA).

A 74-year old man underwent bifurcated EVAR for AAA in 2017. A surveillance duplex ultrasound scan two and a half years later showed that the sac size had increased by 10mm. A CTA confirmed a large type 2 endoleak involving L4 and L5 lumbar arteries.

The patient underwent transarterial embolization of the type 2 endoleak under local anaesthesia via left femoral access. The left iliolumbar artery was chosen as the entry vessel into the endoleak sac, which was superselectively catheterised with a microcatheter. The microcatheter was advanced into the left L5 lumbar artery and into the endoleak cavity (nidus). Angiography performed from within the endoleak nidus showed opacification of a large endoleak cavity as well as both L4 lumbar arteries and the right L5 lumbar artery (Figure 1).

Embolisation of the endoleak was performed using Glubran 2 (GEM, Viareggio, Italy), which was mixed with lipiodol in a 1:4 ratio. During glue injection, the glue cast filled the endoleak cavity first then disintegrated intermittently to opacify the exiting lumbar arteries, one at a time. Completion images showed the glue cast within the aneurysm sac and bilateral L4 and L5 lumbar arteries. Unfortunately, glue was also seen within the distal branches of the L4 lumbar arteries and to a lesser extent the right L5 lumbar artery (Figure 2). Completion angiography showed no further endoleak.

The patient developed lower back pain and bilateral thigh pain several hours following the procedure, which required opioid analgesia. He was discharged the following day after a duplex ultrasound confirmed no evidence of residual endoleak. His symptoms persisted for several weeks but gradually diminished over time, and resolved completely in two months. An MRI of the lumbar spine showed abnormal marrow signal in the L4 vertebral body, suggestive of medullary infarction (Figure 3).

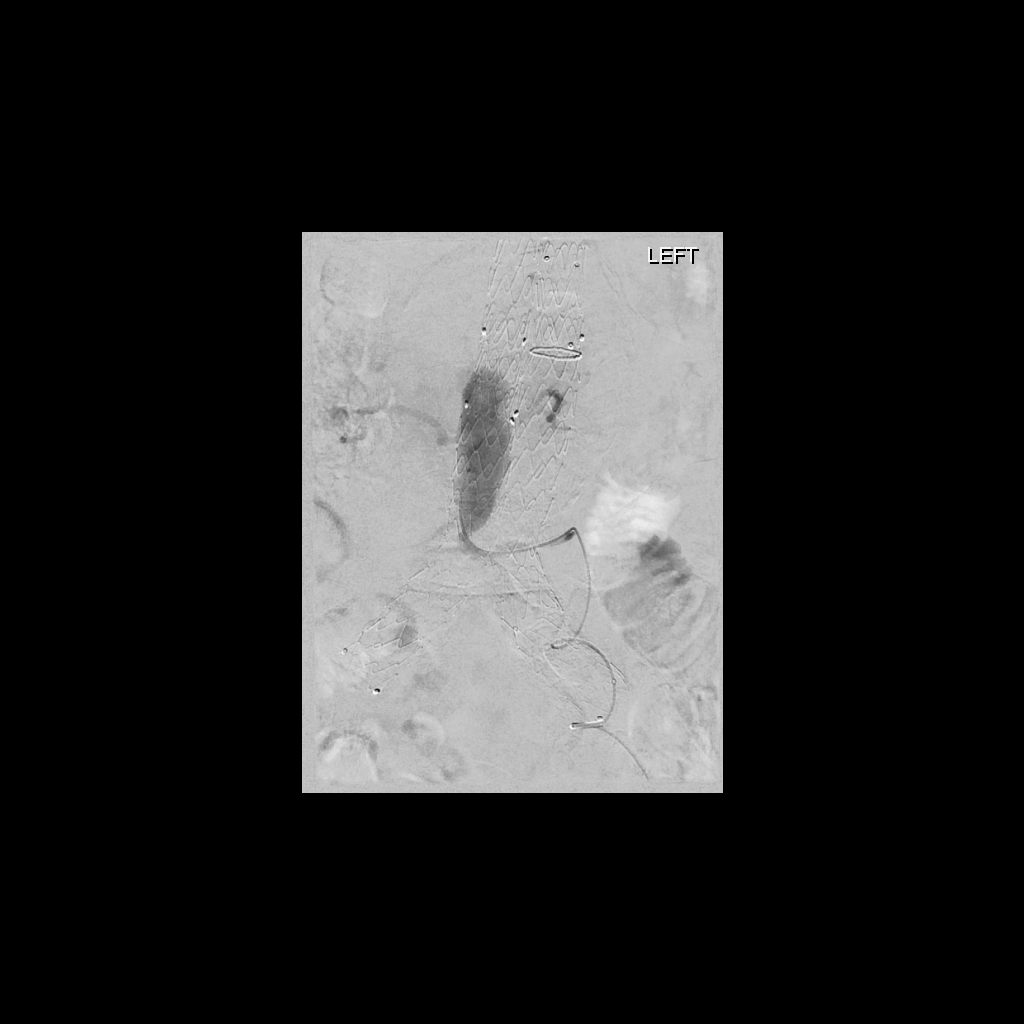
Non-target embolization resulting in neurological symptoms is uncommon following type 2 endoleak embolization of lumbar arteries. Only two reports allude to similar complications. The first report was by Kajiwara et al [1] who described two cases of back pain, one of whom developed transient lower limb muscle weakness. In both cases, a 1:10 histoacryl:lipiodol mixture was used as the sole embolic agent. The second report was published by Zener et al [2] who described neuropraxia and neuromuscular injury in one patient. Again, histoacryl was used as the only embolic agent but in a more viscous ratio of 1:4. During embolization, the glue cast within the aneurysm sac suddenly disintegrated distally into the lumbar artery. Suggested techniques to prevent non-target glue embolization included using higher viscosity glue and prior coiling to reduce blood flow in the endoleak cavity.

Similarly, our case involved the use of glue (Glubran 2) as the sole embolic agent. The endoleak cavity was large involving multiple lumbar arteries. The high blood flow within the aneurysm sac propelled the glue cast distally into the lumbar arteries. We concluded that the patient’s symptoms were due to non-target embolisation of lumbar artery branches resulting in self-limiting ischaemic sequelae – back pain from bone marrow ischaemia and bilateral lower limb pain from ischaemic radiculopathy. Since this complication, we have moved to using a more viscous NBCA:lipiodol ratio of 1:3 and using coils to embolise at least one inflow/outflow lumbar artery prior to glue injection into the endoleak cavity.

We wish to highlight the potential risk of causing ischaemic injury to bone marrow and lumbar nerve roots when embolising type 2 endoleaks involving lumbar arteries. The risk of non-target embolization is high when using liquid embolic agents alone and when the endoleak is large involving multiple lumbar arteries.

**References**

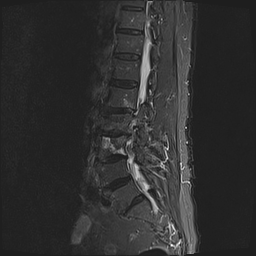
1. Kajiwara K, Yamagami T, Urashima M et al. Embolization for type 2 endoleak with sac expansion after endovascular repair of abdominal aortic aneurysm: safety and effectiveness. SpringerPlus 2016;5:262
2. Zener R, Oreopoulos G, Beecroft R et al. Transabdominal direct sac puncture embolization of type II endoleaks after endovascular abdominal aortic aneurysm repair. J Vasc Interv Radiol 2018;1-7



**Figure 1.** Diagnostic angiogram from within the endoleak cavity (large arrow). Microcatheter in the left lumbar artery and contrast faintly opacifying the right L5 lumbar artery (long black arrows). Contrast in the L4 lumbar arteries (short black arrows).



**Figure 2.** Completion image of glue cast following embolization shows non-target embolization within distal branches of the L4 lumbar arteries (black arrows).



**Figure 3.** Sagittal STIR image of the lumbar spine showing abnormal marrow signal in the L4 vertebral body with a geographic appearance (white arrow). This area returned high signal on T2 and intermediate signal on T1 weighted images. Given the history of recent lumbar artery embolization and back pain, a medullary infarct was suspected. (Note – there is lumbarisation of S1.)