PYOGENIC CEREBRAL ABSCESS WITH DISCHARGING SINUS COMPLICATING AN EMBOLIZED ARTERIOVENOUS MALFORMATION

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SUMMARY

Brain arteriovenous malformations (AVM) are treated with endovascular embolization either as a definitive treatment or as an adjunct to surgery or stereotactic radiotherapy. Complications of AVM embolization are well known but infection of the embolised AVM nidus is extremely rare. On Pubmed search we found only a single case report of an infected brain AVM after embolization. We report a case of pyogenic cerebral abscess with superior sagittal sinus extension complicating an embolised AVM and discuss the possible etiopathogenesis.

Key words: arteriovenous malformations, cerebral, arteriovenous malformations, therapeutic embolization, sinuses, superior sagittal.

CASE REPORT

A 30-year-old right-handed male was referred to our institution in May 2000 for the management of a right motor strip AVM. At presentation, the patient had left sided hemiparesis for 15 years and left focal seizures beginning as paraesthesias and tonic clonic movements of the left lower limb subsequently spreading to the left upper limb with one seizure per month.

The initial CT scan (May 2000) showed an AVM with nidus in the right motor cortex with intraparenchymal hemorrhage in the region of the right centrum semiovale and intraventricular extension to the right lateral ventricle and third ventricle. There was no associated subarachnoid hemorrhage (figure 1a). He was kept on conservative treatment and follow up CT scan (June 2000) revealed resolution of the hemorrhage (figure 1b). Subsequent digital subtraction angiogram (February 2001) demonstrated the feeders from pericallosal and callosomarginal branches of the right anterior cerebral artery, rolandic branch of the right middle cerebral artery with dural supply from anterior falcine branch of the right ophthalmic artery, middle meningeal artery and bilateral superficial temporal artery (figure 2a-d). The venous drainage was through dilated cortical veins to the superior sagittal sinus (SSS). Subsequently, the patient underwent four sittings of endovascular embolization in our department with N-butyl-cyanoacrylate (NBCA) over a period of 3 years. During the first embolization performed in October 2001, right middle cerebral artery (MCA) and right anterior cerebral artery (ACA) feeders were embolised with 17%
Gluing of the microcatheter occurred while embolising the last ACA feeder and the catheter got fragmented at the distal supple segment. The proximal portion of the broken catheter subsequently migrated into the right MCA (figure 3a and 3b). Attempts at retrieving the broken catheter fragment failed and the catheter was left in situ. Second embolization was uneventful. During the third sitting of embolization a portion of the glue migrated to the venous side at the torcula (figure 3a), which was successfully removed with a micro snare. Third sitting embolization resulted in more than 80% reduction in the nidus volume. The patient had no neurological deficits following the third sitting of embolization (August 2004), initial angiography revealed total occlusion of the SSS with retrograde flow in the cortical veins (figure 3a-c). The tiny feeders from both right ACA and MCA could not be catheterized. Embolization of dural supply from the right middle meningeal artery was performed with NBCA. The patient’s neurological condition was stable. He was kept on follow up.

Six months after the last embolization the patient noticed a sinus with pus discharge over the vertex. The patient presented at follow-up only 2 months later. On examination he was afebrile with no additional neurological deficits or features of raised intracranial pressure. A CT head (March 2005) revealed ring-enhancing lesions suggestive of abscess.
along with intensely enhancing AVM nidus in right fronto-parietal region with perilesional edema and mass effect (figure 3c). Bone widow setting showed defect in the skull vault at the site of draining sinus (figure 3d). An MRI was performed immediately. Conventional MR sequences, diffusion weighted imaging and proton MR spectroscopy better characterized the infective nature of the lesion involving the AVM nidus and adjacent brain parenchyma. There was abscess formation inside the superior sagittal sinus from which the discharging sinus was extending into the scalp (figure 4a-f). Residual AVM nidus was observed adjacent to the infected part of the nidus. Angiogram performed a few days later demonstrated the persistent small nidus with occluded SSS (figure 5d-f). Cultures taken from the discharging sinus revealed Pseudomonas aeruginosa sensitive to amikacin and ceftaxime. The patient was being
treated on high dose antibiotics after neurosurgical consultation for 6 weeks as a presurgical measure for abscess evacuation.

DISCUSSION

Brain AVMs most commonly present with intracerebral hemorrhage. The next common presentation is seizure. AVMs can also result in focal neurological deficits [2, 8]. Due to the high morbidity and mortality associated with brain AVM from hemorrhage, treatment is generally recommended. Surgical excision is the treatment of choice for the majority of AVMs. Other important modes of treatment include endovascular embolization and stereotactic radiosurgery. Embolization is curative for small AVMs and an adjunct to surgery or stereotactic radiotherapy for large AVMs. Deep-seated AVMs and those located in eloquent areas are often dealt with embolization or stereotactic radiotherapy alone or in combination [8, 10].

Embolization of brain AVMs is mainly performed with polymerizing agent like NBCA injected through flow-guided microcatheters. Alternatively, other materials such as polyvinyl alcohol, Onyx, absolute alcohol etc. can be used to embolise AVMs [8]. Complications associated with embolization of AVM
include perforation of vessel, intracerebral hemorrhage, normal perfusion pressure breakthrough, non-target embolization, and migration of the glue to the venous side [11]. Complications specific to the use of polymerizing agent is gluing of microcatheter [3].

Infection of a brain AVM as a complication of embolization is extremely rare. There is only one report of infected brain AVM following embolization in the literature [7]. Mourier et al. reported an infected brain AVM in a 24-year-old patient following embolization. This patient had a right frontal AVM and underwent two sittings of embolization. She presented with features of raised intracranial pressure 4 months after embolization and imaging showed multiple abscesses in the region of the embolised AVM, which was confirmed by stereotactic aspiration biopsy. The offending organism in that case was Staphylococcus aureus and they attributed the source of infection possibly to the handling of the microcatheter or glue. Finally the AVM had to be excised due to inadequate response to antibiotic therapy [7].

As reported by Mourier et al., we also observed delayed onset of infection. In spite of all aseptic precautions through out his treatment we observed infection developing in the AVM eight months after the last embolization.

Brain abscess occurs as a consequence of extension of infection either by contiguous spread or hematogenous spread from an infective focus. The mode of infection often determines the causative pathogen causing brain abscess [5]. Pseudomonas aeruginosa is a gram-negative bacillus and is a well-known cause of central nervous system nosocomial infections in patients with head injury, neurosurgical procedures and long term debilitating diseases [4]. In our patient, this pathogen most likely has been carried to the site of infection through catheters or glue. Colonization of the embolised AVM could have occurred through the arterial route during the procedure or when attempts were made to retrieve the catheter. There after the infection must have spread in the nidus and then to the superior sagittal sinus. The discharging sinus in our case perhaps had developed from extension of the infection from SSS into an emissary vein to the scalp. Alternatively transient asymptomatic bacteremia could have led to the infection of the nidus. Presence of broken catheter could be a facilitating factor for development of abscess in this case. The initial focus of infection in our case might have been in the thrombosed superior sagittal sinus from which it could have spread to the embolised nidus via the draining veins. The third possible route of infection being the hematogenous route during the embolization of the dural branches in the last sitting. Infection may have occurred in the scalp and then subsequently progressed to the SSS via an emissary vein and then to the AVM nidus.

Development of brain abscess at the site of embolised AVM nidus is an extremely rare event. Extreme care should be taken to ensure proper asepsis during embolization. Broken catheters or other foreign bodies left in situ may act as a nidus for development of abscess.

REFERENCES


Analyses de livres

**NeuroPET**

*PET in Neuroscience and Clinical Neurology*

K. Herholz, P. Herscovitch, W.D. Heiss

Springer Verlag Berlin Heidelberg 2005

297 pages (1 volume + 1 CD)

La place grandissante des explorations par TEP en pathologie du système nerveux explique la nécessité d’une mise au pont sur ce sujet. L’ouvrage de K Herholz, Peter Herscovitch et Wolf-Dieter Heiss répond tout à fait à cette nécessité. Le livre est divisé en trois grandes parties. La première a une orientation clinique et envisage successivement les démences et troubles de la mémoire, les mouvements anormaux, les pathologies tumorale et vasculaire, l’épilepsie et les pathologies psychiatriques. La deuxième partie a une orientation fonctionnelle et traite de la barrière hémostatique, de métabolisme cérébral, de transports protéiques, d’imagerie moléculaire et de neurotransmission. L’ouvrage se termine par un chapitre consacré à la technique : acquisition des données, reconstruction, analyse des données. Le CD permet au lecteur une navigation interactive dans les données 3D et illustrent les apports diagnostiques de la tomodigraphie par émission de positons. Cet ouvrage saura très certainement être indispensable à tous les professionnels de santé, techniciens et médecins, spécialistes ou non de l’image.

**Vertebroplasty and Kyphoplasty**

D.K. Resnick, S.R. Garfin

Thieme Medical Publishers 2005

(138 pages)

La morbidité rattachée aux fractures vertébrales est importante chez le sujet âgé et le traitement de telles lésions associe traditionnellement immobilisation et antalgiques. Au cours de ces dernières années, le recours aux techniques mini-invasives, vertébroplastie et plus récemment kyphoplastie, s’est considérablement accru. L’effet antalgique quasi-immédiat obtenu, en particulier en cas de tassement ostéoporotique explique en partie l’intérêt porté à ces techniques. De nombreuses questions restent actuellement en suspens et c’est le mérite de Daniel K. Resnick, Steven R Garfin et de leurs collaborateurs de participer avec beaucoup de pertinence à ces débats. Chirurgiens orthopédiques, neurochirurgiens et radiologues interventionnels sont en effet associés dans cet ouvrage pour discuter de sujets aussi importants que la place de la vertébroplastie et de la kyphoplastie dans le traitement des fractures à la phase aiguë et celui des fractures-tassements pathologiques, les avantages et inconvénients respectifs de ces deux techniques, la sélection des patients ou la stabilisation rachidienne. Ce livre manquait : il sera une référence d’une grande utilité pour tout spécialiste prenant en charge ces fréquentes pathologies.