

# Brain abscess surgery

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## Indications

Surgery is indicated for lesions with a diameter >25 mm.

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According to the "Infection in Neurosurgery" Working Party Of The British Society For Antimicrobial Chemotherapy," the guiding principles for surgical management are: <sup>1)</sup>.

To urgently reduce raised intracranial pressure by aspiration of the cavity using image guidance;

to confirm the diagnosis;

to obtain pus for microbiological diagnosis;

to enhance the efficacy of antibiotic therapy;

to avoid iatrogenic spread of infection into the ventricles.

Surgical [excision](#): Shortens length of time on [antibiotics](#) and reduces risk of recrudescence. Recommended in traumatic abscess to debride foreign material (especially bone), and in [fungal infection](#) because of relative antibiotic resistance.

External drainage: Controversial. Not frequently used.

Instillation of antibiotics directly into the abscess: has not been extremely efficacious, although it may be used as for refractory [Aspergillus](#) abscesses.

Currently, the principals methods for surgical management are open [evacuation](#), [excision](#), and [aspiration](#) through a bur hole and more recently stereotactic <sup>2)</sup>.

## Techniques

Different surgical approaches have been described, including puncturing of the abscess (under [neuronavigation](#), [stereotactic](#) or echographic guidance) with aspiration of the purulent fluid through a catheter and craniotomy with microsurgical removal of the purulent material and surrounding capsule. In recent years, the endoscopic approach has become more frequently used to treat brain abscesses. The theoretical advantages are visual awareness of the completeness of pus removal and the possibility of also removing the more solid fibrinoid component, which could be the source of recurrence. A craniotomy is likewise avoided <sup>3)</sup>

An 11-year-old boy affected by a parieto-occipital brain abscess and initial ventriculitis underwent endoscopic surgery. An ultrasonic aspirator was used to wash and suck the purulent material and fragment and remove the more solid fibrinoid component. The occipital horn of the lateral ventricle was also entered, and pus was removed. At the end of the procedure, a ventricular drainage tube was left in the surgical cavity. It was removed 1 day later because the cavity had completely collapsed. The key surgical steps are presented in Video 1.1-9 The procedure was uneventful, with very good clinical and radiological results. The endoscopic technique is a safe and effective treatment option for intracranial abscesses. In the case of large superficial lesions, the surgical risks appear similar to those of simple drainage through catheters, with a possible reduction of the 20% reported recurrence rate. The use of an ultrasonic aspirator could facilitate complete and faster pus removal, increasing the efficacy of the procedure. The patient and his parents consented to the procedure and the report of the patient's case details and imaging studies <sup>4)</sup>.

### Stereotactic needle aspiration for brain abscess

see [Stereotactic needle aspiration for brain abscess](#).

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Some experts advise postoperative administration of antimicrobial agents directly into the abscess cavity through the drainage catheter, since antimicrobial penetration into the abscess cavity after systemic administration can be limited, but there are few data on the risks and benefits of this approach and it is not routinely recommended. Total resection was recommended up to 20 years ago, but it now has a limited role, given the improvements in medical and minimally invasive neurosurgical management. Nevertheless, if an abscess is superficial and is not located in eloquent brain tissue, resection, rather than drainage, should be considered, particularly when there is suspicion of fungal or tuberculous infection or of branching bacteria (e.g., actinomyces or nocardia species). If the causative pathogen has been identified, the indication for aspirating the abscess depends on its size and location, the patient's clinical condition, and the likelihood of achieving meaningful decompression through aspiration <sup>5)</sup>.

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A article describes a novel treatment for a cerebral abscess, using the Penumbra Apollo suction/vibration aspiration system (Penumbra, Alameda, CA, USA). This article represents the first reported case of the device's use for treatment of an intracerebral abscess.

The patient discussed presented to the emergency department in critical condition, and was found to be suffering from a right [thalamic abscess](#). She underwent treatment with both medical management

and surgical intervention with the use of the Apollo system.

This report details a novel technique for surgical abscess drainage with an excellent clinical outcome. The aim is to provide insight into the treatment of intracerebral abscesses, the utility of the Apollo system, and the device's application beyond intracerebral and intraventricular hemorrhage <sup>6)</sup>.

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The endoport is a tubular conduit that can be employed for minimally invasive approaches to deep-seated intracranial lesions, and it may reduce the length of dural opening, size of corticotomy, and retraction-related injury. In this technical note, we present the first report of an adult with a deep cerebral abscess which was successfully treated with endoport-assisted surgical evacuation. The endoport has been shown to be useful for the treatment of other intracranial pathologies, and we believe that this technology may be employed for the evacuation of appropriately selected cerebral abscesses <sup>7)</sup>.

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Minelli et al. present the first nano-mechanical characterization of surgically removed human brain abscess tissues by means of atomic force microscopy (AFM) in the spectroscopy mode. Consistently with previous histological findings, we modeled the brain abscess as a multilayered structure, composed of three main layers: the cerebritis layer, the collagen capsule, and the internal inflammatory border. We probed the viscoelastic behavior of each layer separately through the measure of the apparent Young's modulus (E), that gives information about the sample stiffness, and the AFM hysteresis (H), that estimates the contribution of viscous and dissipative forces. Our experimental findings provide a full mechanical characterization of the abscess, showing an average E of  $(94 \pm 5)$  kPa and H of  $0.37 \pm 0.01$  for the cerebritis layer, an average E =  $(1.04 \pm 0.05)$  MPa and H =  $0.10 \pm 0.01$  for the collagen capsule and an average E =  $(9.8 \pm 0.4)$  kPa and H =  $0.57 \pm 0.01$  for the internal border. The results here presented have the potential to contribute to the development of novel surgical instruments dedicated to the treatment of the pathology and to stimulate the implementation of novel constitutive mechanical models for the estimation of brain compression and damage during BA progression <sup>8)</sup>.

## History

see [Brain abscess surgery history](#).

## Review

The literature regarding surgical treatment of brain abscess was reviewed from 1990 to (and including) 2008 to supplement a previous literature review from 1930 to 1990.

The Ovid Medline database 1950-2009 with the year range limited to 1990-2009 was used to identify all articles relating to brain abscess. The results were compared with a previously published review from 1930-1990 by the senior author.

The original finding was confirmed that the high mortality from aspiration in the pre-computer tomography era decreased dramatically after computer tomographic scanning became available. In

the present review, the mean mortality for aspiration post-1990 was 6.6% for publications with more than five patients. With surgical excision by craniotomy, the mean mortality in the same period was 12.7%.

The present review suggests that aspiration may be the first surgical choice in patients with supratentorial parenchymal brain abscesses <sup>9)</sup>.

## Videos

[Brain abscess surgery videos](#)

## References

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