

# Awake surgery in pediatric patient



[Awake brain surgery](#) (ABS) in [children](#) remains a subject of controversial debate for the potential psychological limitations that are related to this type of [procedure](#). However, the tolerance and benefits of ABS in adults advocate for increased application of ABS in children.

## Literature review

A [literature review](#) was performed using the [MEDLINE](#) (PubMed) electronic database applying the following [MeSH](#) terms to the keyword search within titles and abstracts: “awake brain surgery children,” “awake brain surgery pediatric,” “awake craniotomy children,” “awake craniotomy pediatric,” and “awake surgery children.” Of the initial 753 results obtained from these keyword searches, a full text screening of 51 publications was performed, ultimately resulting in 18 eligible articles for this review.

A total of 18 full-text articles reporting the results of 50 patients were included in the analysis. Sixteen of the 18 studies were retrospective studies, comprising 7 case series, 9 case reports, and 2 reviews. Eleven studies were conducted from anesthesiological (25 patients) and 7 from neurosurgical (25 patients) departments. Most of the patients underwent ABS for supratentorial lesions (26 patients), followed by epilepsy surgery (16 patients) and deep brain stimulation (DBS) (8 patients). The median age was 15 years (range 8-17 years). Persistent deficits occurred in 6 patients, (12%), corresponding to minor motor palsies (4%) and neuropsychological concerns (8%). An awake procedure was aborted in 2 patients (4%) due to cooperation failure and anxiety, respectively.

Despite well-documented beneficial aspects, ABS remains mainly limited to adults. This review confirms a reliable tolerability of ABS in selected children; however, recommendations and guidelines for its standardized implementation in this patient group are pending. Recommendations and guidelines may address diagnostic workup and intra-operative handling besides criteria of eligibility, psychological preparation, and coordinated neuropsychological testing in order to routinely offer ABS to children <sup>1)</sup>.

## Case series

Huguet et al., reported the psychological assessment, evaluation [algorithm](#), and [outcome](#) of pediatric patients, who underwent ABS for surgical treatment of lesions in [eloquent](#) areas. Psychological selection criteria and the specifications of psychological support are described. A retrospective review

and analysis of psychological assessment and psychological outcome of pediatric patients, who underwent ABS between 2005 and 2018 at the Department of pediatric neurosurgery, of [Hôpital Femme Mère Enfant](#), was performed. Long-term psychological outcomes are reported. ABS was proposed to 18 children aged between 9 and 17 years and their families. After psychological evaluation of the individual patient and their familial surrounding, five boys and 12 girls (n = 17) were accounted eligible for ABS. They underwent asleep-awake-asleep brain surgery with intraoperative testing. In 16 cases, ABS could be performed as planned. Psychological alterations were postoperatively observed in 3 patients, symptoms of a post-traumatic stress disorder in 1 patient. The precise preoperative evaluation of the risk-benefit ratio in children plays a crucial role in anticipating a good psychological outcome. Professional psychological preparation and support of the child and his or her family are the key elements for successful completion of ABS <sup>2)</sup>.

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Balogun et al., from The [Hospital for Sick Children](#), reported the experience of [awake craniotomy](#) and cortical stimulation for epilepsy and supratentorial tumors located in and around eloquent areas in a pediatric population (n=10, five females). The presenting symptom was mainly seizures and all children had normal neurological examinations. Neuroimaging showed lesions in the left opercular (n=4) and precentral or peri-sylvian regions (n=6). Three right-sided and seven left-sided awake craniotomies were performed. Two patients had a history of prior craniotomy. All patients had intra-operative mapping for either speech or motor or both using cortical stimulation. The surgical goal for tumor patients was gross total resection, while for all epilepsy procedures, focal cortical resections were completed without any difficulty. None of the patients had permanent post-operative neurologic deficits. The patient with an epileptic focus over the speech area in the left frontal lobe had a mild word finding difficulty post-operatively but this improved progressively. Follow-up ranged from 6 to 27 months. Pediatric awake craniotomy with intra-operative mapping is a precise, safe and reliable method allowing for resection of lesions in eloquent areas. Further validations on larger number of patients will be needed to verify the utility of this technique in the pediatric population <sup>3)</sup>.

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Ard et al., presented the experience with the use of [dexmedetomidine](#), an alpha2 agonist, in two children undergoing awake craniotomy. General anesthesia with the laryngeal mask airway was used for parts of the procedure not requiring patient cooperation to reduce the duration of wakefulness and abolish the discomfort of surgical stimulation. Dexmedetomidine was used as a primary anesthetic for brain mapping of the cortical speech area. The asleep-awake-sleep technique provided adequate sedation and analgesia throughout the surgery and allowed the patient to complete the necessary neuropsychological tests. This is the first description of the use of dexmedetomidine in pediatric neurosurgery <sup>4)</sup>.

## References

<sup>1)</sup>

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<sup>2)</sup>

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<sup>3)</sup>

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<sup>4)</sup>

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