



# Awake craniotomy: improving the patient's experience

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## **Purpose of review**

Awake craniotomy patients are exposed to various stressful stimuli while their attention and vigilance is important for the success of the surgery. We describe several recent findings on the perception of awake craniotomy patients and address nonpharmacological perioperative factors that enhance the experience of awake craniotomy patients. These factors could also be applicable to other surgical patients.

## **Recent findings**

Proper preoperative counseling gives higher patient satisfaction and should be individually tailored to the patient. Furthermore, there is a substantial proportion of patients who have significant pain or fear during an awake craniotomy procedure. There is a possibility that this could induce post-traumatic stress disorder or related symptoms.

## **Summary**

Preoperative preparation is of utmost importance in awake craniotomy patients, and a solid doctor–patient relationship is an important condition. Nonpharmacological intraoperative management should focus on reduction of fear and pain by adaptation of the environment and careful and well considered communication.

## **Video abstract**

<http://links.lww.com/COAN/A39>

## **Keywords**

awake craniotomy, communication, patient management, patient satisfaction

## **INTRODUCTION**

An awake craniotomy remains an intriguing procedure for the anaesthesiologist, as the need for prolonged active cooperation of the patient during a surgical intervention is quite unique. Thereby awake craniotomy stands in stark contrast to other regional anaesthetic techniques in which the patient (or the procedure) profits from a passive cooperation or reduced consciousness of the patient. The need of prolonged vigilance of the patient comes at a price because the patient is exposed to a range of stress factors on different domains and with various intensities. These stress factors range from the diagnosis of a malignant brain tumor and hospital admittance up to the experience of fear, pain and the discomfort of the positioning on the OR-table [1]. Pain during the procedure ranges from mild pain in 14–56% of the patients to severe pain in 5–20% [2,3]. Incidence of anxiety and fear during the procedure also has been assessed in several studies, and ranges from 5 to 50% of the patients [2,4,5]. The overall experience of patients during the procedure has recently

been extensively reviewed elsewhere [6]. Although the short-term response of patients who underwent an awake craniotomy is largely very positive, it comes as no surprise that patients can even exhibit post-traumatic stress disorder symptoms directly attributable to the procedure itself [7<sup>••</sup>].

In the recent literature that evaluates the patient's perception of the awake craniotomy, only a few articles explicitly mention the role of the anaesthesiologist during the preoperative phase [4,8,9]. This may reflect local practice or the relationship between anaesthesiologists and neurosurgeons.

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## KEY POINTS

- The psychological impact of an awake craniotomy on the patient should not be underestimated.
- Psychological techniques and simple, nonpharmacological interventions can improve patient's experience of an awake craniotomy.
- Careful preoperative preparation and professional intraoperative performance by the respective anaesthesiologist are crucial.

However, we believe that the success of this procedure is made as a team effort. Therefore, we see a crucial role for the anaesthesiologist, being responsible for the vital functions of the patient and creating conditions that enable the neurosurgeon to perform a smooth tumor resection with a cooperative and unstressed patient. Previous reviews on awake craniotomy in this journal focused on the feasibility and safety of the procedure and medical and pharmacological aspects [10–13]. In this review, we want to highlight techniques and measures that the anaesthesiologist can apply to optimize the patient's experience. The studies we refer to were not exclusively performed in patients undergoing awake craniotomies, but also in other clinical settings. However, we are convinced that many of these findings can be transferred to the awake craniotomy patient as well.

## PREOPERATIVE COUNSELING AND PREMEDICATION

The psychological effect of preoperative counseling by the anaesthesiologist has been proven for decades [14]. Although straightforward at first sight, counseling can bring along several possible conflicting interests [15]. General aspects that are important during the preoperative counseling are listed in Table 1. Here, we emphasize certain aspects in this process that are important during the counseling of awake craniotomy patients.

More than for any other procedure, a trustful, solid doctor–patient relationship between the anaesthesiologist who carries out the procedure and the patient is mandatory for a successful awake craniotomy. A personal relationship is in the patient's perspective one of the most essential aspects of the premedication visit as found in a general preoperative population [16]. The authors emphasize the anxiolytic aspect of the premedication visit and the desire for patients to build a personal doctor–patient relationship. This is understandable because patients experience the perioperative process as a loss of control and 'giving up' to strangers. Aust *et al.* [16] describe that patients cope with this process by focusing their own fear and uncertainty onto the person(ality) of the physician, giving the patient a strategy to direct his emotions. Keeping emotions under control has been described as an important psychological factor in awake craniotomy patients [1]. This is supported by other studies, which found that 'the key element of patient satisfaction' is 'spending time establishing a trusting alliance' [17].

There is a controversy going on to what extent and what level of detail the patient has to be preoperatively counseled in preparation for the surgical procedure. There are suggestions that proper counseling before the procedure alleviates anxiety before and during the operation [18], especially with other forms of information provision such as short films [19]. In a large interview study, the need for information was assessed in patients planned for non-cardiac surgery. Generally, patients were satisfied with the information from the anaesthesiologist, but there is a relatively large proportion of patients that either have more or less need of preoperative information. ASA-score, education and quality of life were independent predictors for the need of information. This underlines the amount and kind of information needs to be tailored to the individual patient [20]. It is unknown whether the extent of the surgical procedure plays a role in the information needs; one could argue that the need for information in patients undergoing an awake craniotomy is considerably larger, given the invasiveness

**Table 1.** Do's and don'ts during the preoperative consultation

Do's	Don'ts
Give honest information about the procedure(s)	Give too much or too little information
Discuss risks and complications	Take away opportunities for questions
Be straightforward about options and outcomes	Use technical terms or jargon
Tailor information need to the individual patient	Take too little time or try to rush
Avoid negative suggestions, assure positive suggestions	Be misinformed about the patient

Adapted with permission from [15].

and the character of the procedure. Shaping perceptions, managing expectations and preventing surprises by detailed descriptions seem important to prevent an acute psychological stress reaction or the acute withdrawal of the consent of the patient before or during the procedure.

It is important to be aware of possible 'side-effects' of a too detailed preoperative information, leading to a nocebo effect: the expectation of a negative outcome that could precipitate or exacerbate the corresponding symptom [21]. Nonetheless, besides psychological preparation, there is a legal obligation to inform patients about risks and complications because the preoperative consult has to end with the informed consent of the patient. Seemann *et al.* [22<sup>■</sup>] describe several strategies that could be used to prevent a nocebo effect. The first one is 'linking', which is the strategy to describe risks with possible benefits. An example of linking could be the description of the placement of an arterial line. Pain and a hematoma are possible side-effects, but these are rare and well justified against the fact that it helps to keep the patient safely and closely monitored during the procedure. The second strategy could be the explanation of measures that are taken to prevent complications and the treatment options in case of a complication.

In general, it is important to empower the own responsibility and the autonomy of the patient with the aim to improve active cooperation and to reduce complications. However, personal experience shows that a significant number of patients – despite all active engagement during the neuromonitoring – feels fine with being directed through the procedure by the anaesthesiologist. This will work out much smoother if patient and anaesthetist do not meet for the first time on the OR table.

Brain tumors can affect different brain functions, both simple and complex. Quality (e.g. executive functions, emotion and cognition) and quantity of the disruptions depend on the localization and the histology of the tumor. Recent work shows that patients suffering from temporal lobe gliomas have impaired neurocognitive functions. It is important to realize that these patients have difficulties or disruption of learning and memory, attention and executive functions [23<sup>■</sup>]. More subtle changes such as changes of personality or disruption of social interaction and social cognition have also been described. These changes can be caused not only by the tumor, but also by the surgical intervention [24]. In the perioperative process, the anaesthesiologist needs to be aware of these possible alterations of the higher brain functions because

they can interfere with the patient's cooperation during the procedure. Furthermore, the patient and family members should be informed about the possible effects of surgery, like the previously described personality changes. Data on postoperative quality of life is growing, and this enables better patient education and management of expectations after surgery. Recent studies addressed not only fatigue, mood and cognitive dysfunction [25<sup>■</sup>] but also sexual dysfunction [26].

Besides nonpharmacological interventions mentioned above, pharmacological interventions could be of use to reduce anxiety and fear and optimize the patient's vigilance during the procedure. Benzodiazepines and especially midazolam are the most used group of drugs in awake craniotomy patients, but there are many studies that do not use any premedication at all (e.g. [3,27]). There is accumulating evidence that the use of benzodiazepines is not necessarily beneficial in awake craniotomy procedures. Drawbacks are respiratory depression (especially in combination with opioids given during the procedure), paradoxical agitation and interference with electro cortical recordings [28]. It was recently shown in general surgery patients that sedative premedication did not improve patient satisfaction or preoperative anxiety [29]. The use of benzodiazepines is also associated with a higher occurrence of postoperative delirium [30]. The use of other agents like clonidine, promethazine and dexmedetomidine as preoperative sedatives is also common and at least partially understandable considering the pharmacological profiles. Nevertheless, higher evidence supporting the use of these drugs is lacking.

## INTRAOPERATIVE MANAGEMENT

Intraoperative awareness is indispensable in patients undergoing an awake craniotomy procedure. Phases of the operation that leaves the most significant memory are the positioning, the fixation in the Mayfield clamp and the craniotomy itself [1]. Given the results from research on perioperative pain, comfort, anxiety and the postoperative satisfaction, there is still ample room for improvement during the procedure.

Karlsson *et al.* [31] systematically interviewed patients under spinal anaesthesia. Patients experience a feeling of being left out and feel that they have no control, which they counterbalance by communication either way by eye contact or verbal communication. To improve eye contact and communication, we recommend that the drapes are placed carefully so that the patient can keep a certain field of vision and eye contact with at least the

anaesthesia team and the neuropsychologist. If transparent drapes and blankets are used, even eye contact with the surgeon can easily be established and the patient might feel less claustrophobic. Although described first almost 40 years ago as an improvement for the anaesthesiologist and the surgeon [32], the idea is still not widespread.

In general, VAS scores during the awake craniotomy procedure are below the acceptable range of 4 of 10 (see [3,5]). However, there are significant numbers of patients who experience discomfort because of pain during the procedure [7<sup>\*\*\*</sup>]. This pain is not only because of the surgical intervention but also the continuous pressure on the lower parts of the body due to the positioning on the table. A simple measure that could improve the tolerance of patients is to do a preoperative 'practice run' [33]. Patients should also be encouraged to practice this at home (e.g. lying on the floor, not moving, letting others scratch on their itching nose) to identify possible pressure points, to cope with unpleasant sensations and to get better used to lying on the OR-table without too much spontaneous movements.

Preoperative fasting could also lead to perioperative discomfort. In concordance with European guidelines [34] it is well tolerated to drink clear fluids 2 h before surgery. In our practice, we reduced the fasting period to 1 h without any perioperative complications. Because caffeine withdrawal has been identified as a major cause of postoperative headache in fasted patients undergoing general anaesthesia, especially in awake craniotomy patients who are used to a morning cup of coffee, patients should drink it on the day of the procedure as well, to prevent this withdrawal headache [35]. To prevent a dry mouth, we use lemon glycerin swabs, although they have not been investigated in patients undergoing regional anaesthesia. In tobacco-addicted patients, we do not restrict smoking prior to the surgery. Although tobacco use is associated with various perioperative complications [36], acute nicotine withdrawal could lead to undesired side-effects like coughing or stress during the procedure. The question whether nicotine affects gastric emptying is also under debate [37].

It is at least questionable whether patients with an extremely high level of preoperative anxiety (panic) should undergo an awake craniotomy. In any case, perioperative psychological decompensation must be prevented. Continuous eye and verbal contact ('vocal anaesthesia') during the procedure could reduce feelings of helplessness [31,38], and some patients could benefit from physical contact with one of the members of the treating team, for example by holding the patient's hand [33]. Physical contact serves two ways: on one hand it can give

guidance to patients, on the other hand it can serve as a monitor that helps to detect stress quite early [22<sup>\*\*</sup>]. Inviting family members to support their relatives during the procedure on the OR table could also be considered, naturally in children [39] but under some circumstances also in adults. Whittle and Lim [40] described three patients in whom their relatives provided crucial support during the procedure; however, all family members had nursing qualifications.

Patients describe noise as one of the most disturbing factors during the procedure [1,9,15]. Noise could arise from different sources, ranging from OR personnel to the surgical drill, and has an intensity of up to 120 dBA [41]. In non-neurosurgical patients, noise was experienced as annoying, disruptive and stressful. There was no correlation between the actual sound level and the perception of noise, which leaves the recommendation to keep noise levels as low as possible [42]. A strategy to prevent the impact of ambient noise is 'reframing' disturbing noises such as reframing the noise of a surgical drill to that of the motorcycle [9].

Another intervention is the application of music. In patients under loco regional anaesthesia, music led to lower anxiety scores, higher postoperative patient satisfaction and better sedation of patients [43–45]. Recently, the effect of music was also assessed in awake craniotomy patients in which the same results have been found [46<sup>\*</sup>]. Interestingly, patients reported here that music acted as a distraction from the actual surgical procedure.

To conclude, the anaesthesiologist can exert great influence by means of communication. There are two important aspects of communication. First, it is important to avoid negative suggestions. Although much used in the perioperative process and used with a good intention, these suggestions can lead to a higher experience of anxiety and pain [47] and lead to a nocebo effect [48]. As patients have a higher level of attention, it is not only important for the anaesthesiologist to refrain from negative suggestions like misinformation, denial or suggestive questions, but for the whole team to be attentive of their verbal and nonverbal communication.

Reframing negative suggestions into positive suggestions is therefore an important other aspect. Positive suggestions have been shown to decrease pain, anxiety and the use of analgesics [49]. Positive suggestions show overlap with hypnotic techniques and can help patients to regain their own responsibility and use their own resources to reduce stress and anxiety [47,50].

The domain of positive suggestions can be extended to hypnotherapeutic techniques. These techniques are an example of a coping strategy for

patients and have been successfully used in awake craniotomy patients [9]. In short, patients are invited to imagine another place and situation, and the anaesthesiologist can encourage and invite patients to explore and revive these thoughts, resulting in a form of dissociation. Seemann *et al.* refer to this as a 'safe place' in which the patient can retreat, which is left to the patient's imagination. An example could be a beach or a forest. Hypnotherapeutic techniques can help patients to explore and experience this well tolerated place [22<sup>■</sup>]. There is no question that a strong doctor-patient relationship and a thorough preparation are essential for successful application of this technique. Hypnosis and hypnotic techniques have been extensively studied in surgical patients (for a meta-analysis, see [51]). To assist patients in adopting a successful coping strategy, either aware or unaware, communication with the patient and the team is of utmost importance. The importance of 'vocal anaesthesia' cannot be overestimated.

## CONCLUSION

In summary, next to all pharmacological developments of the last decades, there is growing evidence supporting the application of psychological techniques and simple interventions to improve the patient's experience of an awake craniotomy. These techniques should be used well tailored to the patients' needs and personality, and should be used by an anaesthesiologist who feels comfortable with applying them. Further research is necessary to assess the additional value of these techniques. Furthermore, the publication of new techniques, both pharmacological and nonpharmacological, and experiences in awake craniotomy procedures by anaesthesiologists should be encouraged. The patient's experience during an awake craniotomy is largely depending on the anaesthesiologist's careful preoperative preparation and professional intraoperative performance. It is beyond dispute that a professional patient-doctor relationship based on mutual trust and respect is an essential condition for the success of this life-changing procedure.

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## Conflicts of interest

There are no conflicts of interest.

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