Pediatric Anesthesia 2006 **16**: 85–88 doi:10.1111/j.1460-9592.2005.01607.x

Case report

Near-death experience in a boy undergoing uneventful elective surgery under general anesthesia

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Summary

Near-death experience (NDE) is a complex subjective experience, which may include affective elements such as a sense of peacefulness, paranormal components such as a sensation of floating out of the body, and a perception of being in a dark tunnel and seeing a brilliant light. It is usually reported to occur in association with a wide range of life-threatening situations, as for instance, cardiopulmonary resuscitation. We report on an episode of NDE that occurred in a 12-year-old boy who underwent a general anesthesia for an elective uncomplicated surgery. To our knowledge, this is the first case of NDE in a child that has been reported in this context.

Keywords: children; anesthesia; near-death experience

Introduction

Near-death experience (NDE) is a well-documented phenomenon, which is usually reported by people who have survived a life-threatening event; however, it may also occur in less or even nonstressful situations (1). Its content is reported to be similar worldwide, and to be independent of religion, time, age, gender, education or social level (1).

There is no internationally determined and agreed set of criteria which define NDE, but this phenomenon has been classified in five main stages, which represent the core of NDE as characterized by Ring (2): (i) feeling peacefulness and weightlessness, (ii) an out-of-body experience (OBE), which is characterized by an impression of seeing ones body and the world from a location outside the real body, (iii) feeling drawn into a dark tunnel and passing through it, (iv) at the end of the darkness, seeing a brilliant and sweet light radiating unconditional love, (v) entering the light or into an 'other world'. This stage is the culminating point of the NDE, with transcendental elements such as an encounter with deceased family or religious figures, and sometimes a 'life review'. Finally, people meet a border and have to make the choice to go back on earth.

Although, the NDE content seems similar worldwide, the number of stages, their order of occurrence, and the depth of the experience vary between individuals. The most common stage experienced by people is the sense of peace, with an occurrence of 60%, but only 10% attain the last stage (2).

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Case report

Within the context of a prospective study that was designed to evaluate the incidence of awareness with intraoperative recall in children undergoing general anesthesia, a 15-year-old French-speaking boy was interviewed after general anesthesia for elective orthopedic lower limb surgery. He reported on a state of awareness during that anesthetic. In fact, he remembered hearing music (which was confirmed by the surgeon) and the voice of the doctor, seeing three big lamps above him and having tactile sensations. He felt as if someone was moving him on the operating table and putting him on his left side (his position was changed after induction of anesthesia to a left lateral position). He also felt an injection in his hip (probably the puncture in the L4–L5 intervertebral space).

However, the patient also spontaneously described an experience that occurred 3 years earlier during a similar orthopedic operation. This earlier experience strongly suggested a NDE; however, the boy specified not having experienced awareness during this earlier operation.

This 15-year-old boy (height, 127 cm; weight, 32 kg; ASA status I) was scheduled when he was 12 for an elective tarsal bone fusion associated with tendon transfers and Achilles tendon lengthening procedure on both lower extremities under combined general and epidural anesthesia. He had a history of prematurity (born at 32 weeks of pregnancy) and a diagnosis of cerebral palsy with spastic diplegia. He had no previous history of psychiatric disorders, was on no medication, and was successfully attending public school.

The review of the anesthesia chart of this earlier surgery revealed that the patient received premedication of midazolam (10 mg orally) 45 min before the procedure. When he arrived in the operating room, he was monitored with an electrocardiogram, a pulse oximetry, a noninvasive blood pressure and a precordial stethoscope. A 22G venous catheter was placed in his left arm and infused with a glucose/saline 2% solution. After 3 min of preoxygenation via a facemask, general anesthesia was induced with propofol (120 mg), and fentanyl (0.1 mg) intravenously. Atracurium (15 mg) was also used to facilitate tracheal intubation, which was performed without problem. Then, the patient was placed on his side for the lumbar epidural block. After skin disinfection, a puncture in the L5 intervertebral space was performed with a 18 G Tuohy needle, and the epidural space was located without any problem at 3.5 cm of the skin. An epidural 20G catheter was introduced easily at 10 cm of the skin. A first test dose of 3-ml bupivacaine 0.25% with epinephrine 1/200 000 produced a tachycardia at 120 $b \cdot min^{-1}$, which was not reproduced by a second test dose with the same dosage. General anesthesia was maintained with a continuous intravenous infusion of propofol (250–400 $mg \cdot h^{-1}$) in O_2 and air. Neither ketamine nor volatile agents were used at any stage of the anesthesia. Analgesia was provided by a continuous infusion of epidural bupivacaine 0.125% (throughout the procedure). The patient did not receive additional atracurium. He was normoventilated (endtidal CO_2 between 3.9 and 4.2 kPa (30–32 mmHg)) and temperature was maintained between 36.5 and 36.9°C. Surgery lasted 4 h, and a tourniquet was inflated at 300 mmHg 70 min after induction of anesthesia, and lasted 90 min per leg. An additional bolus of propofol (10 g) was injected when the tourniquet was inflated on the second leg. Blood pressure and heart rate were initially stable (80/50 mmHg and 80 $b \cdot min^{-1}$) during the first hour of surgery. After 60 min of tourniquet on the first leg, these hemodynamic parameters started to rise with the blood pressure reaching 140/80 mmHg and heart rate $11 \cdot min^{-1}$. Then, they remained stable at these values until the end of the surgery. Except for these hemodynamic changes, there was no sign of awakening, hypoxia, ischemia or hypoglycemia during anesthesia. The blood loss was insignificant. The patient awakened slowly and was extubated without any problem. No emergence delirium was reported.

A psychologist who was involved in our study, interviewed the boy using a hierarchically semi-structured questionnaire. The interview was recorded, transcribed, and then analyzed. In order not to influence the answers of the patient, the interview began with general, open-ended questions. Subsequently, specific questions were used to obtain more detailed information. We report on some extracts of this interview:

> 'I was sleeping and suddenly I felt awake and had the impression that I was leaving my body through my head. […] I could see from above my whole body lying on the back on the operating

table, (on request he answered that his body had no deformities) and surrounded by many doctors. […] I felt as being above my physical body […] and I was lying face down. […] I was like a spirit […] without my own arms and legs, […] and I was floating under the ceiling of the room. Initially, while feeling detached from my real body (which was lying on the operating table), I felt a little bit scared and weird, […] but then I had a sensation of lightness […] and I felt relaxed and comfortable. […] I had the impression that everything was real. […] I distinguished the operating room and the surgeons. […] I then saw a dark tunnel in front of me […] and I felt attracted to it. […] I passed through the tunnel very fast and at its end I saw […] a bright light […] that did not hurt my eyes. […] As I was passing through the tunnel […], I heard noises […] which sounded like when you are watching TV without a program […], then these noises became voices. […] Suddenly I felt again attracted to my body (which was still lying on the operating table), in which I went again through my head. At this time point, the experience was over and I was asleep'.

The boy indicated that when he woke up from anesthesia, he felt disappointed as he did not have enough time to see what was going on at the end of the tunnel. Finally, he mentioned that he had never talked about this to anybody in the past, because he thought it was just a strange dream. He had never thought about it until this interview took place.

Discussion

The events described by our patient are similar to those previously reported in the NDE literature, based on Ring's classification (1,2). We were surprised by the precision of his recall as the boy had never heard of or spoken about this phenomenon before.

Various unexpected recall following anesthesia have been described in the literature, which may take several forms including NDE, OBE, hallucinations, dreams, and awareness. However, these phenomenon should be clearly distinguished, as their content, their occurrence, their after-effect and their cause are different. Awareness refers to a recall of real facts that took place during general anesthesia (3), whereas the other phenomenon correspond to a subjective experience with a recall of unreal events. In fact, OBE is defined as an impression of detachment from the body (4); hallucinations can correspond to visual, or auditory sensations and can be of sexual nature (5); dreams are characterized by a vague and weird content, which can be positive or negative, and finally NDE correspond to the five stages mentioned above and can include an OBE.

We do not think that our patient's experience corresponds to intraoperative awareness as he reported a recall of unreal facts. Depth of anesthesia was not assessed (no Bispectral index and no agent monitoring). The anesthesia was titrated according to the classical clinical signs such as lachrymation, tachycardia, grimaces, movement, and sweating. Except for an increase of hemodynamic parameters after 90 min of tourniquet, there was no sign of awakening. The patient did not complain of awareness for this anesthesia, when he was asked for it 2 years later.

Our patient's experience included an OBE but also various other elements not experienced during a 'simple' OBE. One cannot rule out that this boy's experience may correspond to hallucinations or dreams induced by propofol. However, hallucinations or dreams evocating a NDE have never been reported in the literature with this agent.

The classical etiologies of NDE mentioned in the literature such as cerebral anoxia, hypoglycemia, hypercapnia, use of ketamine, psychological reaction to approaching death, and psychiatric diseases (1) can be ruled out in this mentally healthy boy, as he had an uncomplicated surgery with no use of ketamine. Until today, only two cases of NDE during general anesthesia have been reported; both were associated with the occurrence of severe perioperative complications (6,7). The only abnormality that we detected retrospectively during the general anesthesia of our patient was hypertension and a tachycardia. These symptoms can be attributed to various causes such as a sensation of pain induced by the tourniquet inflated on the operated leg (which may suggest a superficial analgesia), or a sign of bupivacaine toxicity. However, we consider that this last hypothesis is unlikely, as our patient presented hemodynamic changes 130 min after induction of anesthesia and no supplemental dose of atracurium was given during the maintenance of anesthesia. At that time, our patient was either

partially or no longer paralyzed, thus clinical signs of bupivacaine toxicity such as seizure, would have been detected.

Neurophysiological processes have also been proposed to explain NDE. In fact, some features associated with NDE such as OBE, have been induced through electrical stimulation of the right angular gyrus of the brain (8). Blanke *et al.* demonstrated in five epileptic patients, the implication of the temporoparietal junction in the occurrence of OBE (4).

The role of this cortical area in the occurrence of OBE constitutes an interesting hypothesis to explain the occurrence of NDE in our patient. In fact, his general anesthesia was induced and maintained with propofol, which is known to have neuroexcitatory effects, with seizure-like activity even in nonepileptic patients (9). Moreover, propofol was demonstrated to specifically decrease metabolism in the dorsolateral prefrontal and posterior parietal cortex (this last area includes the angular gyrus), whereas it induces modest changes in the temporal structures (10). In this context, an irritative effect on cortical parietal areas induced by propofol cannot be excluded. Furthermore, this patient had a history of prematurity and a diagnosis of cerebral palsy, which can constitute a risk factor in the release of epilepsy (11). Although no involuntary movement appeared during anesthesia, a seizure-like phenomenon could have been masked by the neuromuscular blocking agent during the first 45 min after its administration.

Unfortunately, we cannot prove the implication of this cerebral area in the occurrence of NDE in our patient, that is why our hypothesis should be considered cautiously.

Furthermore, the few studies on this topic included patients who experienced only an OBE, which is a less complex phenomenon than NDE. It is thus important to deserve more investigations to determine if this parietal cerebral area is implicated in these two phenomena, or if a more extensive cerebral territory is implicated in the occurrence of NDE.

In adults, NDE can be a highly emotional experience, which can induce long-lasting transformational effects (1). Our patient did not seem to have suffered from NDE. It may be possible that adults suffer more psychological sequelae from NDE given their greater emotional/cultural/religious/social experience.

It is likely that episodes of NDE are underreported by surgical patients. Similar to reports of awareness during general anesthesia, NDE has never been a major concern to health care professionals. It may be speculated that, as with intraoperative awareness (3), lack of compassion, and inadequate management of patients who have experienced NDE could lead to negative psychological consequences. Thus, it is necessary to inform anesthesiologists about NDE, so that they will recognize it and adopt an empathic attitude toward patients who have this experience.

In conclusion, it is well-known that NDE may occur in surgical patients during resuscitation, intensive care management, and emergency procedures. However, our observation suggests that NDE may also happen during uneventful surgery under general anesthesia. Similar to the growing interest into intraoperative awareness and its prevention, further prospective research should be initiated to evaluate the incidence and predictive factors of NDE during anesthesia, and the psychological consequences of this phenomenon.

References

1 Van Lommel P, Van Wees R, Meyers VI *et al.* Near-death experience in survivors of cardiac arrest: a prospective study in the Netherlands. *Lancet* 2001; **358:** 2039–2043.
2 Ring K. *Life at Death: A Scientific Investigation of the Near-death Experience*. New York, NY: Coward, McCann, and Geoghegan, 1980.
3 Ghoneim MM. Awareness during anesthesia. *Anesthesiology* 2000; **92:** 597–602.
4 Blanke O, Landis T, Spinelli L *et al.* Out-of-body experience and autoscopy of neurological origin. *Brain* 2004; **127:** 243–258.
5 Martinez Villar ML, d'Este Gonzalez JP, Aren Frontera JJ. Erotic hallucinations associated with the use of propofol. *Revista Espanola de Anestesiologia y Reanimacion* 2000; **47:** 90–92.
6 Sabom MB. *Light and death: One Doctors Fascinating Account of Near-death Experiences*. Michigan: Zondervan Publishing House, 1998: 37–52.
7 Jackson DA. Out-of-body experience in a patient emerging from anesthesia. *J Post Anesth Nursing* 1995; **10:** 27–28.
8 Blanke O, Ortigue S, Landis T *et al.* Stimulating illusory own-body perceptions. *Nature* 2002; **419:** 269–270.
9 Walder B, Tramèr M, Seeck M. Seizure-like phenomena and propofol: a systematic review. *Neurology* 2002; **58:** 1327–1332.
10 Veselis RA, Reinsel RA, Feshchenko VA *et al.* A neuroanatomical construct for the amnesic effects of propofol. *Anesthesiology* 2002; **97:** 329–337.
11 Nolan J, Chalkiadis GA, Low J *et al.* Anesthesia and pain management in cerebral palsy. *Anaesthesia* 2000; **55:** 32–41.

Accepted 10 December 2004