PREVENTION OF POSTOPERATIVE PSYCHIC TRAUMA IN CHILDREN THE ROLE OF THE ANESTHETIC AND SURGICAL APPROACH

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Introduction

Anxiety in children undergoing surgery is characterized by subjective feelings of tension, apprehension, nervousness, and worry that may be expressed in various forms. The result is the occurrence of the global surgical stress response, which is considered a homeostatic mechanism for adapting to the perioperative injury. Anxiety may result also in the development of the postoperative maladaptive behavior[1]. Factors responsible for the development of psychological trauma in children admitted in a hospital for surgery are shown in Table I. Anesthesia, particularly the induction period, is recognised as a cause of psychological trauma in children. We conducted a study in which an adopted practical quality anesthetic and surgical approach was undertaken to prevent the occurrence of postoperative psychic trauma in children.

Table I
Factors responsible for postoperative psychological trauma in children.

Factors responsible for the development of psychological trauma in children:

- Hospitalisation
- Anesthesia
- Age
- Type of surgery
- Extent of surgery
- Ethnic origin
- Family background:
  - coddling
  - socioeconomic status
  - separated parents
  - parental anxiety

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Methods

Prospective study lasted 3 years following approval of Hospital Research and Ethics Committee of the Armed Forces Hospital, Wadi Al-Dawasir, Kingdom of Saudi Arabia. All children between the ages of 3-14 year-old admitted for elective ENT surgical procedures during the period from 1.3.2005 to 29.2.2008 were included in the study. A parent was allowed to stay with child during hospitalization. Unless there is specific indication, there was no phlebotomy done for preoperative tests[2]. Nurses were instructed to assure and distract children whenever necessary. Surgeon and anesthetist visit the children preoperatively without wearing the white coat. We applied the preoperative fasting recommendations of American Society of Anesthesiologists with clear oral liquids until 2 hours before induction of anesthesia[3] (Table II).

Table II
Preoperative Fasting Guidelines

Contents	Minimum Fasting Period
Clear liquids	2 hours
Breast milk	4 hours
Infant formula	6 hours
Nonhuman milk	6 hours
Light meal	6 hours

Known children with sickle cell trait or disease were encouraged to drink plenty of fluids until 2 hours preoperatively, then received IV fluids to keep them well hydrated during the perioperative period. Children up to 40 kg body weight were premedicated with alimemazine 2.5 mg/kg body weight (BW) or chloral hydrate 100 mg/kg BW. Children above 40 kg BW were premedicated with diazepam 150µg/kg BW. EMLA® cream was applied on the back of the non-dominant hand of all children at time of premedication. Triage of children occurs on arrival at entrance of operating theater (OT): If the child was awake or sedated a parent was allowed to accompany child in the anesthetic room. After consulting the parent, and depending on age and understanding of the child, induction of anesthesia may be with sevoflurane inhalation or IV induction following venepuncture at site of the EMLA cream. If the child was asleep on arrival, sevoflurane inhalational induction is conducted quietly and child passes from sleep to anesthesia without disturbance. Except in surgery on the middle ear, nose and sinuses, intubation was performed using no muscle relaxant and children were left to breathe spontaneously, or breathing was assisted during brief periods of apnea following incremental doses of fentanyl. After securing the airway paracetamol suppository 20-40 mg/kg body weight was inserted rectally. At the end of the procedure, the child was extubated in the lateral position and 4 liters of oxygen were administered by venturi face-mask. The mother was admitted to the recovery area and allowed to stay with child until discharged to the ward. Day case children were seen prior to discharge home, while admitted children were visited the next day. During the postoperative outpatient visit to the ENT clinic, parents were asked if their child has shown any signs of behavioral changes than in the preoperative period. At 3 and 6 months postoperatively, children's medical records were inspected for possible psychiatric consultation.

Results

A total of 1248 children were operated upon during the period of the study. Surgical procedures included adenoidectomy, tonsillectomy, limited septoplasty, functional endoscopic sinus surgery (FESS), examination of ears, Grommet's tube insertion, middle ear surgery, or combination of two or more of them. All children received the appropriate premedication and when arrived at the OT reception area, were assessed by the anesthetist regarding their conscious status. Results are shown in Table III.

Table III
Status of conscious level of premedicated children on arrival at operating theater (OT) reception area.

Total number of children	1248
Conscious level on arrival in OT: Sleeping	479 (38.4%)
Sedated, but awake	511 (40.9%)
Fully awake	258 (20.7%)

Sleeping children were quietly escorted to the inside of the operating room and induced by sevofluorane without disturbance. Sedated and awake children were accompanied by a parent (in 87% of the cases was the mother, 11% was the father and in 2% was a relative) into the anesthetic induction room and the parent was allowed, under supervision, to hold the transparent induction mask on or close to the face of the child during inhalational induction. The standard inhalational setting was 3L O_2, 3L N_2O and 8% sevoflurane. Sevoflurane was used only for induction of anesthesia then changed to isoflurane. Children who accepted venepuncture were induced with thiopental 3 mg/kg BW and continued by isoflurane in O_2 and N_2O. Once the child was asleep the anesthetist took over and the parent stayed in the waiting room. Management of the airway is shown in Table IV. All children received fentanyl 1-2 µg/kg BW as intraoperative analgesia.

Table IV
Intraoperative management of airway. (RAE=Ring-Adair-Elwyn)

Total number of children	1248
Laryngeal mask airway (LMA) (ear only cases)	161 (12.9%)
Plain RAE tracheal tube	863 (69.2%)
Cuffed RAE tracheal tube	224 (17.9%)

However, the paracetamol suppository was given only to children aged 3-8 year-old, while the rest received IM pethidine when needed during recovery. Colorado needle was used for dissection of the tonsils. Three cases received a second anesthetic during the first postoperative 24 hours due to bleeding from the tonsillar bed and discharged home the next day. During the first postoperative visit to the ENT clinic, parents were asked a leading question if they noticed any alteration in their child's behavior. All parents denied such observation. Four children aged 9-11 year old, who had hospital phobia reported that their preoperative fear was not warranted. An 11 year-old girl refused pre-induction venepuncture, instead requested inhalational induction. She was promised that she will be asleep after few breaths, but when it took longer, it was discovered that the inspiratory limb of the circuit was disconnected. On the postoperative visit she was offered an apology and a present. All patients were from the local community, and their medical records were reviewed after 3 and 6 months from the time of surgery for possible psychiatric consultation. There was no record of visits to the psychiatric clinic of any child in relation to behavioral changes as a result of the surgical management.

As part of our quality system, we inquired about the satisfaction of the patient/parent regarding the anesthetic and surgical services offered to them during the management of their condition. The satisfaction score achieved was 98.3%.

Discussion

The human response to surgical stress is characterized by a series of hormonal, immunological, and metabolic changes that together constitute the global surgical stress response[4-6]. This perioperative response is considered a homeostatic mechanism for adapting to the perioperative injury. The effects of the surgical stress response, however, may be detrimental: neuroendocrine hormones (e.g., cortisol, catecholamines) and cytokines (e.g., interleukin-6) provoke a negative nitrogen balance and catabolism, delay wound healing, and cause postoperative immunosuppression (Table V).

Table V
Systemic responses to surgery.

Sympathetic nervous system activation
Endocrine 'stress response'
pituitary hormone secretion
insulin resistance
Immunological and hematological changes
cytokine production
acute phase reaction
neutrophil leucocytosis
lymphocyte proliferation

Children are particularly vulnerable to the global surgical stress response because of limited energy reserves, larger brain masses, and obligatory glucose requirements[7]. Because acute psychological stress, such as preoperative anxiety, is associated with immediate stress hormone release, the contribution of perioperative psychological factors to the global perioperative stress response cannot be ignored.

Studies have indicated that up to 60% of all children undergoing surgery may present with negative behavioral changes at 2 weeks postoperatively[8,9]. This may result in the development of the postoperative maladaptive behaviors, such as new onset enuresis, feeding difficulties, apathy and withdrawal, and sleep disturbances.

Extreme anxiety during induction of anesthesia is also associated with an increase of these postoperative negative behavioral changes[10]. In addition to behavioral manifestations, preoperative anxiety activates the human stress response, leading to increased serum cortisol, epinephrine, and natural killer cell activity[11,12]. This stress response can be activated by many different noxious stimuli including fear, anxiety, pain, cold, major surgery, and infection. Stress also activates the hypothalamic pituitary-adrenal axis, increases circulating glucocorticoids, and is associated with alterations of immune function and susceptibility to infection and neoplastic disease[13].

The perioperative anesthetic and surgical approach to children presenting for surgery is crucial in the prevention of postoperative psychic trauma to children. Both sedative premedication and parental presence during induction of anesthesia are currently used to treat preoperative anxiety in children[14]. We encourage parents and children to stay together all through their presence in the hospital, only to be separated when child is anesthetized. We established an anesthetic induction room to allow parental presence during induction of anesthesia. This room contains a wall-mounted anesthetic apparatus with gas scavenging connection, suction machine, portable pulse oximeter, an ECG, and assorted collection of tracheal tubes and accessories. It has also hanging toys which produce rhymes when functional. It is interesting to know the result of a survey of this practice in the United States of America hospitals. When asked about the policy of their hospital toward parental presence, 32% of anesthetists indicated that parental presence at induction was allowed in their hospital, and 11% indicated that it was encouraged by their hospital. In contrast, 23% reported no formal hospital policy, and parental presence at induction was against hospital policy for 26% of those surveyed. Ninety-two percent of all respondents never used an induction room and 5.8% of respondents used an induction room in 25% of all pediatric cases. Only 5% of all respondents indicated that they routinely obtained a separate written consent for parental presence at induction of anesthesia[15]. On the contrary anesthetists from Great Britain encourage parental presence at induction significantly more than from the USA[16].

Objections to parental presence at induction time include concern about disruption of the OT routine, crowded OT, and a possible adverse reaction of parents. In addition, increased parental anxiety can increase a child's anxiety, prolong anesthetic induction, and place additional stress on the anesthetist. In our hospital, we had overcome all causes of objections as we explain to parents before admitting them to either anesthetic induction or recovery areas their role and we encourage their participation in inducing their children. Apart from motherhood emotional responses, we never experienced adverse parental reaction at induction.

Colorado microdissection needle was used because it has an ultra-sharp tungsten tip which allows the surgeon to use very low wattages, resulting in dramatically reduced bleeding with minimal tissue damage. Apart from its cost-effectiveness, it minimizes postoperative pain[17].

When visiting children at anytime of their stay in the hospital we avoid wearing laboratory white coats to prevent the occurrence of white coat hypertension or white coat syndrome[18].

For economical reasons and to avoid its postoperative agitating effect, sevoflurane was used only for induction of anesthesia and was replaced by isoflurane until end of surgery. However, 226 child showed a degree of restlessness or agitation during recovery, most of them were self-limited while the rest (35% of them) were managed either by midazolam or a narcotic[19].

Patient satisfaction is a cornerstone in the outcomes of applying quality in the health care system. It has taken center stage as the primary means of measuring the effectiveness of health care delivery. It is commonly acknowledged that patients' reports of their health and quality of life, and their satisfaction with the quality of care and services, are as important as many clinical health measures. The high score of child/patient satisfaction in our study (98.3%) is a direct message to anesthetists and surgeons operating on children that they have important role to apply in the prevention of postoperative psychic trauma with its present and future effects on the quality of life of children.

References

1. McCann ME, Kain ZN: The Management of Preoperative Anxiety in Children: An Update. *Anesth Analg;* 2001, 93:98-105.
2. National Institute for Health and Clinical Excellence: www.nice.org.uk.
3. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures. A report by the American Aociety of Anesthesiologists Task Force on preoperative fasting. *Anesthesiology;* 1999, 90:896-905.
4. Chernow B, Alexander HR, Smallridge RC, et al: Hormonal responses to graded surgical stress. *Arch Intern Med;* 1987;147:1273-8.
5. Weissman C: The metabolic response to stress: an overview and update. *Anesthesiology;* 1990, 73:308-27.
6. Desborough JP: The stress response to trauma and surgery. *Br J Anaesth;* 2000, 85:109-17.
7. Deshpande S, Platt MP, Aynsley-Green A: Patterns of the metabolic and endocrine stress response to surgery and medical illness in infancy and childhood. *Crit Care Med;* 1993, 21:S359-61.
8. Kain ZN, Mayes LC, O'Connor TZ, Cicchetti DV: Preoperative anxiety in children: predictors and outcomes. *Arch Pediatr Adolesc Med;* 1996, 150:1238-45.
9. Kotiniemi LH, Ryhanen PT, Moilanen IK: Behavioural changes in children following day-case surgery: a 4-week follow-up of 551 children. *Anaesthesia;* 1997, 52:970-6.
10. Kain ZN, Caldwell-Andrews AA, Marannets I, et al: Postoperative anxiety and emergence delirium and postoperative maladaptive behaviors. *Anesth Analg;* 2004, 99:1648-54.
11. Kain Z, Mayes L, Caramico L, Hofstadter M: Distress during induction of anesthesia and postoperative behavioral outcomes. *Anesth Analg;* 1999, 88:1042-7.
12. Kain Z, Sevarino F, Rinder C: The preoperative behavioral stress response: does it exist? [abstract] *Anesthesiology;* 1999, 91:A742.
13. Chrousos G, Gold P: The concepts of stress and stress system disorders. *JAMA;* 1992, 267:1244-52.
14. Kain ZN, Mayes LC, Bell C, et al: Premedication in the United States: a status report. *Anesth Analg;* 1997, 84:427-32.
15. Zeev N Kain ZN, Caldwell-Andrews AA, et al: Trends in the practice of parental presence during induction of anesthesia and the use of preoperative sedative premedication in the United States, 1995–2002: Results of a Follow-Up National Survey. *Anesth Analg;* 2004, 98:1252–9.
16. Kain ZN, Ferris CA, Mayes LC, Rimar S: Parental presence during induction of anaesthesia: practice differences between the United States and Great Britain. *Paediatr Anaesth;* 1996, 6:187-93.
17. Rideout B, Shaw GY: Tonsillectomy using the Colorado microdissection needle: a prospective series and comparative technique review. *South Med J;* 2004, 97:11-7.
18. Pierdomenico SD, Mezzetti D, Lapenna MD: White-coat hypertension in patients with newly diagnosed hypertension: evaluation of prevalence by ambulatory monitoring and impact on cost of health care. *Eur Heart J;* 1995, 16:692-7.
19. Kim JW, Chang YJ, Lee JY, Park HY, Kawaka HJ: Post-induction alfentanil reduces sevoflurane-associated emergence agitation in children undergoing an adenotonsillectomy. *Acta Anaesthesiol Scand,* 2009, May; 53:678-81.