Trapezius squeeze test as an indicator for depth of anesthesia for laryngeal mask airway insertion in children

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Abstract

Background: Clinical tests, such as loss of verbal contact, eyelash reflex, corneal reflex, and jaw relaxation, are used to assess the depth of anesthesia. “Trapezius squeeze test” (TST) is one such clinical test. It is a simple test to perform in which 1–2 inches of trapezius muscle is held and squeezed in full thickness and response is evaluated in the form of toe/body movement.

Materials and Methods: One hundred pediatric patients between 3 and 5 years of age, scheduled to undergo elective surgery, were included in this study. We evaluated negative TST as an indicator for optimal anesthesia depth for laryngeal mask airway (LMA) insertion in anesthetized spontaneously breathing children. Anesthesia was induced using 4% sevoflurane in oxygen. As the child lost the verbal contact or loss of body movement, TST was performed. Test was repeated every 15 s till it became negative. When the TST became negative, a well lubricated, appropriate-size LMA was inserted.

Results: Mean time for TST to become negative in our study was 271.80 ± 55.8 s and ease of insertion was excellent in 91 patients and acceptable in 9 patients. LMA was successfully inserted in first attempt in 96% patients.

Conclusions: Negative TST is a reliable indicator for placement of LMA in spontaneously breathing children. Excellent conditions for LMA placement are present in majority of the patients without any untoward effects at this point of time.

Key words: Assessment of depth of anesthesia, clinical indicators of depth, trapezius squeeze

Introduction

The use of laryngeal mask airway (LMA) is popular in pediatric anesthesia as it avoids the risk of laryngeal injury and edema commonly associated with endotracheal intubation. Successful insertion of LMA requires adequate depth of anesthesia. LMA if inserted under lighter planes of anesthesia can result in coughing, gagging, body movements, breath holding, and even rejection of LMA.

Certain clinical tests used to assess the neurological status in unconscious patients have also been used in anesthetic practice to assess the depth of anesthesia. Few such tests are loss of verbal contact, eyelash reflex (ER), corneal reflex, acceptance of anesthesia mask (AM), ease of manual ventilation, loss of ability to hold light object, and jaw relaxation. Loss of corneal reflex and jaw relaxation are the most frequently used clinical end points in the studies conducted for evaluation of LMA insertion in anesthetized spontaneously breathing patients.

“Trapezius squeeze test” (TST) is a clinical test used to assess the depth of sedation/consciousness by observing the response to central noxious stimulation. It is a simple test to perform in which 1–2 inches of full thickness trapezius muscle is held and squeezed for 1–2 s and response evaluated in the form of toe/body movement. Thickness of trapezius muscle varies according to age. Although used extensively for grading consciousness, this test has rarely been used as an indicator of adequate depth of anesthesia of LMA insertion. We evaluated negative TST as an indicator for optimal anesthesia depth for LMA insertion in anesthetized spontaneously breathing children. Negative response to trapezius squeeze was depicted by loss of toe or body movements.

Material and Methods

One hundred ASA I or II patients between 3 and 5 years of age...
age, scheduled to undergo elective surgery, were included in this study. Patients with known or predicted difficult airway, a history of regurgitation, and pathology of oropharynx and neck were excluded. All patients were kept fasting for 6 h for solids and 4 h for clear liquids prior to scheduled time of surgery. No premedication was administered to the patients. Informed consent for the trapezius squeeze was taken from the parents of all the children. Anesthesia was induced using 4% sevoflurane in oxygen and this concentration was maintained till the LMA was successfully inserted. As soon as the child lost verbal contact or there was loss of body movement, the TST was performed. Test was repeated every 15 s till it became negative. When child lost response to trapezius squeeze, a well lubricated, appropriate size LMA was inserted as per manufacturer’s guidelines. For analgesia, fentanyl was administered during the intraoperative period and paracetamol suppositories during the postoperative period, and caudal block was used for analgesia for surgeries such as hypospadias, hernia, and hydrocele.

The time to negative TST was noted from start of induction of anesthesia till the negative response to trapezius squeeze, ease of insertion was judged on a three-point scale [Table 1], number of attempts, and any coughing, gagging, laryngospasm, breath holding, or body movements at the time of insertion of LMA were also noted. The correct placement of the LMA was judged clinically by the ability to ventilate the patient with gentle positive pressure. Heart rate, blood pressure, and SpO2 were recorded before induction of anesthesia, immediately after insertion of LMA and then 5 min after the LMA placement. Postoperative problems such as pain at the squeeze site, sore throat, hoarseness, and evidence of trauma were recorded.

### Results

Mean age of the patients was 4.12 years. Mean time for TST to become negative in our study was 271.80 ± 55.8 s [Figure 1] and ease of insertion was excellent in 91 patients and acceptable in 9 patients [Table 1]. LMA was successfully inserted in first attempt in 96% patients [Table 2]. On LMA insertion, coughing was observed in 4 patients, breath holding in 1 patient, and body movements were present in 5 patients during LMA insertion [Table 3]. No significant change in blood pressure, heart rate, and SpO2 was found [Figure 2].

### Discussion

The assessment of depth of anesthesia using clinical indicators involves observing responsiveness of a patient to defined stimulus. One of the most common indicators

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**Table 1: Ease of laryngeal mask airway insertion**

| Grading     | No. of patients |
|-------------|-----------------|
| Excellent   | 91              |
| Acceptable  | 9               |
| Un acceptable | 0              |

**Table 2: Attempts to place laryngeal mask airway**

| No. of attempts | No. of patients |
|-----------------|-----------------|
| 1               | 96              |
| 2               | 4               |
| 3               | 0               |

**Table 3: Complications during laryngeal mask airway placement**

| Episodes          | No. of patients |
|-------------------|-----------------|
| Coughing          | 4               |
| Breath holding    | 1               |
| Body movement     | 5               |
| Gagging           | 0               |
| Laryngospasm      | 0               |
| Biting            | 0               |
| Desaturation      | 0               |
used to assess the depth of anesthesia is loss of ER. Eye lid reflex gets abolished at lighter planes of anesthesia. Dose of anesthetic required to abolish ER is comparatively less when compared to other reflexes such as acceptance of AM, loss of corneal reflex, and trapezius muscle response. Acceptance of AM by the child during inhalation induction is a frequently used clinical indicator for assessing the depth of anesthesia in children, but it corresponds to lighter planes of anesthesia.[9]

Loss of verbal contact and loss of motor response to jaw thrust are frequently used clinical indicators for insertion of LMA. Loss of verbal contact gets abolished in early stages of anesthesia and does not correspond to adequate anesthetic depth for LMA insertion. Jaw thrust has a painful component so it requires deeper planes of anesthesia to get abolished. Drage et al. compared these clinical indicators as end points to assess ease of insertion of LMA. Conditions were optimal when jaw thrust was used as an end point of insertion as compared to loss of verbal contact.[7]

Loss of response to trapezius muscle is graded as intense noxious stimulus. Some investigators have equated this as having the same intensity as that of surgical incision, laryngoscopy, and intubation.[10,11] Corneal reflex has been compared to trapezius reflex and is graded as stimulus of almost same intensity and essentially defines the same depth of anaesthesia.[12,13] We studied trapezius squeeze as an end point for LMA insertion in children and recorded the mean time for TST to become negative (271.80 ± 55.80 s, i.e., 4.53 min). In our study, in 91% patients conditions for LMA placement were observed to be excellent and they were acceptable in 9%. LMA was successfully inserted in first attempt in 96 patients and in second attempt in 4 patients. LMA was found to be rotated in all the 4 patients who required second attempt at insertion. Coughing, breath holding, and body movement was observed in 4%, 1%, and 5% patients, respectively, at the time of LMA insertion. No episodes of laryngospasm, gagging, and biting were reported in any patient. No significant change in blood pressure, heart rate, and \( \text{SpO}_2 \) was observed in our study when compared with baseline and each other using paired Student’s “t” test [Table 4]. Our results were comparable to the results of the study conducted by Chang et al.[8]

We concluded that negative TST is a reliable clinical indicator to assess adequate anesthetic depth for LMA insertion in spontaneously breathing children without neuromuscular blocking agents. Besides having the advantage of easy to perform, it is also cost effective, not associated with any side effects, repeatable and reproducible, and reliable end point.

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