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Original Article

Comparison of Mean Insertion Time of Supraglottic Airway Device in Children Followed by Trapezius Squeeze Test Versus Jaw Thrust

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ABSTRACT

Objective: To compare the assessment of the timing of insertion of supraglottic airway device in children by trapezius squeeze test versus jaw thrust as an indicator of the depth of anaesthesia.

Study Design: Prospective comparative study.

Place and Duration of Study: Combined Military Hospital, Quetta Pakistan, from Jan to Dec 2021.

Methodology: Eighty children undergoing surgical interventions under Sevoflurane anaesthesia with supraglottic airway device having ASA physical status I or II were divided into two sets of 40 children. Both groups were labelled Group-A (trapezius squeeze test) and Group-B (jaw thrust). Supraglottic airway device iGel was inserted immediately after the negative trapezius squeeze test or jaw thrust. A negative test was defined as the absence of cough, reflex movements, breath-holding, gag reflex and laryngospasm. Insertion time and the number of attempts were carefully recorded.

Results: The mean age of patients in the study was 4.8±2.028years, and the mean weight was 17.05±5.34. 47% of patients were in ASA-I, 52% in ASA-II in Group-A, 40 % were ASA-I and 60% in ASAII in Group-B. The mean insertion time was 143.42±5.56 seconds in Group-A and 117.525±7.15 seconds in Group-B with a p-value of 0.002.

Conclusion: We concluded that the trapezius squeeze test provides better insertion conditions for supraglottic airway devices than jaw thrust during Sevoflurane anaesthesia in pediatric patients.

Keywords: Jaw thrust, Supraglottic airway device, Trapezius squeeze test.

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INTRODUCTION

Anesthesiologists are always striving to achieve adequate depth of anaesthesia before airway manipulation. Smooth induction prevents complications and mitigates the unpleasant effects of recall. The pediatric age Group is more prone to accidental awareness under anaesthesia (AAGA), and the incidence is almost 0.7%. Half of such recall experiences were very stressful for the patients.[1,2]

The appropriate measurement of anaesthesia depth helps reduce awareness during general anaesthesia and reduces human and financial costs.[3] There are certain means of measuring of depth of anaesthesia. There are clinical parameters like an absence of eyelash reflex, loss of verbal communication, loss of corneal reflex and acceptance of an anaesthesia mask which indicates deeper plane anaesthesia.[4] The lack of response to painful central stimuli like jaw thrust, sternal pressure, pressure on the supraorbital notch and trapezius squeeze also helps to assess anaesthetic depth. Advanced methods like electroencephalogram, bi-spectral index, evoked potentials and isolated forearm technique are reserved for extensive surgical interventions and at-risk patients.[5] Their use for short procedures in spontaneously breathing patients under Sevoflurane anaesthesia could be more cost-effective.[6] For short procedures, surrogate measures might suffice. Some studies have compared surrogate measures like jaw thrust and trapezius squeeze test to assess the depth of anaesthesia in adults. Although successful attempts in the trapezius squeeze Group are 96%,[7] and 72% in the jaw thrust Group, there are studies which have highlighted an insignificant difference between the two, establishing that noxious stimulation by trapezius squeeze was equivalent to jaw thrust.[8,9]

The rationale of our study is to assess the reliability of the trapezius squeeze, which is relatively new to our anaesthetic practice and compare it to jaw thrust. We have used only Sevoflurane as an inhalational agent. We have not used nitrous oxide or any benzodiazepine premedication like previous studies, which have used midazolam premedication and nitrous as inhalational agents and Sevoflurane. Moreover, we have done it on the pediatric population.

METHODOLOGY

After seeking permission from the Ethical Committee (IERB #103476/adm/11), the study was

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conducted at the Anaesthesia Department of Combined Military Hospital, Quetta Pakistan, from July to June 2021. The sample size of 83 was calculated using the WHO sample size calculator, keeping expected frequency of successful attempts of supraglottic airway insertion to be 96.07% in the trapezius squeeze test Group and 72.07% in jaw thrust Group.[10]

Inclusion Criteria: The pediatric patients of both genders were included with ages between 1 to 10 years and ASA physical status I or II. All patients scheduled to undergo elective surgery for minor surgical interventions were included.

Exclusion Criteria: The study did not include patients with preexisting health conditions like asthma and ASA status III and IV or airway abnormalities.

Forty cases were included in each study Group by purposive sampling. The two study Groups were named: Group-A, the trapezius squeeze Group and Group-B, the jaw thrust Group. Written informed consent was taken from parents or guardians. All the patients were subjected to a thorough paranaesthesia assessment, and routine baseline labs were done. All patients were kept nil per oral according to NPO guidelines. No premedication was administered to any patient. Inhalational anaesthesia was induced by giving 8% Sevoflurane in an oxygen flow of 10 litres per minute. As soon as the child lost spontaneous eye-opening, the trapezius squeeze test was done by squeezing 1-2 inches of the full thickness of the trapezius muscle between the thumb and index finger for one to two seconds, and the response was recorded. The toe or body movement was the standard response. The test was repeated every 15 seconds till it became negative. When the child lost response to trapezius, squeeze a well-lubricated, appropriate-size iGel was inserted and secured with tape and tie.

Similarly, in Group-B participants, no premedication was used. Inhalational anaesthesia was induced by giving 8% Sevoflurane in an oxygen flow of 10 litres per minute. As soon as the child lost spontaneous eye-opening sustained jaw thrust was applied by lifting jaws from both angles for 2 seconds. The time to negative trapezius squeeze or jaw thrust was noted from the point of start of induction of anaesthesia till the negative response. The occurrence of any complications like a gag reflex, breath holding, coughing or laryngospasm was recorded. The negative response to supraglottic airway insertion was considered an adequate depth of anaesthesia and successful insertion. The first attempt was aborted in case of violent coughing and gagging, and the second attempt was made if required. Standard monitoring was attached after induction and continued during the procedure.

Statistical Package for the Social Sciences (SPSS) version 23.00 was used to analyze data. Mean±SD was calculated for quantitative variables including age, weight, duration of anaesthesia (minutes) and insertion time (seconds). Frequency and percentage were computed for qualitative variables like gender, ASA physical status and successful attempts. The chi-square test was applied to compute the outcome. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

The mean insertion time was longer (143.42±5.56 seconds) in Group-A and comparatively shorter (117.525±7.15 seconds) in Group-B with a *p*-value <0.002. (Table-I). The frequency of the first successful attempt was greater in the trapezius squeeze Group than in the jaw thrust Group (*p*-value 0.001), shown in Table-II. This showed that the trapezius squeeze test causes more noxious stimulation than the jaw thrust test, takes longer to get negative, and provides better conditions for supraglottic airway insertion.

Table-I: Insertion Time of Supraglottic Airway (n=80)

	Group-A Trapezius squeeze Mean±SD	Group-B Jaw Thrust Mean±SD	*p*-value
IGel Insertion Time	143.425(5.56)	117.525(7.153)	<0.002

Table-II: Number of Attempts to Successful Supraglottic Device Insertion (n=80)

Number Of Attempts	Group-A n%	Group-B n%	*p*-value
One Attempt	39(97.5)	22(55)	0.001
Two Attempts	1(2.5)	18(45)	0.001

The mean age of patients in the study was 4.8±2.028years, and the mean weight was 17.05±5.34. 17(47%) patients were ASA-I, 23 (52%) were ASA-II in Group-A and 16(40 %) were ASA-I, and 24(60%) were ASA-II in Group-B.

DISCUSSION

The central painful stimuli check the integrity of the cerebrum, and they are preferred over peripheral stimuli, which might be misleading as they can result from spinal cord reflex.[11] The central stimuli are important for assessing intact higher centres, and mostly used painful central stimuli are jaw thrust,

sternal rub, supraorbital notch pressure and trapezius squeeze. The anesthesiologists use these tests as surrogate measures to assess the depth of anaesthesia as they are abolished at deeper planes of anaesthesia.[12] Achieving adequate depth of anaesthesia facilitates smooth induction and prevents life-threatening and cumbersome complications. So far, anesthesiologists are more familiar with jaw thrust as it relieves airway occlusion. Jaw thrust induces sympathetic response regardless of the magnitude of force applied.[13] Trapezius squeeze is widely used by neurologists to assess the neurological status of patients. However, it is not commonly used to assess the depth of anaesthesia. Hooda *et al*. studied it to assess the depth of anaesthesia in hundred children and showed that it provided optimal conditions in ninety-six percent of children. The mean time for a negative trapezius test and successful laryngeal mask airway insertion was 271±55 seconds.[12]

Devyani Desai *et al*. studied jaw thrust and trapezius squeeze in their study on a similar population. They showed that they are equivalent in assessing the depth of anaesthesia. However, the mean time for the negative trapezius squeeze test was considerably longer than in the jaw thrust Group, approximately 145 seconds versus 112 seconds, respectively. His conclusion was based on several successful attempts, which were the same in both Groups.[14] In another study in 2011, Dinesh Kumar *et al*. deemed it superior to jaw thrust for assessing the depth of anaesthesia for laryngeal mask airway insertion.[15] Later on, Wan *et al*. studied multiple parameters and found that the time required for a negative trapezius squeeze test was approximately three minutes, corresponding to an end-tidal Sevoflurane concentration of 3.25% and narcotend index of almost fifty two.[16] Petersen-Felix *et al*. studied multiple nociceptive stimuli and motor responses to assess the depth of anaesthesia and potency of isoflurane. He concluded that tetanic stimulation and trapezius squeeze generated sympathetic response and noxious stimulation, equivalent to skin incision. They had an added advantage of reproducibility as they can repeatedly do in contrast to skin incision.[17]

Upper airway obstruction is a more frequent complication in children than in adults, and using supraglottic airway devices reduces respiratory complications in the pediatric age Group compared to adults. Muscle relaxation is not commonly used in pediatric daycare procedures under inhalational anaesthesia, and spontaneous breathing is usually preserved. An adequate depth is important, as a slight miscalculation can lead to laryngospasm. Trapezius squeeze seems a reliable indicator of anaesthetic depth. It is reproducible and simple to apply.[18] It is less traumatic and is not liable to cause bruising. It can also be applied to check the patient's arousal during emergence, as neuro physicians already use it for neurological examinations.[19] The results of our study have helped us to develop familiarity with the trapezius squeeze, and we are using it routinely to approximate anaesthetic depth.

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LIMITATIONS OF STUDY

Our study was only done on pediatric patients. We could not check the significance of trapezius squeeze on adult patients.

CONCLUSION

The trapezius squeeze test provides a better idea about the timing of insertion of the supraglottic airway device compared to jaw thrust during Sevoflurane anaesthesia in pediatric patients.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

KMK: Conception, study design, drafting the manuscript, critical review, approval of the final version to be published.

MAW & AH: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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