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# INTRA OPERATIVE DEXMEDETOMIDINE ON POSTOPERATIVE COGNITIVE DYSFUNCTION OF PATIENTS

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**ABSTRACT**

Postoperative cognitive dysfunction is commonly encountered after major surgical operations. This study was conducted to evaluate the effect of dexmedetomidine on neurocognitive dysfunction and postoperative recovery after total laryngectomy in the elderly population. Postoperative cognitive dysfunction is one of the most common complications affecting the central nervous system after general anaesthesia and surgery especially in elderly patients. It's characterized by short-term cognitive decline and includes memory, mood, confusion, and sleep disorders. Its medical manifestations include cognitive disorder, personality exchange and memory loss, intellectual problems and social impairment. Starting with demographic data, the mean age of the included cases was 69.98 and 70.02 years in the Dex and control groups, respectively. Males represented the majority of the included cases, as they formed 100 and 98.9% of cases in the same groups, respectively. Body mass index (BMI) had mean values of 28.11 and 27.43kg/m2 in the two groups, respectively. Dexmedetomidine admin is related with a considerable development of cognitive function after surgery in the elderly inhabitants. It is linked with a better analgesic and sedative profile and decreased neurological inflammatory markers (S100B). Conversely, we should closely monitored for side effects like bradycardia and hypotension in patients. Dexmedetomidine administration is associated with a significant improvement of cognitive function after surgery in the elderly population. It is associated with a better analgesic and sedative profile along with decreased neurological inflammatory markers. However, the patient must be closely monitored for side effects like bradycardia and hypotension.

**Key words**: Post-operative cognitive dysfunction , Dexmedetomidine, Sedation sevoflurane.

## INTRODUCTION

Postoperative cognitive dysfunction (POCD) is one of the most common. Neuroprotective effects of dexmedetomidine (DEX) are reported in previous studies but evidence regarding the POCD is still unclear. In order to gain latest evidence, the present study analyzes the outcomes of randomized controlled trials (RCTs) which utilized DEX with general anaesthesia perioperatively POCD (Postoperative cognitive dysfunction) is one of the most common complications affecting the central nervous system after general anaesthesia and surgery especially in elderly patients. It'scharacterized by short-term cognitive decline and includes memory, mood, confusion, and sleep disorders.[1] Its clinical manifestations include cognitive dysfunction, personality change and memory loss, mental disorders and social impairment.[2] For the reason that long anesthesia duration and the severe surgical stress, the risk of POCD in elderly patients is incredibly increased. [3] The incidence of POCD is ranging from 10 to 60% and varies with clinical, demographic and surgical variables, as well as the interval between surgery and assessment in older patients. POCD has aimportant negative impact on the affected person's health. [4] It is associated with increased morbidity, prolonged recovery, delayed restoration of function, impaired quality of life, and even increased mortality.[5] Thus, the prevention of such problems is crucial for the anesthetic community.

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Dexmedetomidine (DEX) is aefficient and greatly selective α2-adrenergic receptor agonist and acts as a multifunctional drug in the treatment of various human diseases.[7] A previous study has suggested that DEX is efficient in the treatment of nerve diseases through the beneficial effects of decreasing central nervous system sympathetic outflow and providing sedation and analgesia.[8] DEX treatment may improve behavioral disturbances, including aggression, agitation and cognitive dysfunction.[9]In addition, some clinical studies have indicated that DEX has analgesic, anxiolytic and anti-delirium effects without respiratory depression. These properties make it anappropriate option for sedation in the intensive care unit and in perioperative period. [10]

Many researches have discussed the protective position of dexmedetomidine towards perioperative delirium. This effect is thought to be mediated by enhancing the expression of brain-derived neurotrophic factors, regulation of N-methyl N-aspartate receptors, and regulation of excitatory amino acid transport. [11]The current study aims to assess intraoperative dexmedetomidine on postoperative cognitive dysfunction of aged patients under taken total larynx ablation.

## MATERIAL AND METHODS

The study was designed as a prospective, inpatient, double-blind trial was carried out at the Departments of Anesthesia and Neurology of the Saveetha Medical college, *Poonamalle High Road*,,Chennai and under observation experienced neurologists and anesthetists performed the evaluations and completed the examination. The 128 patients who had undergone for total laryngectomy and classified as American Society of Anesthesiologists (ASA) score I, II, or III.

Patient grounding included detailed history taking, thorough physical examination and routine preoperative laboratory investigations. The included 128 cases were randomly divided into two equal groups, the Dex and control groups, using the closed envelope method. In the Dex group, patients received dexmedetomidine infusion before the induction. One μg/kg was infused over 10 min, then infusion was maintained at 0.2–1.4 μg/kg/h. Controls were managed via the standard anesthetic protocol without any addictive drugs. For both groups, anesthesia was maintained using sevoflurane 1–3% according to patients' response and hemodynamic stability.

In contrast, we expelled cases with BMI> 35 kg/m2, uncontrolled systemic comorbidities, patients with bradycardia, hypotension, and heart failure as dexmedetomidine may exacerbate these conditions, pre-existing neurological or psychiatric disease and visual or hearing impairment. Also, cases with major intraoperative events, like major bleeding or allergy to the study medications, were excluded in this study.

On arrival at the operative theater, the patient wasplaced supine, and then, an intravenous cannulawas inserted into a suitable peripheral vein. Basichemodynamic monitoring was established, includingnon-invasive blood pressure (NIBP), pulse oximeter, five-lead ECG, end-tidal capnography, and axillary temperature. A 5-ml blood sample was obtained before induction of anesthesia. The sample was centrifuged, and the plasma was used to measure the level of S100 protein by enzyme-linked immunosorbent assay (ELISA).

Fentanyl was administered intravenously at doses of 1–2 μg/kg and 2–3 min before induction. Propofol was used to induce anesthesia by 0.5–2 mg/kg according to clinical response and hemodynamic stability. If possible, tracheal intubation with an appropriately sized cuffed endotracheal tube was facilitated using 0.5 mg/ kg atracurium. Otherwise, a tracheostomy was done by the operating surgeon. Increments of 0.1 mg/kg of atracurium were used to maintain muscle relaxation every 20–30 min throughout the intra-operative period.

Heart rate, mean arterial pressure, and pulse oximetry were monitored continuously and recorded by a different anesthetist, other than the investigator, before and immediately after induction, after intubation, every 15 min during the 1st hour and then every 30 min until the end of surgery.

After the operation, patients were discharged from the operative room after fulfilling the criteria of discharge.The duration of operation was defined as the time from the skin incision to the last skin suture, whereas recovery time was defined as the time from the last skin suture until discharge from the operating room. Patients were transferred to the post-anesthesia care unit (PACU), and the Richmond Agitation–Sedation Scale (RASS) was used to assess the patients' sedation score 1 h after extubation before discharge from PACU.

Assessment of neurocognitive function was repeated on the fifth postoperative day using the same tests used pre-operatively. The time to first analgesic request and the total duration of hospitalization were recorded. The effect of dexmedetomidine on neurocognitive function was our primary outcome. Secondary outcomes included intraoperative hemodynamic stability, postoperative recovery profile and agitation-sedation scores.

Representative experiments from at least three independentexperiments are shown. Statistical analysis was performedusing the SPSS 19.0 for Windows (SPSS, IBM, USA). All datawere expressed as means ± SDs. Significant differenceswere assessed using Student's *t*-tests or Tukey's test andLeast significant difference with one-way analysis ofvariance (ANOVA), when appropriate. $P < 0.05$ was considered statistically significant.

## RESULTS

Starting with demographic data, the mean age of theincluded cases was 69.98 and 70.02 years in the Dexand control groups, respectively. Males represented themajority of the included cases, as they formed 100 and98.9% of

cases in the same groups, respectively. Bodymass index (BMI) had mean values of 28.11 and 27.43kg/m2 in the two groups, respectively.

Smoking was reported in 90 and 85.4% of cases in theDex group and control group respectively. The Dex group expressed significantly lower values in both heart rate and mean arterial pressure (MAP) comparedto controls throughout the subsequently recorded readings till 300-min follow-up ($P > 0.001$).

The duration of operation was equivalentamong the two groups ($P = 0.749$), as it had Dexgroup mean values of 331.3 and 342.3 min in the control groups, respectively.Sevofluraneconsumption significantly decreased in the Dex group 135.9 compared of 166.5 ml in controls—$P < 0.001$). And also time showed a significant decrease in the same group (5 vs. 8.85 min in controls—$P < 0.001$).

Dexadministration showed that highest prevalence of cardiovascular (CV) side effects. Bradycardia was encountered in 26.2%Dex cases and 9.7% of control cases, while hypotension was encountered in 48.7 and 15.1% of cases in the Dex and control groups, respectively. Additionally, both fluid and ephedrine intake showed a significant increase in the Dex group. Fluid bolus was commenced for 46.5% and 9.9% of cases, whereas ephedrine intake was needed in 29.5 and 6.5% of cases in the same two groups, respectively.

The time to first analgesic request showed a significant persistence in the Dex groupin 4.73 vs. 2.34h in controls—$P < 0.00$ and also duration of hospitalization obsereved no significant difference between the two groups 7.11 and 7.12 days in the two groups, respectively—$P = 0.950$). Prevalenceof delirium showed a significant decrease in the Dex group compared to controls (9.9 vs. 25.3%, respectively—$P$ =0.006).

The postoperative sedation scale showed better results in the Dex group during the early 36 hours following the operation. However, the subsequent readings were comparable between the two groups.Even though,Basal S100B protein levels 88.1 in the Dex and 94.58 ng/l control groups,P 0.116, here no significant difference between the both study groups .Postoperative levels showed a significant decrease in the Dex group than control.

**DISCUSSION**

In present study was conducted to the effectof dexmedetomidine administration on neuro cognitivedys function, hemodynamics, sedation and postoperativerecovery after total laryngectomy in the elderly indivuals.

Postoperative cognitive dysfunction (POCD) is one of the most common complications affecting the central nervous system after general anaesthesia and surgery, especially in elderly patients, which is characterized by short-term cognitive decline and includes memory, mood, confusion, and sleep disorders . Its clinical manifestations include cognitive dysfunction, personality change, and memory loss, mental disorders, and social impairment. Because of the long anesthesia duration and the severe surgical stress, the risk of POCD in elderly patients is incredibly increased

Our result showed that the Dex group expressed significantly lower heart rates and MAP than controls until the 300-min follow-up ($P > 0.001$). Dexmedetomidine can decrease norepinephrine release, reducing catecholamine release from nerve endings which leading to a decrease in heart rate and blood pressure this is correlated. [12-13]reported a significant decrease in MAP and heart rate with Dex administration compared to controls ($P < 0.05$). This consequence was evident 3 h after drug administration till 12-h assessment [14] reported that dexmedetomidine was connected with noticeably decreased inhaled anesthetic requirements during traumatic phases of surgeries. which is correlated withsevoflurane consumption significantly decreased in the Dex group 135.9 compared of 166.5 ml ($P < 0.001$)[15]reported a 41% reduction in sevoflurane consumption in patients receiving IV dexmedetomidine as an adjuvant in patients undergoing laparoscopic cholecystectomy under general anesthesia.

In the current study, the incidence of CV side effects was significantly higher with Dex administration. Bradycardia was encountered in 26.2 and 9.7% of cases, while hypotension was encountered in 48.7 in the Dex and control groups15.1% of cases respectively.Accordingly, both fluid and ephedrine intake increased with Dex administration. [16] In study reported that dexmedetomidine also has some disadvantages, including inducing the increased risk for bradycardia and hypotension in old patients.

In present study, the time to first analgesic request showed a significant prolongation in the Dex group 4.73 vs. 2.34h in controls—$P < 0.001$which similar to the [17] report this may bedue to analgesic effect of dexmedetomidine, which is mediated through inhibition of nociceptive impulse transmission through the posterior horn of the spinal cordan and also it promotes acetylcholine release from spinal interneurons, leading to the overproduction of nitric oxide that acts as a mediator for analgesia. [18]

results showed that the overall incidence of delirium showed a significant decrease in the Dex group compared to controls. Delirium score had mean values of 13.2 and 17.4 in the Dex and control groups which correlated with present study 9.9 vs. 25.3%, respectively—$P$ =0.006. In agreement with our results, recent studies also noted that dexmedetomidine decreased emergence agitation after surgery.[19]

First, the number of studies and the corresponding sample size were relatively limited, and the doses and methods of administration of DEX given to patients varied substantially. Secondly, the enrolled studies' inclusion and

exclusion criteria, body weight, anesthetic doses, duration of surgery, surgical blood loss and consequently the characteristics of the patient cohorts, were also varied, which might have led to heterogeneity. We suggest that the postoperative use of dexmedetomidine could still suppress excessive inflammation and the stress response, resulting in a lower incidence of postoperative neurological dysfunction. [20-22].

In the present study, there was no significant difference between the two study groups about basal S100B protein levels (Basal S100B protein levels 88.1 in the Dex and 94.58 ng/l control groups, P 0.116), when postoperative levels showed a significant reduction in the Dex group compared to controls (122.41 vs. 587.99 ng/l in controls—*P*< 0.001). It is an acidic calcium-binding protein; a biomarker of central nervous system injury which is similar to Bindraet al.[19] reported that the Dex group was associated with a significant decrease in serum S100B protein at 24- and 8-h readings. The former had mean values of 52.55 and 99.34 ng/ml.

**CONCLUSIONS**

Dexmedetomidine admin is related with a considerable development of cognitive function after surgery in the elderly inhabitants. It is linked with a better analgesic and sedative profile and decreased neurological inflammatory markers (S100B). Conversely, the patient must be closely monitored for side effects like bradycardia and hypotension.

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