EFFECT OF DEXMEDETOMIDINE ON HAEMODYNAMICS DURING EXTUBATION IN PATIENTS UNDERGOING MASTOID TYPANOPLASTY PROCEDURE THROUGH PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

BACKGROUND
Dexmedetomidine an α2 agonist has been successfully used for attenuating the stress response to laryngoscopy. It is known to produce sedation, anxiolysis, hypnosis, analgesia, and sympatholysis. Thus it can reduce the requirement of inhalational agents and narcotics when used as an adjunct to general anaesthesia thereby providing smooth extubation since patient will be awake pain free and without respiratory compromise. Our objective is to study the effect of Dexmedetomidine on haemodynamics during extubation in patients undergoing mastoid tympanoplasty procedure compared to control group through prospective observational study.

MATERIALS AND METHODS
After obtaining Institutional Ethics Committee approval, 60 ASA I – II patients undergoing Mastoid -Tympanoplasty procedure were randomly enrolled into the study. After intubation and before surgical incision, Dexmedetomidine infusion was started at the rate of 0.4 mcg/kg/hr., which was continued until after extubation. Intra-op monitoring consisted of ECG, non-invasive blood pressure, oxygen saturation, ETCO2; from pre-induction to post- extubation for 15 minutes. Post-op monitoring consisted of ECG, respiratory rate, NIBP, sedation score, any side effects to Dexmedetomidine. Requirement of any beta-blocker/ionotopic agents/vasoconstrictors or vasodilators/ total IV fluids given was recorded. Postoperatively patient was followed up for 2-3 hrs for any adverse effect of study drug/postoperative complications/haemodynamic stability. Same method of anaesthetic management and monitoring was followed in patients not receiving Dexmedetomidine and peri extubation response was watched for. Data was collected and analysed using standard statistical principles.

RESULTS
Haemodynamic stability was more with Dexmedetomidine group during peri-extubation period as compared to pre-op values than control group. Both surgeon and patient satisfaction and comfort were better with Dexmedetomidine than control group because of bloodless field under microscope during surgery and sedative anxiolytic analgesic properties of Dexmedetomidine postoperatively respectively.

CONCLUSION
Dexmedetomidine at the dose studied is safe with hypotensive effect and is an alternative to traditional beta blockers for surgical procedures. Infusion of Dexmedetomidine without a loading dose appears to be adequate in maintaining haemodynamic stability without any extra sedation effect.

KEY WORDS
Dexmedetomidine, Haemodynamics, Mastoid-Tympanoplasty.


BACKGROUND
Exubtion produces significant haemodynamic changes comparable to laryngoscopy and tracheal intubation which can be detrimental in patients especially those with CAD.[1-7] Dexmedetomidine an α2 agonist has been successfully used for attenuating the stress response to laryngoscopy. It is known to produce sedation anxiolysis hypnosis analgesia and symp thany,.[6-13]Thus it can reduce the requirement of

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inhatalional agents and narcotics when used as an adjunct to general anaesthesia thereby providing smooth extubation since patient will be awake pain free and without respiratory compromise.[14-18] α2 adrenergic agonists in addition to its sedative effects, alpha-2 receptor stimulation in the central nervous system inhibits sympathetic activity.[14-19] and reduces plasma epinephrine and norepinephrine levels.[20-24] Dexmedetomidine has been reported useful in attenuating haemodynamic stress secondary to hyperadrenergic overreactivity and agitation associated with delirium.[25-26] Because alpha-2 receptor stimulation does not cause respiratory depression,[27-28] sedation with dexmedetomidine may facilitate the transition to unassisted breathing in agitated patients.

Dexmedetomidine a more specific and selective α2 adrenergic agonist and has a shorter duration of action,[29-30]
The majority of patients receiving dexmedetomidine were effectively sedated yet were easily arousable a unique feature not observed with other sedatives. Effective analgesic-sparing sedation with minimal haemodynamic change has been reported without a loading dose prior to dexmedetomidine infusion and with low dose-infusion rates.\(^{(31)}\)

**MATERIALS AND METHODS**

After obtaining Institutional Ethics Committee approval 60 patients were enrolled randomly into the study. The periextubation haemodynamic response was observed for those who were getting Inj. Dexmedetomidine and those who were not getting it through prospective observational study.

**Entry Criteria**
- Patients undergoing mastoid- tympanoplasty under General anaesthesia
- ASA I – II

**Exit Criteria**
In this study exclusion criteria are set because hypertensive patients can be on alpha methyl-dopa drug and in such situations study drug is not recommended to use effect of study drug on patients with BMI > 35 may be unpredictable also as extubation response is observed in the study, patients requiring post-op ventilation are excluded from study.

After intubation and before surgical incision inj. Dexmedetomidine infusion was started at 0.4 mcg/kg/hr, which was continued until after extubation the anaesthesiologist managing the patient, who is not involved in the subsequent data collection administered the infusions.

Intra-op monitoring consisted of ECG non-invasive blood pressure, oxygen saturation, ETCO\(_2\); and the readings before induction at the time of induction post intubation, and thereafter every 30 min interval upto the time of giving reversal, and since then every 5 min interval, at the time of extubation and post extubation for 15 minutes were noted. Post-op monitoring consisted of ECG respiratory rate NIBP sedation score any side effects to Dexmedetomidine like bradycardia hypotension hypertension PONV allergic reaction. Also, the requirement of any beta-blocker/vasoconstrictors agents/vasodilators and total IV fluids given was recorded. Patient was reversed with Inj. Neostigmine 0.05 mg/kg and Inj. Glycopyrrolate 0.01 mg/kg at the end of surgery.

Postoperatively patient was followed up for 2-3 hrs for any adverse effect of study drug/postoperative complication/haemodynamic stability Same method of anaesthetic management and monitoring was followed in patients not receiving Inj. Dexmedetomidine and periextubation response was watched for.

**Statistical Analysis**
The data was collected and analysed using standard statistical chi - square test Student’s t test P < 0.05 – statistically significant. Data was entered in Microsoft excel and analysis was done using SPSS version 20.

**RESULTS**
The groups were comparable with respect to age (p value - 0.404), and sex (p value - 0.432) as distribution amongst two groups were statistically not significant. There was a higher distribution of ASA II patients in group C (Control) which was statistically not significant (p value - 0.468).

As Mastoid –Tymanoplasty requires intra –op induced hypotension for which Inj. Metoprolol or Inj. Labetalol were being used commonly and results were observed. The group C(control) received more dosage of Betablockers as compared to group D (Dexmedetomidine) where only one patient received it and the comparison was statistically significant (p value - 0.028). As per observed results use of vasoconstrictors was more in group D as compared to group C and it was statistically significant (p value-0.032). Also, one patient was excluded from study because of severe hypotension and study drug was discontinued.

**Heart Rate**
Periextubation haemodynamic changes were compared to pre-op vitals. Observations states that heart rate variability were similar in both groups during extubation but post extubation stability was more in group D as compared to group C.

**Systolic Blood Pressure**
As per the observations systolic BP was more stable in group D as compared to group C in periextubation period. Pre-Operative values were not statistically significant (p value-1)

**Diastolic Blood Pressure**
Also, diastolic BP was more stable in group D.
Respiratory Rate
Respiratory rate variability was more in group C as compared to group D after giving reversal agent but postextubation changes were nearly similar in both groups.

Sedation Score
0 – Awake and alert.
1 – Mildly sedated easily arousable.
2 – Moderately sedated aroused by shaking.
3 – Deeply sedated difficult to be aroused by physical stimulation.

The extent of sedation was assessed at the end of anaesthesia after extubation using post-operative sedation score (Pop SS) for 2 - 3 hrs. As per the observations group D patients showed higher sedation score (1) than group C (0), but it was not statistically significant (p value- 0.455).

Side Effects
Both groups were observed for any untoward side effect in post–op recovery unit for 3 hrs. As per study protocol.

There was no incidence of any side effect except 3 patients in group D and 1 in group C who complained of nausea/vomiting which was treated with Inj Metoclopramide/Inj Ondansetron, but the difference was not statistically significant.

DISCUSSION
Our study was different from other similar studies with respect to two aspects. First, we did not use a loading dose but rather began with the infusion rate of 0.4 mcg/kg/hr. This was done to assess whether a loading dose is necessary in the presence of other sedative agents during general anaesthesia and to avoid potential hypertension, reflex bradycardia and hypotension which is sometimes encountered during loading-dose administration secondly our study was done in patients undergoing mastoid-tympanoplasty surgery where induced hypotension was beneficial during surgery to give bloodless field under microscope. To our knowledge use of dexmedetomidine to facilitate induced hypotension in this subgroup of patients has not been previously reported. Current practice usually entails reducing or discontinuing sedation prior to extubation thus leads to agitation undesirable sympathetic stimulation use of dexmedetomidine was associated with more stable haemodynamic and respiration during entire process of extubation. There was no observed respiratory depression in both the groups. In our study we observed 60 patients in which 1 patient was excluded from study due to development of severe hypotension for dexmedetomidine and discontinuation of it retrospectively we found out that patient received antihypertensive on the morning of the surgery. Though there were more patients in group D who had hypotension compared to group C they responded well to single dose of vasoconstrictor. Effects were transient and not clinically significant.

Sedation score was 1 in group D as compared to 0 in group C but was not clinically significant. There were no side effects except post-operative nausea vomiting in 3 patients of Dexmedetomidine and 1 from control group. Use of antiemetics was more in Dexmedetomidine group than control in our study but the results were not statistically significant no other side effects were observed in both the groups.

Both surgeon and patient’s satisfaction and comfort were better with dexmedetomidine than control group. Because of bloodless field under microscope during surgery and sedative anxiolytic properties of dexmedetomidine postoperatively respectively.

CONCLUSION
Dexmedetomidine at a dose of 0.4 mcg/kg/hr provides a comfortable field for tympanoplasty surgery and stable haemodynamics during extubation without causing any respiratory depression or excessive sedation. But instead of stiff dose infusion, titrated infusion doses may be more benefit to greater haemodynamic stability and requirement of vasoconstrictors can also be minimised.

REFERENCES
Dexmedetomidine: A Novel \alpha-2 Adrenoceptor Agonist for Anesthesia

Dexmedetomidine is a novel \alpha-2 adrenoceptor agonist that has gained popularity in recent years due to its sedative, anxiolytic, and analgesic properties. This drug, originally developed as an anesthetic agent, has been found to improve surgical outcomes by reducing the need for additional sedatives and analgesics. It is known for its ability to attenuate sympathoadrenal responses, making it an attractive option for patients undergoing gynecologic surgery.

One of the key benefits of dexmedetomidine is its ability to reduce the need for thiopental and peripherally acting fentanyl. A study by Scheinin et al. (2001) compared the effects of dexmedetomidine and propofol in healthy volunteers, demonstrating that dexmedetomidine reduced the need for propofol in postoperative patients requiring mechanical ventilation.

In another study, Shehabi et al. (2001) compared the analgesic requirements of dexmedetomidine and remifentanil in healthy volunteers. They found that dexmedetomidine and remifentanil had comparable analgesic effects, with dexmedetomidine showing a lower incidence of nausea and vomiting.

Dexmedetomidine has also been studied in patients undergoing gynecologic surgery. In a study by Scheinin et al. (2001), dexmedetomidine was found to reduce the need for propofol and fentanyl in gynecologic patients undergoing hysterectomy.

However, dexmedetomidine is not without its side effects. It can cause sedation, hypotension, and bradycardia, and its use should be monitored closely. Despite these concerns, dexmedetomidine remains a promising agent for use in gynecologic surgery, offering improved postoperative outcomes and reduced analgesic requirements.