

## COMPARISON BETWEEN ONDANSETRON AND DEXAMETHASONE FOR PREVENTING POSTOPERATIVE NAUSEA AND VOMITING AFTER LAPAROSCOPIC CHOLECYSTECTOMY

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### ABSTRACT

#### BACKGROUND

Postoperative Nausea and Vomiting (PONV) has been variously described as the "big little problem" for anaesthesiology. Incidence of PONV after surgery is in the range of 20-30%, but it may be up to 50-70% after laparoscopic surgeries. The commonest cause of morbidity after anaesthesia and surgery are pain and postoperative nausea and vomiting. Unrelieved pain is a common cause of PONV and opioids used for pain relief also causes PONV.

The aim of the study is to compare between ondansetron and dexamethasone to prevent postoperative nausea and vomiting after laparoscopic cholecystectomy and to note any adverse reactions of drugs, if arises after their use.

#### MATERIALS AND METHODS

A prospective randomised comparative study was conducted with 60 female patients of ASA physical status I and II aged between 18-65 years undergoing laparoscopic cholecystectomy who were randomly assigned to one of the two groups containing 30 patients each. We assessed the parameters such as response to the drug to what extent the drug is reducing nausea, retching and vomiting, postoperatively.

#### RESULTS

From this study, it was observed that ondansetron is as effective as dexamethasone in controlling postoperative nausea and vomiting. The side effect in this study was very low with one patient in group A (ondansetron) developing headache. It was relieved without any treatment. There were no side effects in group B (dexamethasone).

#### CONCLUSION

This study says that ondansetron, a 5HT<sub>3</sub> antagonist in a dose of 4 mg, and dexamethasone, a glucocorticoid, in a dose of 8 mg are both effective prophylactic drugs in the prevention of PONV in laparoscopic cholecystectomy under general anaesthesia. We observed that-

- Ondansetron is as effective as dexamethasone in preventing PONV in laparoscopic cholecystectomy.
- Both ondansetron and dexamethasone have minimal side effects.
- Use of rescue antiemetic is same with ondansetron as well as dexamethasone.

#### KEYWORDS

PONV - Postoperative Nausea and Vomiting, Ondansetron, Dexamethasone.

**HOW TO CITE THIS ARTICLE:** Kolluru S, Mulpur B, Murthy SGK. Comparison between ondansetron and dexamethasone for preventing postoperative nausea and vomiting after laparoscopic cholecystectomy. J. Evid. Based Med. Healthc. 2017; 4(93), 5650-5653. DOI: 10.18410/jebmh/2017/1133

#### BACKGROUND

Postoperative Nausea and Vomiting (PONV) has been variously described as the "big little problem"<sup>1</sup> for anaesthesiology. Incidence of PONV after surgery is in the

range of 20-30%, but it may be up to 50-70% after laparoscopic surgeries.<sup>2</sup> The commonest cause of morbidity after anaesthesia and surgery are pain and postoperative nausea and vomiting. Unrelieved pain is a common cause of PONV and opioids used for pain relief also causes PONV.

In spite, extensive understanding of physiology of nausea and vomiting and abundance of antiemetic medications, certain surgical procedures are associated with unacceptably high incidence of PONV. Laparoscopic surgery is one of them, which is popular for minimal invasiveness, but is associated with increased morbidity due to PONV. Factors believed to contribute are-

*Financial or Other, Competing Interest: None.*

*Submission 15-11-2017, Peer Review 18-11-2017,*

*Acceptance 03-12-2017, Published 05-12-2017.*

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*DOI: 10.18410/jebmh/2017/1133*



- I. Rigorous decompression of abdomen by surgeon.<sup>3</sup>
- II. Irritation of parasympathetic nerve endings in the abdomen.
- III. Effect of carbon dioxide on emetic centre.

Although, unpleasant and embarrassing, PONV may occasionally lead to significant morbidity from dehydration, electrolyte imbalance, aspiration of vomitus and wound dehiscence. PONV may lead to prolongation of hospital stay and therefore increased expenses for surgery.

PONV is multifactorial. Studies have attempted to identify factors associated with PONV to predict, which patients are at highest risk for this complications, these factors may be related to the patients, the surgical procedure or the choice of anaesthesia.

Ondansetron and dexamethasone are two popular drugs used to prevent PONV. Ondansetron is 5-HT<sub>3</sub> receptor antagonist and widely used as antiemetic. Dexamethasone causes better control of late/delayed PONV by inhibiting prostaglandin 2 synthesis, decreasing 5-HT level in nervous system and by its anti-inflammatory action at operative site."

## MATERIALS AND METHODS

**Study Design-** Group - A (patients received ondansetron).

Group - B (patients received dexamethasone).

Parameters to be studied- Complete response, nausea, retching, vomiting and rescue drug.

### Inclusion Criteria

- Female patients aged between 18-65 years with ASA physical status I and II.
- Laparoscopic cholecystectomy operation <90 minutes with bodyweight of female patients <60 kg.

### Exclusion Criteria

- Patients with systemic, cardiac, respiratory diseases, bleeding disorders and gastrointestinal disorders.
- History of allergic reactions to drugs in use.
- Patients who have received antiemetic drug in 24 hours before anaesthesia and during study.
- Patients who have experienced nausea, vomiting or both in 24 hours before anaesthesia.
- Pregnancy and breastfeeding mothers and menstruating women.
- Sensitive to vomiting episodes and having motion sickness.
- Smokers.

Patients were randomised into group A (ondansetron) and group B (dexamethasone) by computer generated randomisation in two groups of 30 each, group A (n=30) and group B (n=30). Patients were advised to take oral midazolam 7.5 mg oral, the previous night. All patients were kept in fasting for 8 hours. Monitors were attached and intravenous line was secured. A personal, who was blind to the randomisation schedule prepared the drugs in 2 mL syringes and gave the drug intravenously 1 minute prior to other IV drugs.

### One of the following regimens-

Ondansetron 4 mg in 2 mL,

**OR**

Dexamethasone 8 mg in 2 mL was administered.

Observation was taken. On the operation table, routine monitoring (ECG, pulse oximetry, NIBP) was started and baseline vital parameters like heart rate, BP (systolic, diastolic, mean) and arterial O<sub>2</sub> saturation (SpO<sub>2</sub>) were recorded. Inj. Glycopyrrolate 0.2 mg was given. After preoxygenation for 3 minutes, induction of anaesthesia with thiopentone.

Sodium (5 mg/kg) and fentanyl (2 microgram/kg) was done. Endotracheal intubation was facilitated after muscle relaxation with succinylcholine in a dose of 1 mg/kg.

Maintenance of anaesthesia with N<sub>2</sub>O, O<sub>2</sub> @ 60:40 and isoflurane was done. Muscle relaxation was maintained by intermittent bolus doses of vecuronium bromide. Patients were mechanically ventilated to keep ET-CO<sub>2</sub> between 35-40 mmHg. A nasogastric tube was inserted to empty the stomach of air and other contents. For laparoscopic surgical procedure, peritoneal cavity was insufflated with CO<sub>2</sub> to keep intra-abdominal pressure less than 14 mmHg. After completion of surgery, anaesthetic agents were discontinued, residual neuromuscular blockade was reversed using intravenous glycopyrrolate and neostigmine. Before tracheal extubation, nasogastric tube was suctioned and removed. For postoperative analgesia, Inj. Paracetamol (1000 mg) IV was administered. All patients were observed postoperatively by noting vital signs and complications, if any. All episodes of PONV (nausea, vomiting and retching) were recorded for 12 hours postoperatively. Rescue drug Inj. Metoclopramide 10 mg IV was given, if required. All data from each patient was obtained and tabulated. Nausea is defined as unpleasant sensation associated with awareness of urge to vomit. Retching is defined as laboured, spastic and rhythmic contraction of respiratory muscles without expulsion of gastric contents. Vomiting is defined as forceful expulsion of gastric contents from mouth. Complete response (free from emesis) is defined as no PONV and no need for rescue medication.

## RESULTS

A clinical study of 60 patients in ASA I and II undergoing laparoscopic cholecystectomy under general anaesthesia was undertaken to compare the efficacy and safety of IV ondansetron and dexamethasone for PONV. Group A received IV ondansetron 4 mg and group B received IV dexamethasone 8 mg. Data was analysed using computer statistical software system GraphPad Prism version 5 and SPSS version 20 are presented in a tabular manner. Comparison between groups were performed by using Mann-Whitney-Wilcoxon tests or Chi-square test or Student's unpaired t-test as appropriate. The results were expressed in mean SD and number (%) of 60 patients' age incidence was as follows.

- The average age in group A (ondansetron) was 41.83 years and in group B (dexamethasone) was 41.30 years.
- The average weight in group A (ondansetron) was 54.5 kg and in group B (dexamethasone) was 53.47 kg.
- The average duration of surgery was 68.67 minutes in group A and 67.5 minutes in group B.

| Hours | Ondansetron (n=30) | Dexamethasone (n=30) | P value |
|-------|--------------------|----------------------|---------|
| 0-1   | 10                 | 9                    | 1       |
| 1-3   | 2                  | 2                    | 0.708   |
| 3-6   | 1                  | 2                    | 0.795   |
| 6-12  | 0                  | 0                    | -       |

**Table 1. Incidence of Nausea**

Incidence of nausea is higher in both groups in the first hour though it is not statistically significant. Within 3-6 hours, dexamethasone had higher incidence of nausea, but it is not statistically significant.

| Hours | Ondansetron (n=30) | Dexamethasone (n=30) | P value |
|-------|--------------------|----------------------|---------|
| 0-1   | 2                  | 2                    | 0.708   |
| 1-3   | 0                  | 0                    | -       |
| 3-6   | 0                  | 0                    | -       |
| 6-12  | 0                  | 0                    | -       |

**Table 2. Incidence of Retching**

Incidence of retching is higher in both groups in the first hour. It is not statistically significant.

| Hours | Ondansetron (n=30) | Dexamethasone (n=30) | P value |
|-------|--------------------|----------------------|---------|
| 0-1   | 3                  | 3                    | 0.559   |
| 1-3   | 2                  | 2                    | 0.708   |
| 3-6   | 0                  | 0                    | -       |
| 6-12  | 0                  | 0                    | -       |

**Table 3. Incidence of Vomiting**

Vomiting was more in the first 3 hours in both groups. It was not statistically significant.

|     | Ondansetron (n=30) | Dexamethasone (n=30) | P value |
|-----|--------------------|----------------------|---------|
| Yes | 3                  | 3                    | 0.559   |
| No  | 27                 | 27                   |         |

**Table 4. Rescue Drugs**

Need for rescue drug (Inj. Metoclopramide 10 mg IV) was similar in both groups.

## DISCUSSION

Postoperative nausea and vomiting is the most distressing and unpleasant experience when undergone anaesthesia and surgery. Furthermore, severe postoperative treatment may lead to dehydration, electrolyte imbalance, which in turn may alter the overall outcome of the entire surgical procedure. Postoperative vomiting may though rarely lead to a life-threatening complication like aspiration pneumonitis. In laparoscopic surgery, manipulation of

abdominal viscera are strong emetic stimuli. Pain, anxiety and drugs like opioids, NSAID also have been implicated in postoperative vomiting. There are many drugs used for treatment of PONV like metoclopramide, domperidone, phenothiazines, butyrophenones, anticholinergics and antihistamines. Even though, these drugs have either alone or in combination has been proved effective to a certain extent, a search was on for a newer antiemetic drug, which leads to the invention of 5-HT3 antagonist, ondansetron.

Studies comparing many of these drugs with ondansetron have been carried out in the recent years (since 1991). It was evident that ondansetron was highly or equally effective in preventing PONV in some studies. But, the incidence of side effects were low with ondansetron, whereas with most of the other drugs, the incidence of side effects were high, like extrapyramidal symptoms (e.g.- metoclopramide, domperidone, perphenazine, droperidol); haematological abnormalities (e.g.- prochlorperazine); sedation (e.g.- chlorpromazine, droperidol, cyclizine, etc.) and adverse cardiovascular effects (e.g.- metoclopramide, chlorpromazine, etc.).

Dexamethasone is a well-established antiemetic in patients receiving highly emetogenic cancer chemotherapy. Its antiemetic mechanism of action is not well understood, however. Dexamethasone may antagonise prostaglandin or release endorphins that elevate mood, improve one's sense of well-being and stimulate appetite. For these reasons, dexamethasone has been studied for preventing PONV.

In this study, we compared the efficacy and safety of IV ondansetron and dexamethasone as prophylaxis for PONV in laparoscopic cholecystectomy, which was chosen because of high incidence of PONV associated with it. In our study, the factors that would have contributed to nausea and vomiting maybe due to isoflurane and laparoscopic cholecystectomy. Use of face mask, use of nitrous oxide may or may not had contributed nausea and vomiting.

Avoidance of opioids and use of nasogastric tube towards the end of surgery must have helped in preventing PONV.

In their study,<sup>4</sup> they proved combination of ondansetron and dexamethasone is more effective in preventing postoperative nausea and vomiting in patients undergoing laparoscopic surgery than ondansetron alone.

In the study,<sup>5</sup> they proved combination of ondansetron and dexamethasone is better than each drug alone in preventing PONV after laparoscopic cholecystectomy. Dexamethasone alone is significantly less effective in preventing early vomiting compared to its combination with ondansetron; whereas, ondansetron alone is less effective against late PONV as compared with combination therapy.

In the study,<sup>6</sup> they proved ondansetron and dexamethasone were more effective than placebo in controlling PONV after tympanoplasty surgeries. Moreover, dexamethasone was more effective than ondansetron in preventing PONV.

In the study,<sup>7</sup> they proved dexamethasone was as effective and as safe as ondansetron in preventing PONV.

The results are similar to this study. In this study, 86% patients in both groups experienced no emesis. The incidence of emesis was higher in first 3 hours in both groups.

Retching was observed separately from vomiting. 93% patients in both groups experienced no retching. Incidence of retching was high in the first hour. A 33% patients experienced nausea in the ondansetron group and 30% patients experienced nausea in the dexamethasone group.

Incidence of PONV was very less at 6 hours and 12 hours in both groups.

This study proved that ondansetron and dexamethasone are similarly effective in controlling PONV.

**Age Incidence-** Average age in present study was 41.83 in group A (ondansetron) and 41.30 years in group B (dexamethasone). In this study, the incidence of PONV was more in younger patients in both groups.

**Weight Incidence-** Obesity is usually seen to be associated with increased incidence of PONV. In a study,<sup>8</sup> they found a higher percentage of patients with emetic episodes in heavier group. Average weight in the study was 47.5 kg.

The average weight in group A (ondansetron) was 54.5 kg and group B (dexamethasone) was 53.47 kg.

**Side Effects-** While the purpose of using prophylactic drug is to prevent PONV, it is imperative that drugs used do not compromise the patient's condition due to the side effects. Drugs commonly used like metoclopramide, droperidol and domperidone are associated with sedation, hypotension and extrapyramidal symptoms.

In a study,<sup>9</sup> they observed low incidence of side effects with ondansetron. Headache and constipation being the most common side effects.

The side effect in this study was very low with one patient in group A (ondansetron) developing headache. It was relieved without any treatment. There were no side effects in group B (dexamethasone).

Thus, both ondansetron and dexamethasone have a low incidence of side effects.

## CONCLUSION

It is fair to conclude from this study that ondansetron, a 5-HT<sub>3</sub> antagonist in a dose of 4 mg and dexamethasone, a glucocorticoid in a dose of 8 mg are both effective prophylactic drugs in the prevention of PONV in laparoscopic cholecystectomy under general anaesthesia.

## We observed that-

1. Ondansetron is as effective as dexamethasone in preventing postoperative nausea and vomiting in laparoscopic cholecystectomy.<sup>10</sup>

2. Both ondansetron and dexamethasone have minimal side effects.
3. Use of rescue antiemetic is same with ondansetron as well as dexamethasone.

## REFERENCES

- [1] Fisher DM. The big little problem of postoperative nausea and vomiting: do we know the answer yet? *Anaesthesiology* 1997;87(6):1271-1273.
- [2] Thune A, Appelgren L, Haglind E. Prevention of postoperative nausea and vomiting after laparoscopic cholecystectomy. A prospective randomized study of metoclopramide and transdermal hyoscine. *Eur J Surg* 1995;161(4):265-268.
- [3] Andrews PL. Physiology of nausea and vomiting. *Br J Anaesth* 1992;69(7 Suppl 1):2S-19S.
- [4] Bhattarai B, Shrestha S, Singh J. Comparison of ondansetron and combination of ondansetron and dexamethasone as a prophylaxis for postoperative nausea and vomiting in adults undergoing elective laparoscopic surgery. *J Emerg Trauma Shock* 2011;4(2):168-172.
- [5] Gautam B, Shrestha BR, Lama P, et al. Antiemetic prophylaxis against postoperative nausea and vomiting with ondansetron-dexamethasone combination compared to ondansetron or dexamethasone alone for patients undergoing laparoscopic cholecystectomy. *Kathmandu Univ Med J* 2008;6(23):319-328.
- [6] Eidi M, Kolahdouzan K, Hosseinzadeh H, et al. A Comparison of preoperative ondansetron or dexamethasone in the prevention of post-tympanoplasty nausea and vomiting. *Iran J Med Sci* 2012;37(3):166-172.
- [7] Wang XX, Zhou Q, Pan DB, et al. Dexamethasone versus ondansetron in the prevention of postoperative nausea and vomiting in patients undergoing laparoscopic surgery: a meta-analysis of randomized controlled trials. *BMC Anesthesiol* 2015;15:118.
- [8] McKenzie R, Kovac A, Duncalf D. Comparison of ondansetron versus placebo to prevent postoperative nausea and vomiting in women undergoing ambulatory gynaecologic surgery. *Anaesthesiology* 1993;78(1):21-28.
- [9] Dupeyron JP, Conseiller C, Levarlet M, et al. The effect of oral ondansetron in the prevention of postoperative nausea and vomiting after major gynaecological surgery performed under general anaesthesia. *Anaesthesia* 1993;48(3):214-218.
- [10] Maitra S, Som A, Baidya DK, et al. Comparison of ondansetron and dexamethasone for prophylaxis of Postoperative nausea vomiting in patients undergoing laparoscopic surgeries: a meta-analysis of Randomised controlled trials. *Anesthesiol Res Pract* 2016;2016:1-8.