


# Original Article: Dexamethasone Administered Intraperitoneally as a Novel Approach to Treat Shoulder Pain Following Gynecologic laparoscopy

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## ABSTRACT

**Introduction:** According to information currently available, there has not yet been a published study about the effectiveness of intraperitoneal dexamethasone that uses high-quality methodology. However, after laparoscopy, dexamethasone intravenously has been used to treat nausea. In this study, we compare the efficacy of intraperitoneal dexamethasone with placebo in patients who have undergone gynecologic laparoscopy in a double-blind randomized clinical trial.

**Material and Methods:** The patients were divided into groups using the four-block randomization method. The groups' treatment options were chosen at random by drawing lots. There were an equal number of candidates in each block at the conclusion of the selection process. Anesthesia was administered to each patient. A 16 mg dose of dexamethasone was administered into the peritoneum of patients in the first group at the conclusion of the procedure, while patients in the second group received a placebo injection of 16 cc of normal saline.

**Results:** Within the first 0, 2, 4, 8, and 12 hours following the procedure, the dexamethasone group experienced significantly less pain than the placebo group. The placebo group consumed more opioids on average as analgesics/sedatives than the dexamethasone group. **Conclusion:** Our study's findings demonstrate that, compared to a placebo, 16 mg of dexamethasone can significantly lessen the intensity of pain following gynecologic laparoscopy, and these patients also require fewer opioids. Controlling postoperative pain following laparoscopic surgery can be done in advance using this technique, which has no negative side effects.

## Introduction

Laparoscopy is one of the most widely used diagnostic and therapeutic procedures in use today. It has a variety of indications for abdominal and

pelvic surgeries. Laparoscopic surgery has many benefits, including quicker recovery times for patients and shorter hospital stays [1-3]. It also causes less postoperative pain and requires fewer analgesics than open surgery, but some

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pain, particularly acute pain, is likely to persist after laparoscopy [4-6].

Opioid therapy is suggested in these situations. The pain experienced after laparoscopic surgery and after laparotomy are strikingly different. The pain that patients feel after a laparotomy is actually somatic pain, whereas pain from a laparoscopy is visceral [7-9]. The laparoscopic diaphragm instigation that results in carbon dioxide pneumoperitoneum causes shoulder pain [10-12].

Numerous treatments are advised to relieve this pain because it can be very severe. To identify the source of this pain, numerous investigations have been carried out. Most of these investigations claim that the inflammation of the peritoneum brought on by carbon dioxide pneumoperitoneum is the cause of the pain. Non-steroidal anti-inflammatory drugs (NSAIDs) are therefore advised for patients to take [13-15].

However, there is significant debate surrounding the use of NSAIDs to treat postoperative pain because pneumoperitoneum is caused by carbon dioxide, which can result in pathophysiological changes in kidney blood flow that can counteract the effects of NSAIDs. More frequently now, local analgesics are injected during laparoscopic surgery to treat postoperative pain. One of these procedures involves injecting analgesics like lidocaine and bupivacaine [16-18].

intra-abdominally. However, there is conflicting evidence regarding the efficacy of this procedure [19-21]. As was already mentioned, carbon dioxide pneumoperitoneum causes peritoneal inflammation, which is the cause of postoperative pain. It appears that decreasing inflammation can therefore lessen pain [22-25]. Steroids may be used as alternatives to opioid painkillers because they have been used to reduce inflammation. It has been proven that injecting a single dose of dexamethasone may prevent post-operative nausea [26-28].

Dexamethasone is a potent, long-acting glucocorticoid that is frequently used after surgery [30-32]. The effectiveness of higher doses of dexamethasone and other glucocorticoids in reducing postoperative pain following foot surgeries, breast surgeries, laparoscopic cholecystectomy, and spinal column surgeries has recently been established. Although the effects of dexamethasone have not yet been proven, it is likely that pain relief is brought on by the inhibition of prostaglandin production [33-35]. Another theory holds that dexamethasone works by decreasing the amount of 5-hydroxytryptamine (5HT) that is returned to the central nervous system or by increasing the permeability of the blood-brain barrier for serum proteins. According to information currently available, there has not yet been a published study about the effectiveness of intraperitoneal dexamethasone that uses high-quality methodology [36-38]. However, after laparoscopy, dexamethasone intravenously has been used to treat nausea. In this study, we compare the efficacy of intraperitoneal dexamethasone with placebo in patients who have undergone gynecologic laparoscopy in a double-blind randomized clinical trial [39-41].

### Material and Methods

The Tehran University of Medical Science's Ethical Committee has given its approval to this study, which is a double-blind, randomized clinical trial. Women who had a gynecologic laparoscopy in a hospital between 2019 and 2021 were enrolled in the study [42-44]. Only women between the ages of 18 and 70 with a gynecologic indication for laparoscopy were included in this study, in accordance with the inclusion criteria [45-47].

Additionally, the patients were divided into groups I or II based on the American Society of Anesthesiologists (ASA) physical classification system because the overall health of the patients

was crucial and so that the questions posed by the investigators could be answered [48-50]. Patients with a history of diabetes mellitus, abdominal surgery, a dexamethasone drug reaction, and those who had received steroid treatment in the past were disqualified from the study. Before taking part in this study, each patient signed a written consent form after being informed of the entire process [51-53].

Before placing each patient in one of the two groups, a gynecologist collected the fundamental data required for the study, including age, fertility condition (gravidity, parity), weight, height, body mass index (BMI), and the type of laparoscopic surgery they had undergone. After that, the patients were split into two groups; the first group received intraperitoneal dexamethasone while the second group received a placebo [54-56].

The patients were divided into groups using the four-block block randomization method. The groups' treatment options were chosen at random by drawing lots. There were an equal number of candidates in each block at the conclusion of the selection process. Anesthesia was administered to each patient [57-59]. A 16 mg dose of dexamethasone was administered into the peritoneum of patients in the first group at the conclusion of the procedure, while patients in the second group received a placebo injection of 16 cc of normal saline [60-62].

After the laparoscopy, 2, 4, 8, 12, and 24 hours later, patients were questioned about the severity of their shoulder pain. Using the visual analog scale (VAS) method, the degree of pain was evaluated. The degree of pain was graded using this system on a scale of zero to ten. The patients' maximum level of pain severity was rated as 10, and the degree of painlessness was given a score of 0. Patients reported their level of pain intensity during the specified times using the VAS method. The intravenous injection contained 25 mg of pethidine diluted in 10 cc of ordinary saline [63-65]. As needed by the

patients, this dose was given again every 4 hours. For each patient, the total amount of pethidine injected within 24 hours of surgery was noted [66-68].

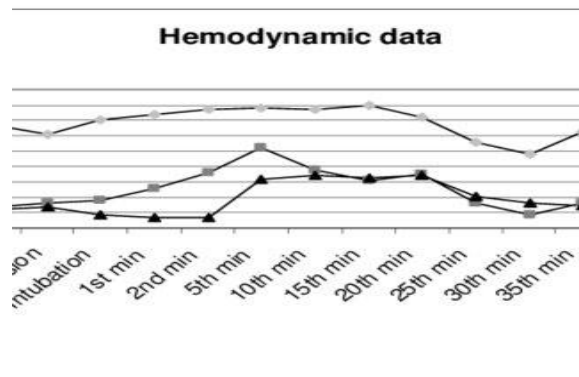
SPSS 13 was used to analyze the collected data. Both qualitative and quantitative data were displayed using the terms frequency and mean for the quantitative data. If our distribution was normal, the chi-square test was used to compare the two groups of qualitative data, and the t test was used to compare the two groups of quantitative data. Nonparametric tests were applied when our distribution was non-normal. P-values below 0.05 were deemed significant [69].

**Ethical Considerations:** This study has been approved by the committee of Alborz University of Medical Sciences [70].

## Results

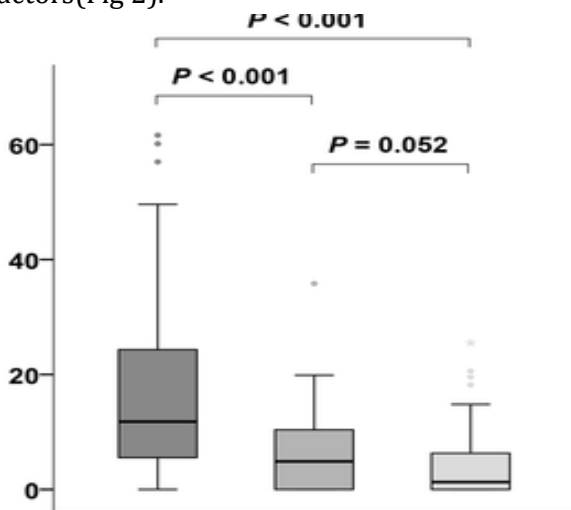
63 patients were evaluated in two groups as part of this study. Patients in the first group received intraperitoneal dexamethasone (31 patients), while those in the second group received a placebo (32 patients). Patients' ages ranged from 18 to 47, and our research indicates that there were no appreciable differences between the two groups in terms of age, BMI, or ASA-based physical condition. The mean time of laparoscopic surgery, which was 51.135point8 minutes in the first group (dexamethasone) and 53.735point6 minutes in the second group, did not statistically differ between the two groups, according to the results.

As previously mentioned, the patients' pain intensity increased in the placebo group, and after eight hours it began to decline; in contrast, the dexamethasone group's average pain intensity was less than three. Pain levels were significantly lower in the dexamethasone group than in the placebo group during recovery, 2, 4, 8, 12, and 24 hours following surgery (Fig 1).



**Figure 1:** Hemodynamic change between tow groups

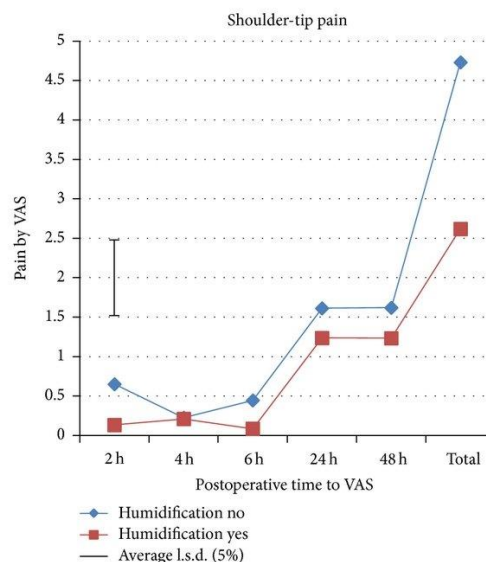
After recovery, this difference is smaller than it is at other points in the study. We used analysis of the variance of repeated measurements to try and determine whether the patient's pain severity is influenced by time and other general factors like age, BMI, and lengthy laparoscopic surgery. According to the study's findings, dexamethasone can reduce pain severity on its own and is not dependent on any other factors (Fig 2).



**Figure 2:** Pain intensity between tow groups

Opioids were first prescribed as an analgesic in the dexamethasone group and placebo group one hour after the first dose. Generally, an analgesic was requested within an hour of surgery by 83% of dexamethasone-treated patients and 78% of placebo-treated patients.

Regarding the initial demand for analgesics, there are no statistically significant differences (Fig 3).



**Figure 3:** Opioids need after surgery

The average dose of the opioid (pethidine) given was 35.918point9 mg in the placebo group and 27.57point6 mg in the dexamethasone group. We did not discover any complications such as wound infection and a delay in wound healing during the investigation period, despite the fact that the amount of opioid prescribed as an analgesic in the placebo group was significantly higher than that used in the dexamethasone group.

### Discussion

This study's main objective is to determine whether or not a single dose of dexamethasone injected into the peritoneal cavity can reduce the intensity of pain following laparoscopic surgery. The findings of this study demonstrate that dexamethasone injections into the peritoneum following laparoscopic surgery can significantly reduce postoperative pain. In addition, compared to patients receiving a placebo, those receiving dexamethasone requested fewer narcotics.

Important considerations in the care of patients after laparoscopy include the prevention and relief of postoperative pain and its complications, such as nausea and vomiting. Additionally, this has a significant impact on how well patients are doing overall. Non-opioid analgesics are frequently taken into account for managing postoperative pain. We did try to find new analgesics to relieve postoperative pain, though, due to the known risks associated with non-opioid analgesics. In actuality, the primary focus of this investigation has been the management and treatment of postoperative pain following laparoscopy.

As was already mentioned, the mechanism of pain following laparoscopy and that following laparotomy are completely different. An investigation into the cause of this pain has linked it to the peritoneal inflammation caused by carbon dioxide pneumoperitoneum. Pain after laparotomy is somatic, but pain after laparoscopy is visceral. NSAIDs have been suggested in these situations as a painkiller.

In this study, intraperitoneally administered dexamethasone was used instead of the local analgesics lidocaine and bupivacaine, which have recently become popular for treating postoperative pain. Even though there is debate over the use of these medications, the majority of medical professionals agree that the best explanation for shoulder pain following laparoscopic surgery is an inflammatory process in the peritoneal cavity. Therefore, anti-inflammatory drugs like corticosteroids can lessen shoulder pain intensity by reducing inflammation following laparoscopy.

Dexamethasone, a corticosteroid, has been successfully used to treat some complications like nausea and vomiting for many years. Although corticosteroids have been shown to have analgesic effects in clinical settings, it is still unknown whether or not they can effectively reduce postoperative pain.

In this study, we successfully demonstrated that dexamethasone can relieve postoperative pain and lessen the need for opioids by injecting it directly to the inflamed area. But the question of whether systemic (intravenous) dexamethasone can have such effects still lingers. Although dexamethasone is frequently used and does not have any serious side effects, higher doses may cause some side effects, such as gastrointestinal bleeding, an increase in the rate of infection, and a delay in the healing of wounds. 1900 patients received methylprednisolone dosages of 15 to 30 mg/kg as part of a meta-analysis of 52 studies.

Some of these studies were carried out in critical wards (such as heart surgery, neurosurgery, and trauma ward) rather than elective and laparoscopic surgery wards, and no significant difference was reported regarding serious side effects compared to the control group. In reality, patients only experienced a reduction in pulmonary complications—a problem that occurs more frequently in patients with fractures—which was the only notable effect. No clinical study demonstrating that a single dose of corticosteroids can have serious adverse effects on patients was found in the literature review.

### Conclusion

Our study's findings demonstrate that, compared to a placebo, 16 mg of dexamethasone can significantly lessen the intensity of pain following gynecologic laparoscopy, and these patients also require fewer opioids. Controlling postoperative pain following laparoscopic surgery can be done in advance using this technique, which has no negative side effects.

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