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The incidence of side effects and their relation with anesthetic techniques after ambulatory surgery

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Abstract

The aim of this study was to evaluate the incidence of side effects and their relation with anesthetic techniques in patient undergoing ambulatory surgery. 654 patients, ASA I–II, aged between 20 and 70 years scheduled for ambulatory surgery were enrolled into the study protocol. Patients were requested to record the existence of headache, sore throat, postoperative pain, nausea, vomiting, muscle weakness, lack of appetite, drowsiness, sleep disturbances, dizziness, dysuria, and lumbar pain during first week postoperatively. Postoperative pain was significantly higher after peripheral neural blockage. Muscle weakness, sore throat, lack of appetite, dysuria, sleep disturbances, headache, and dizziness were significantly higher after inhalational anesthesia ($P < 0.05$). It was concluded that total intravenous anesthesia or neural blockade should be preferred for ambulatory surgery and an effective postoperative analgesic therapy should be planned before discharge.

Keywords: Ambulatory surgery; Postoperative side effects; Anesthetic techniques

1. Introduction

Throughout the developed world there is a trend towards performing more and more surgery on an ambulatory basis [1]. The advantages of ambulatory surgery include economic savings, earlier ambulation, patient convenience, and a lessened risk of nosocomial infection. However, discharge from hospital is not the end of the process of recovery as the patient is concerned, they still have to go through the late stage, and it may be days or even weeks before they return to their preoperative physiological status. In this late recovery period, the patient may also run into complications of anesthesia and surgery, which require further contact with the hospital [2].

The aim of this study was to evaluate the incidence of postoperative side effects and their relation with anesthetic techniques prospectively in patients undergoing ambulatory surgery.

2. Methods

After institutional ethics committee approval and patients' written consent, 654 unpremedicated patients, ASA I–II, aged between 20 and 70 years scheduled for ambulatory surgery were prospectively studied. Demographic characteristics of patients, the type and duration of surgery, anesthetic techniques, and the method of airway management were recorded during surgery.

The patients were requested to record the existence and duration of postoperative pain, lumbar pain, headache, sore throat, nausea, vomiting, muscle weakness, lack of appetite, drowsiness, dizziness, dysuria, and sleep disturbances using standardized questionnaire during the first 7 days postoperative. Each side effect is defined in Table 1 [3]. The patients who did not bring their questionnaire were interviewed by the same research assistant through phone by second week postoperative.

All questionnaire and interview responses were entered into a database and analyzed. Descriptive statistics were in the form of frequencies, means $\pm$ S.D. The chi-square test was used for frequency data and the relation between anesthetic techniques and side effects. An independent t-test was used to test the differences

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Table 1
Description of postoperative side effects

Side effect	Description
Postoperative pain	You wake up moaning or writhing and need extra painkillers
Low back pain	You feel pain in the lumbar area on rest or activation
Headache	You have headache during postoperative period
Sore throat	Your throat is painful and it may hurt when you try to swallow
Nausea	You feel queasy with a strong desire to vomit
Vomiting	You are retching and bringing up liquid to solids
Muscle weakness	You feel muscle pain and loss of muscle strength
Lack of appetite	You feel aversion to food
Drowsiness	You feel very tired and do not want to get out of bed
Dizziness	You feel faintness, giddiness, and unsteadiness
Dysuria	You feel difficulty or pain in urination
Sleep disturbances	You are sleeping longer than normal or have difficulty to sleep

Taken from Ref. [3].

between groups with and without side effects. Statistical significance was assigned when $P < 0.05$.

3. Results

654 patients were studied and 403 patients (61.6%) completed the questionnaire. We did not receive the answers of 251 patients after 7 days following surgery and the telephone interviews were conducted for these patients.

The demographic characteristics of patients and type of surgery are detailed in Table 2. The mean duration of surgery was 39 ± 20 min.

Table 2
Demographics of patients, type of surgery, and anesthetic techniques

	Side effects	No side effects
Number of patients	232/654	422/654
Age (year)	43 ± 1	39 ± 3
Gender (M:F)	85:147	165:257
ASA class		
I	145/654	209/654
II	87/654	213/654
Type of surgery ($n = 654$)		
Orthopedic surgery	60	103
General surgery	46	96
Gynaecological surgery	25	80
ENT surgery	34	50
Urological surgery	67	93
Anesthetic technique ($n = 654$)		
Inhalational anesthesia	138 (44%)	177 (56%)
Total intravenous anesthesia	32 (27%)	85 (73%)
Central neural blockade	40 (30%)	93 (70%)
Peripheral neural blockade	22 (24.7%)	67 (75.3%)

The anesthetic techniques used were inhalational anesthesia (sevoflurane, nitrous oxide) in 315 patients (48%), central neural blockade (spinal, epidural, or caudal blockade) in 133 patients (20%), total intravenous anesthesia (propofol and alfentanil) in 117 patients (17%), and peripheral neural blockade (axillary, interscalene, or femoral-sciatic blockade) in 89 patients (14%). The neuromuscular relaxant drug such as succinylcholine was used in 102 patients (15.6%), rocuronium was used in 36 patients (5.5%), and atracurium was used in 24 patients (3.7%).

The method of airway management was endotracheal intubation in 141 patients (32.7%), insertion of laryngeal mask airway in 225 patients (52%), and ventilation with face mask in 66 patients (15.3%) during general anesthesia.

35% percent (232 patients) of all patients experienced one or more side effects during 7 days postoperatively. Postoperative pain was the most frequently reported side effect (9.6%) followed by muscle weakness, nausea, and sore throat (Fig. 1). The most common three side effects were muscle weakness, sore throat, and lack of appetite after inhalational anesthesia; sore throat, muscle weakness, and postoperative pain after total intravenous anesthesia; postoperative pain, lumbar pain, and vomiting after central neural blockade; and postoperative pain, nausea, and drowsiness after peripheral blockade. Postoperative pain was significantly higher after peripheral blockade than the other anesthetic techniques ($P < 0.05$). The incidences of muscle weakness, sore throat, lack of appetite, dizziness, and sleep disturbances were significantly higher after inhalational anesthesia ($P < 0.05$). Dysuria was significantly higher after inhalational anesthesia and central neural blockade, and headache was significantly higher after inhalational anesthesia and total intravenous anesthesia than the other anesthetic techniques ($P < 0.05$). No difference was observed in nausea, vomiting, drowsiness, and low back pain in relation with anesthetic technique. No correlation was found between pairs of postoperative side effects. The incidences of side effects and their comparison with anesthetic techniques were showed in Table 3.

Sore throat was significantly higher in intubated patients ($P < 0.05$) and no correlation was found between the other side effects and airway management devices.

Surgical procedures and anesthetic techniques used were shown in Table 4 and the relationship with side effects was reported in Table 5.

4. Discussion

In our study, the incidence of one or more side effects following ambulatory surgery was 35.4% and the most

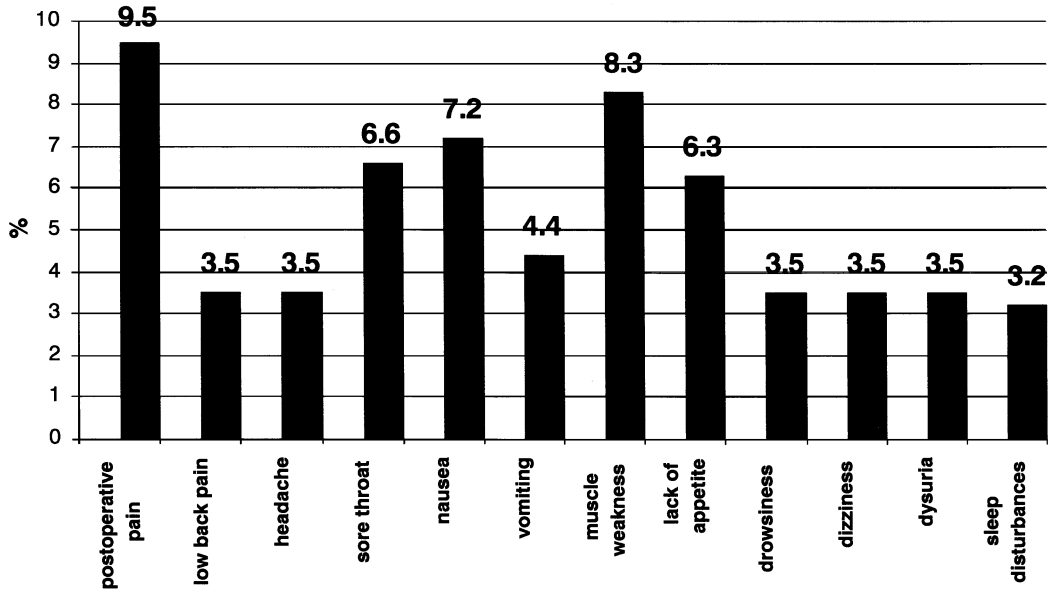

Fig. 1. Postoperative side effects (%).

common side effect was postoperative pain (9.6%). Postoperative pain is a common reason for delayed discharge and causes extreme discomfort and suffering after ambulatory surgery. Pain also precipitates several deleterious physiological effects leading to postoperative complications [4]. It was a major problem in 27.1% (63 patients) of 232 patients with side effects. The pain started after 24 h following surgery and continued until sixth day postoperative. The incidence of postoperative pain was found significantly higher after peripheral neural blockade than the other anesthetic techniques. 54% of the patients who had postoperative pain underwent orthopedic surgery and most of these patients had peripheral neural blockade. It is well-known that bone injury is more painful than soft tissue injury and orthopedic patients had the greatest incidence of severe pain postoperatively [5]. This type of surgery was found to play a role in determining the degree of postoperative pain. Puolakka et al. [6] reported that about one-third of the patients had pain in the operative area following orthopedic outpatient surgery and 5.6% continued to report this during first week.

Postoperative muscle weakness is a complex symptom consisting of a decreased ability to carry out the activities of daily living; it is often related to an element of depression. In our study, the second most common side effect was muscle weakness. The incidence of muscle weakness following inhalational anesthesia was two times higher than the total intravenous anesthesia and three times higher than the central neural blockade. The physiological causes of postoperative muscle weakness are not clear [7]. Early postoperative muscle weakness may be related to postoperative sleep disturbances, inflammatory mediators, and the use of systemic opioids [8]. In our study, succinylcholine was administered in 102 patients. 54 patients had muscle weakness and 28 (28/102 patients) of 54 patients who suffered from muscle weakness following anesthesia received succinylcholine and 11 (11/36) of the patients received rocuronium bromide. Preoperative systemic opioid–alfentanil was used in only 8 of 54 patients who suffered muscle weakness. Therefore, succinylcholine and opioid–alfentanil were not thought to be a reason of muscle weakness and predictor of postoperative myalgia [9]. However, further studies are needed to determine the relation between muscle weakness with preoperative systemic opioid and succinylcholine.

Table 3
Surgical procedures and anesthetic techniques

Surgery	IA ($n = 315$)	TIVA ($n = 117$)	CNB ($n = 133$)	PNB ($n = 89$)
Orthopedic surgery ($n = 163$)	32	–	42	89
General surgery ($n = 142$)	87	–	55	–
Gynaecological surgery ($n = 105$)	59	46	–	–
ENT surgery ($n = 84$)	53	31	–	–
Urological surgery ($n = 160$)	84	40	36	–

Table 4
The incidence of side effects and anesthetic techniques (%)

	IA ($n=315$)	TIVA ($n=117$)	CNB ($n=133$)	PNB ($n=89$)
Postoperative pain	9/315 (2.8)	7/117 (6)	13/133 (9.7)	34/89 (38.2)*
Low back pain	10/315 (3.2)	3/117 (2.6)	7/133 (5.3)	3/89 (3.4)
Headache	16/315 (5.1)**	6/117 (5.1)**	–	1/89 (1.1)
Sore throat	41/315 (13)***	8/117 (6.8)	–	–
Nausea	25/315 (7.9)	5/117 (4.3)	5/133 (5.6)	12/89 (9)
Vomiting	20/315 (6.3)	3/117 (2.6)	6/133 (4.5)	–
Muscle weakness	35/315 (11)***	8/117 (6.8)	5/133 (3.8)	–
Lack of appetite	33/315 (10.5)***	1/117 (0.9)	5/133 (3.8)	2/89 (2.2)
Drowsiness	14/315 (4.5)	4/117 (3.4)	–	5/89 (5.6)
Dizziness	18/315 (5.7)***	3/117 (2.6)	2/133 (1.5)	–
Dysuria	17/315 (4)****	1/117 (0.9)	6/133 (4.5)****	–
Sleep disturbances	18/315 (5.7)***	2/117 (1.7)	17/133 (0.8)	–

IA, inhalational anesthesia; TIVA, total intravenous anesthesia; CNB, central neural blockade; PNB, peripheral neural blockade.
* $P<0.05$: PNB vs. other anesthetic techniques.
** $P<0.05$: IA and TIVA vs. PNB, CNB.
*** $P<0.05$: IA vs. other anesthetic techniques.
**** $P<0.05$: IA and CNB vs. TIVA, PNB.

Postoperative sleep disturbances are other side effects. Rawal et al. [10] reported that sleep disturbances are very common in the postoperative period. Few studies have been performed to evaluate the influence of anesthetic techniques on postoperative sleep and they reported that regional anesthetic techniques can be used to reduce surgical stress and to provide superior analgesia with decreased opioid requirements [7]. In our study, sleep disturbances were higher after inhalational anesthesia than the other anesthetic techniques and no relation was found between opioid requirements and postoperative sleep disturbances.

Propofol and alfentanil were used for total intravenous anesthesia. Propofol provides rapid, clear-headed wake-up with a low incidence of nausea and vomiting [1]. However, Philip et al. [11] and Jellish et al. [12] reported that the incidence of postoperative nausea and vomiting was similar between propofol and sevoflurane groups. We also did not find any difference in the incidence of nausea and vomiting between inhalational and intravenous anesthesia. These side effects did not seem to be related with anesthetic techniques. Alfentanil has a short duration of action and is a popular ambulatory anesthetic, but the incidence of nausea and vomiting limits its efficacy in this setting [13]. In our study, the incidence of nausea was 4.3% and the incidence of vomiting was 2.6% after total intravenous anesthesia. The use of general anesthesia, systemic opioid's use, the surgical stress–response, and postoperative pain have all been implicated in the aetiology of PONV [7]. However, there was no relation found between systemic opioid's use, postoperative pain, inhalational anesthesia, and PONV in our study.

Table 5
The side effects and surgical procedures (%)

	Orthopedic surgery	General surgery	Gynaecological surgery	ENT surgery	Urological surgery
Postoperative pain	34/163 (20.8)*	4/142 (2.8)	5/105 (4.8)	7/84 (8.3)	13/160 (8.1)
Low back pain	5/163 (3)	3/142 (2.1)	6/105 (5.7)	–	9/160 (5.6)
Headache	5/163 (3)	6/142 (4.2)	5/105 (4.8)	2/84 (2.4)	5/160 (3.1)
Sore throat	–	–	1/105 (0.95)	32/84 (38)**	10/160 (6.2)
Nausea	13/163 (8)	8/142 (5.6)	7/105 (6.7)	8/84 (9.5)	11/160 (6.8)
Vomiting	1/163 (0.6)	4/142 (2.8)	6/105 (5.7)	8/84 (9.5)	10/160 (6.2)
Muscle weakness	1/163 (0.6)	16/142 (11.3)***	11/105 (10.5)***	8/84 (9.5)***	18/160 (11.2)***
Lack of appetite	12/163 (7.4)	2/142 (1.4)	6/105 (5.7)	7/84 (8.3)	14/160 (8.7)
Drowsiness	9/163 (5.5)	3/142 (2.1)	2/105 (1.9)	4/84 (4.8)	5/160 (3.1)
Dizziness	6/163 (3.7)	4/142 (2.8)	1/105 (0.95)	7/84 (8.3)	5/160 (3.1)
Dysuria	–	1/142 (0.7)	8/105 (7.6)	–	15/160 (9.4)
Sleep disturbances	6/163 (3.7)	1/142 (0.7)	3/105 (2.9)	8/84 (9.5)**	4/160 (2.5)

* $P<0.05$: orthopedic surgery vs. other types of surgeries.
** $P<0.05$: ENT surgery vs. other types of surgeries.
*** $P<0.05$: general, gynaecological, ENT and urological surgeries vs. orthopedic surgery.

Sore throat was significantly higher after inhalational anesthesia than the other anesthetic techniques as 99.2% of intubated patients were anesthetized with inhalational anesthesia. Endotracheal intubation causes a high incidence of postoperative airway-related complaint as sore throat. The incidence of sore throat is markedly reduced when the laryngeal mask airway is used and endotracheal intubation was a major predictor of sore throat. However, no correlation was found between the other side effects and airway management devices.

The type of anesthesia is often forced by the surgical procedure that is being performed during the study. In our study, the incidence of postoperative pain was significantly higher after orthopedic surgery as discussed, muscle weakness was significantly higher after general, urological, and gynecological surgery, and sore throat was significantly higher after ENT surgery than the other postoperative side effects. ENT surgical patients had a high incidence of sore throat (38%) and sleep disturbances (9.5%). Sore throat was found to be related with the airway management device and surgical procedure.

Chung et al. [14,15] and Jenkins et al. [3] reported that the most common side effects were pain, nausea, and vomiting after ambulatory surgery and the type of surgery did influence these symptoms. However, the type of anesthesia was not used as a predictive factor. Our study showed that the type of anesthesia, surgical procedure, and the method of airway management did influence the postoperative side effects. Postoperative muscle weakness, lack of appetite, dysuria, headache, dizziness, and sleep disturbances were related to the type of anesthesia. The incidence of muscle weakness and lack of appetite was higher after inhalational anesthesia. Therefore, the incidence of postoperative side effects may be altered depending on anesthetic techniques and drugs as these side effects played a major role in determining the degree of return to daily living functions.

We concluded that the incidence of postoperative side effects was significantly lower following central or peripheral neural blockade and total intravenous anesthesia. These anesthetic techniques should be preferred for ambulatory surgery and postoperative pain therapy should be planned before discharge. The patients must be educated for postoperative pain therapy options. However, surgical factors may determine the choice of anesthesia technique used and the side effects seen may be related to those factors. Further studies should be made to develop effective strategies for the prevention and treatment of frequently seen postoperative side effects in ambulatory surgical patients.

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