

DOI: 10.4274/gulhane.galenos.2020.1099
Gulhane Med J 2020;62:193-9



Fast track anesthesia for lumbar discectomy in outpatient basis: A retrospective observational study

© Mehmet Özgür Özhan¹, © Mehmet Burak Eşkin², © Ceyda Çaparlar³, © Bülent Atik⁴, © Mehmet Anıl Süzer¹, © Uğur Gönç⁵

¹Cankaya Hospital, Clinic of Anesthesiology and Reanimation, Ankara, Turkey

²University of Health Sciences Turkey, Gülhane Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey

³University of Health Sciences Turkey, Yildirim Beyazit Training and Research Hospital, Clinic of Anesthesiology and Reanimation, Ankara, Turkey

⁴Balikesir University Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey

⁵Cankaya Hospital, Clinic of Orthopedics and Traumatology, Ankara, Turkey

Date submitted:

17.04.2020

Date accepted:

27.05.2020

Online publication date:

15.09.2020

Corresponding Author:

Mehmet Burak Eşkin, MD, University of Health Sciences Turkey, Gülhane Faculty of Medicine, Department of Anesthesiology and Reanimation, Ankara, Turkey
burakeskin@hotmail.com

ORCID:

orcid.org/0000-0001-6781-9334

Keywords: Outpatient, lumbar discectomy, general anesthesia

ABSTRACT

Aims: The use of short acting anesthetics has introduced a fast track anesthesia concept that allows the transfer of the patients from the operating room directly to the ward without a need for an observation in the post anesthesia care unit. The aim of this study was to evaluate whether fast tracking had an effect on the duration of hospital discharge after lumbar discectomy (LD) under general anesthesia (GA) between October 2017 and April 2018.

Methods: Medical records of 252 American Society of Anesthesiologists physical status 1-2 patients were enrolled in this retrospective and observational study. The primary aim was to determine the patients who were eligible for fast tracking and to compare the duration of hospital discharge between fast track eligible and ineligible patients. The secondary aim was to identify the factors that prevented fast tracking and early hospital discharge. The value of $p < 0.05$ was considered statistically significant.

Results: More patients were eligible for fast tracking than those who were not eligible [176 (69.8%) vs. 76 (30.2%), $p = 0.012$]. The duration of hospital discharge was lower in fast track eligible patients compared to ineligible patients (14.5 ± 7.5 hours vs 17.8 ± 7.3 hours; $p = 0.009$). Pain was the most common cause of fast track ineligibility and delay in hospital discharge (42.1% and 64.5%; $p < 0.05$).

Conclusions: GA using short acting anesthetics could increase fast track eligibility which reduced the duration of hospital discharge after outpatient LD. Postoperative pain should be considered as a limiting factor for fast tracking and early hospital discharge.

Introduction

The developments in the anesthetic and surgical techniques facilitated early recovery after the surgery and introduced the "fast track anesthesia" concept in practice (1). According to the concept, the patients are assessed for the fast track eligibility in the operating room (OR) immediately after awakening from general anesthesia (GA). Eligible patients are transferred from the OR directly to the ward (phase 2 recovery area) without a need for an observation in the phase 1 recovery area of the

post-anesthesia care unit (PACU) which is called "PACU bypass" (1,2). It has been reported that fast tracking is associated with a reduced length of hospital stay which increases patient's satisfaction and cost-saving in the health care (1-3).

In the past, fast tracking was preferred generally for anesthetic managements including monitored anesthetic care (MAC), neuraxial anesthesia, or GA using only supraglottic airway devices that did not necessitate endotracheal intubation with the use of neuromuscular blocking agents (NMBAs) (4).

However, in recent years, the introduction of newer anesthetics with a short duration of action and immediate-acting reversal agents has made fast tracking after GA possible (5-7).

We have been using fast tracking in our anesthesia practice for three years in certain outpatient surgeries under GA that enables the discharge of patients in less than 24 hours after the surgery. One of these outpatient surgeries is lumbar discectomy (LD) which is the most common surgical practice in the neurosurgery (8). LD necessitates endotracheal intubation with the use of NMBA when they are performed under GA due to a prone positioning. The aim of this study was to evaluate whether fast tracking had an effect on the duration of hospital discharge after LD under GA.

Methods

Study Design

This observational and retrospective study was conducted in a tertiary hospital after obtaining ethics committee approval (Gülhane Training and Research Hospital, date: 06/05/2018; protocol no: 18/148). Data were retrospectively collected from the hospital's computerized database, medical and anesthesia files of all adult patients who underwent elective LD under GA for lumbar disc hernia between October 2017 and April 2018. The inclusion criteria were as follows: Being American Society of Anesthesiologists (ASA) physical status 1-2 and undergoing elective one level LD for the treatment of a lumbar disc hernia performed by a single neurosurgeon under GA. Exclusion criteria were undergoing urgent surgery, having a history of a neurological impairment, having obstructive sleep apnea, having difficult airway management, the presence of insufficient data, and being lost to follow-up in the perioperative period. Informed consent was not obtained from patients due to the retrospective design of the study. The study followed the strengthening the reporting of observational studies in epidemiology (STROBE) guidelines. The study was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

Anesthetic Technique

The routine anesthetic protocol for the outpatient LD under GA was as follows: GA was induced using IV propofol (2-2.5 mgkg⁻¹), fentanyl (1 µgkg⁻¹), and rocuronium (0.6 mgkg⁻¹) and maintained using a total intravenous (IV) anesthesia (TIVA) technique based on IV infusions of propofol (3-6 mgkg⁻¹ h⁻¹) combined with remifentanyl (1-2 µgkg⁻¹ h⁻¹). Infusion doses were adjusted to keep the mean arterial blood pressure and heart rate in ± 20 of baseline levels. At the end of the surgery, a subcutaneous wound infiltration was performed on the surgical incision site using a local anesthetic mixture containing 100 mg of lidocaine 2% and 25 mg of bupivacaine 0.5%. GA was discontinued. Sugammadex (2-4 mgkg⁻¹) was given for the

reversal of the NMBA and the patients were extubated. Fast track eligibility was evaluated using the White's Fast Track scoring system (Table 1) (4). The patients with a score >12 were considered to be eligible for fast tracking and were transferred from the OR directly to the phase 2 recovery area (the ward). This was called PACU bypass. Ineligible patients were followed in the PACU where their treatments were continued. The patients were discharged from the PACU to the ward according to the modified Aldrete scoring system. A score >9 was considered to be eligible for the transfer from PACU to the ward (Table 1) (9).

Postoperative Follow-up Period

A multi-modal analgesic (MMA) regimen was used throughout the perioperative period including preoperative IV tenoxicam (10 mg), intraoperative IV paracetamol (10 mgkg⁻¹) and tramadol (1 mgkg⁻¹), postoperative IV patient controlled analgesia (IV-PCA) using tramadol, IV paracetamol (10 mgkg⁻¹ with six hours intervals, up to a total daily dose of 3000 mg), and oral diclofenac sodium (75 mg with 24 hours intervals). Pain was evaluated using a Visual Analogue Scale (VAS) and IV pethidine (0.5 mgkg⁻¹) was given when VAS score >3. Postoperative nausea and vomiting were treated using IV ondansetron (4 mg). The Post Anesthetic Discharge Scoring System Discharge was used to evaluate the eligibility for discharge from the hospital (Table 2) (10).

Data Collection

All medical data were reviewed in detail to obtain: 1) demographic characteristics including gender, age, ASA physical status, co-morbidity, and body mass index, 2) recovery times: a) the duration of the operation (min), b) time to be eligible for PACU by-pass in fast tracked patients (min), d) the duration of PACU care for non- fast tracked patients (min), e) time to hospital discharge (hours), 3) number and rate of patients who were fast tracked and discharged from hospital with respect to outpatient surgery (discharge time <24 hours), 5) factors preventing fast tracking and/or discharge from hospital in outpatient setting, 6) complications.

Outcome Measure Criteria

The primary outcome measure was to determine the patients who were eligible for fast tracking and to compare the duration of hospital discharge between fast track eligible and ineligible patients. The secondary outcome measure was to identify the factors that prevented fast tracking and early hospital discharge.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 21 (IBM SPSS Inc, Chicago, IL) pocket program. Descriptive statistics were calculated for continuous variables as mean and standard deviation (mean±SD), and for categorical variables as frequency distribution and percentage (n, %). The Pearson's

Table 1. White's fast track scoring system and modified Aldrete scoring system

White's fast track scoring system*	Score	Modified Aldrete scoring system**	Score
Physical activity		Activity	
Able to move all extremities under command	2	Moves all four extremities	2
Weakness in some movements of extremities	1	Moves only two extremities	1
Unable to move all extremities	0	Unable to move any extremities	0
Respiratory stability		Respiration	
Able to deep breathe	2	Able to deep breath with free cough	2
Tachypneic, but with free cough	1	Dyspnea with limited breathing	1
Dyspnea without free cough	0	Apnea	0
Hemodynamic stability		Circulation (BP)	
BP below the 15% of baseline MAP	2	20 mm Hg higher than baseline anesthetic level	2
BP between 15-30% of baseline MAP	1	20-50 mm Hg higher than baseline anesthetic level	1
BP higher than 30% below baseline MAP	0	>50 mm Hg higher than baseline anesthetic level	0
Level of consciousness		Consciousness	
Awake and orientated	2	Fully awake with orientation	2
Arousable with minimal stimulation	1	Arousable on calling	1
Respond to tactile stimulation only	0	Unresponsive	0
Oxygen saturation status		Oxygen saturation	
Maintains SpO ₂ >90% on room air	2	SpO ₂ >92% on room air without O ₂ supplement	2
Requires oxygen supplement (nasal prongs)	1	Requires supplemental O ₂ to maintain SpO ₂ >90%	1
SpO ₂ <90% with oxygen supplement	0	SpO ₂ <90% with O ₂ supplement	0
Postoperative pain assessment			
No pain or mild discomfort	2		
Moderate to severe pain requires IV analgesics	1		
Persistent and severe pain	0		
Postoperative emetic symptoms			
None or mild nausea without active vomiting	2		
Transient nausea and vomiting or retching	1		
Persistent moderate or severe nausea and active vomiting	0		
MAP: Mean arterial pressure, BP: Blood pressure, IV: Intravenous			
*Adapted from the reference 4.			
A score >12 was considered to be eligible for fast tracking.			
**Adapted from the reference 9.			
A score >9 was considered to be eligible for the transfer from post-anesthesia care unit			

chi-square (χ^2) and Fisher's exact tests were used to test the difference in distributions of categorical variables between the groups. Normality of distribution for continuous variables was assessed with the Kolmogorov-Smirnov test. The distribution of the non-parametric variables in groups was assessed with the Mann-Whitney U test. A p value <0.05 was considered statistically significant.

Results

Medical records of 312 patients were analyzed. Sixty patients were excluded from the study due to the partially missing data (n=48), and to the loss to follow up (n=12). The remaining 252 patients were included in the analysis (Figure 1). There were 138 female and 114 male patients with a mean age of 46.2±9.8 years. Two groups were identified after matching the data regarding the fast track availability following surgery: the Fast Track group (group FT) included patients who were eligible for fast tracking and transferred from the OR to the ward. The

PACU group included patients who were not eligible for fast tracking and transferred from the OR to the PACU.

Primary outcome measures: Of a total 252 patients, more patients were found eligible for fast tracking: group FT (n=176, 69.8%) vs. group PACU (n=76, 31.2%), (p=0.012). The demographic characteristics were similar between the groups (p>0.05) (Table 3). The number and rate of patients who were discharged from the hospital in an outpatient basis (length of hospital stay <24 hours) were higher than those patients who were discharged after 24 hours after surgery [221 (87.7%) vs. 31 (12.3%), p=0.006]. The mean time to be discharged from the hospital (time to Post Anesthesia Discharge Scoring System score ≥9) was lower in the group FT compared to the group PACU (14.5±7.5 hours vs. 17.8±7.3 hours; p=0.009). The rate of patients who were discharged in <24 hours was not statistically different between the groups (88.1% vs. 86.8%; p=0.881) (Table 3).

Secondary outcome measures: When assessing factors which prevented fast tracking, it was found that postoperative

pain was the leading factor (42.1%). It is followed by unconsciousness (21.1%), hemodynamic instability (15.8%), postoperative nausea and vomiting (13.1%), and desaturation (7.9%), ($p=0.001$) (Table 4). The factors that prevented outpatient hospital discharge were as follows: pain (64.5%), PONV (29.0%), and hemodynamic instability (6.5%) ($p=0.001$, Table 4). Three patients in group FT and one patient in group PACU were readmitted after hospital discharge due to intractable pain (1.7% vs. 1.3%; $p=0.563$). There were no complications observed related to the surgical procedure.

Discussion

The results of this study demonstrated that the majority of lumbar discectomies (87.7%) could be performed in an

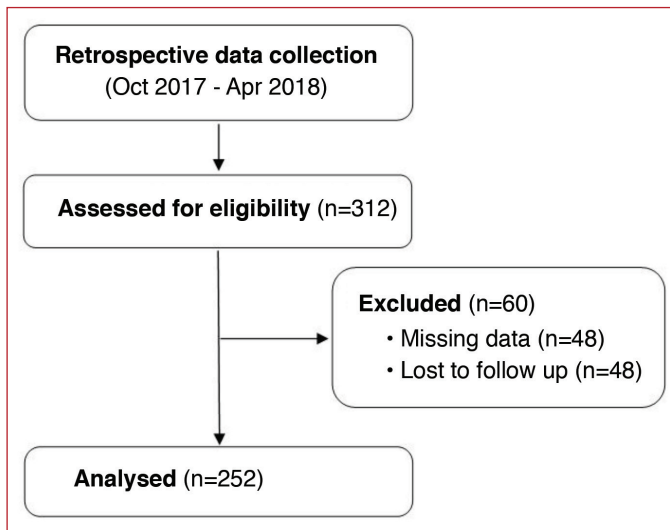


Figure 1. The study flow chart

outpatient basis with a PACU by-pass availability of 69.8% under GA. Numerous studies have reported that 49.9% to 99.8% of patients undergoing LD are discharged at the same-day of the surgery (11-13). Fast tracking provides earlier discharge from hospital as reported in many studies (1-8).

Since the first report by Lubarsky (14) in 1996, fast track anesthesia has been expanded in all types of surgeries. MAC, regional anesthesia, and GA using supraglottic airway devices have been frequently used in fast track anesthesia. The use of NMBAs for endotracheal intubation has limited fast tracking due to the residual neuromuscular block after the procedures. However, the introduction of anesthetics with a short duration of action has facilitated early recovery from GA in those procedures. We used a TIVA technique based on propofol and remifentanyl for the maintenance of anesthesia, a combination of a hypnotic with a short duration of action and an ultra-short acting opioid. It is well-known that interaction between propofol and remifentanyl results in decreased propofol doses required for anesthesia (15). Additionally, the use of sugammadex has made a big contribution to the early recovery from GA by rapid reversal of non-depolarizing neuromuscular blockade induced by rocuronium (6,7,16).

In this study, it was observed that the most important factor which prevented fast tracking was postoperative pain rather than unconsciousness and respiratory failure. Previous studies reported that 80% of patients suffered from acute postoperative pain after the spinal surgery and 80% of them described the pain as severe (17). Inadequate postoperative analgesia is associated with delayed recovery, ambulation and hospital discharge, excessive use of narcotic analgesics, increase of opioids-related side-effects, and development of chronic pain. MMA is considered to be the most effective method for

Table 2. Post Anesthetic Discharge Scoring System

Parameter	Score*
Vital signs	2=Lower than the 20% of preoperative value 1=Between 20% and 40% of preoperative value 0=Higher than the 40% preoperative value
Activity and mental status	2=Oriented and has a steady gait 1=Oriented or has a steady gait 0=Neither oriented nor has a steady gait
Pain, nausea and/or vomiting	2=None or minimal 1=Moderate, required treatment was given 0=Severe, requires treatment
Surgical bleeding	2=Minimal 1=Moderate 0=Severe
Intake and output	2=Has had oral intake of fluids and voided 1=Has had oral intake of fluids or voided 0=Neither oral intake nor voiding

MAP: Mean arterial pressure
*Adapted from the reference 10.
A score >9 was considered to be eligible for the hospital discharge

Table 3. Comparison of demographic characteristics and perioperative data between the groups

Parameters/Groups	Group FT (n=176)	Group PACU (n=76)	p*
Gender (female/male) (%)	55.7%/44.3%	52.6%/38.4%	0.750
Age (years)	41.2±11.1	43.4±12.3	0.272
ASA physical status (1/2) (%)	85.8%/14.2%	84.2%/15.8%	0.579
Body mass index (kgm ⁻²)	26.2±1.3	27.3±2.1	0.716
Duration of surgery (min)	135.2±15.0	131.9±12.8	0.251
Time to discharge from OR into ward (min)	7.8±2.5	31.3±2.9	0.001
Time to PADSS score ≥9 (hrs)	14.5±7.5	17.8±7.3	0.009
Hospital discharge time <24 hours (%)	88.1%	86.8%	0.881
Unanticipated hospital admission n, (%)	3 (3.4%)	1 (2.6%)	0.563

ASA: American Society of Anesthesiologists, OR: Operating room, PADSS: Post Anesthesia Discharge Scoring System, FT: Fast track, PACU: Post anesthesia care unit
 Values are presented as mean±standard deviation, numbers and/or proportion (n, %).
 *p<0.05 was considered as statistically significant

Table 4. The factors preventing fast tracking and hospital discharge in outpatient basis

	Pain	Unconscious-ness	Hemodynamic instability	PONV	Desaturation	p*
Fast tracking n, (%)	32 (42.1)	16 (21.1)	12 (15.8)	10 (13.1)	6 (7.9)	0.001
Hospital discharge n, (%)	20 (64.5)	0 (0.0)	2 (6.5)	9 (29.0)	0 (0.0)	0.001

PONV: Postoperative nausea and vomiting
 Values are presented as mean±standard deviation, numbers and/or proportion (n, %).
 *p<0.05 was considered as statistically significant

the treatment of postoperative pain. MMA combines analgesic medications and techniques targeting different mechanism and actions in the peripheral and/or central nervous system (18). Our MMA regimen consisted of three components: a) pre-emptive analgesia using non-steroidal anti-inflammatory drugs (NSAIDs), b) intraoperative administrations of NSAIDs and tramadol, a centrally acting synthetic opioid medication with a lower risk of respiratory depression, in combination with a local anesthetic wound infiltration, c) postoperative IV/oral NSAIDs and IV tramadol PCA. Pethidine was used only as rescue analgesic to minimize adverse effect. Many combinations of drugs and techniques were described, but there is a lack of evidence regarding optimal MMA after lumbar discectomy (17,18).

An interesting finding was the similar rate of same-day hospital discharge for both fast tracked and not fast tracked patients despite the reduced length of stay in FT group. It might be attributable to the use of different scoring systems for the assessment of fast tracking (White's Fast Track Scoring System) and for the hospital discharge (Post Anesthetic Discharge Scoring System). However, the factors which prevented both fast tracking and early hospital discharge were same in these scoring systems. We think that the treatments for pain and hemodynamic disturbances postponed the hospital discharge time beyond to 24 hours in both groups. In a study by Song et al. (19), it was reported that the time to discharge was shorter in the

fast track group, but the total numbers of nursing interventions and nursing hours were not different between the fast tracked and not fast tracked patients.

This study has several limitations. First, the retrospective nature of the study might have resulted in significant bias that affected the results. To prevent this disadvantage, we used the same criteria for inclusion and exclusion from the study during the data collection period. Data were obtained from multiple sources including anesthesia files, patient files, and electronic medical records to reduce recall bias. A single neurosurgeon performed all interventions. The patient files with insufficient data were excluded. Second, the lack of using bispectral index and monitoring of the neuromuscular junction compelled to adjust the dose of TIVA infusions according to the vital parameters rather than monitoring of the anesthetic depth (20,21). Another limitation was the exclusion of patients with obstructive sleep apnea and morbid obesity. Although recent studies have reported that those patients can be safely operated as outpatients, we still exclude them in the assessment for fast tracking to prevent further risks associated with the respiratory system (22,23).

Conclusion

In conclusion, lumbar discectomies can be performed in outpatient manner with fast track eligibility under GA when appropriate patient selection criteria with short-acting anesthetics

drugs are used. Postoperative pain has to be considered as one of the main factors impairing fast track eligibility and hospital discharge. Therefore, MMA regimens should be routinely implemented in ambulatory surgery.

Acknowledgement

The author thanks to Volkan Türkmen for his expertise in biostatistics.

Ethics

Ethics Committee Approval: The study was approved by the ethics committee of Gülhane Training and Research Hospital, Turkey (06/05/2018; 18/148).

Informed Consent: Retrospective study.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: M.Ö.Ö., Design: M.Ö.Ö., Data Collection or Processing: M.Ö.Ö., Analysis or Interpretation: C.Ç., B.A., M.A.S., U.G., Literature Search: M.B.E., Writing: M.Ö.Ö., B.A., M.A.S., U.G.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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