

Spinal anesthesia versus general anesthesia with a laryngeal mask airway in patients undergoing radiofrequency ablation for varicose veins

Variköz ven nedeniyle radyofrekans ablasyon yapılan hastalarda spinal anestezi ve larengal maske hava yolu ile genel anestezi karşılaştırması

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ABSTRACT

Background: This study aims to compare the efficacy of spinal anesthesia and general anesthesia with a laryngeal mask airway in patients undergoing radiofrequency ablation for varicose veins.

Methods: Between May 2012 and December 2016, a total of 2,999 patients (1,067 males, 1,932 females; mean age 43 years; range 19 to 70 years) who underwent radiofrequency ablation, removal of varices, and perforating vein ligation under general anesthesia with a laryngeal mask airway or spinal anesthesia were retrospectively analyzed. Data including duration of hospitalization, postoperative Visual Analog Scale (VAS) pain scores, patient satisfaction, nausea, vomiting, sore throat, headache, back pain, and urinary retention were recorded using medical records.

Results: Of the patients, 2,512 received general anesthesia with laryngeal mask airway and 487 received spinal anesthesia. The mean duration of hospitalization was 10.7 h in the general anesthesia group and 22.5 h in the spinal anesthesia group, indicating a significant difference ($p<0.001$). At one hour post-surgery, the mean pain scores were significantly higher in the general anesthesia group than in the spinal anesthesia group (1.7 ± 0.1 cm vs 0.1 ± 0.1 cm) ($p<0.001$). In the general anesthesia group, the patient satisfaction rate was significantly higher than in the spinal anesthesia group (97% vs 92%) ($p<0.001$). The incidence of vomiting was higher in the general anesthesia group, whereas the incidence of nausea, headache, and urinary retention was higher in the spinal anesthesia group ($p<0.001$, for all).

Conclusion: During radiofrequency ablation, laryngeal mask airway facilitates earlier hospital discharge with improved patient satisfaction than spinal anesthesia, but at the expense of such adverse effects as vomiting and sore throat. Spinal anesthesia is associated with less postoperative pain than general anesthesia via LMA, although it may cause nausea, headache, and urinary retention.

Keywords: Laryngeal mask airway; radiofrequency ablation; spinal anesthesia.

ÖZ

Amaç: Bu çalışmada variköz ven nedeniyle radyofrekans ablasyon yapılan hastalarda spinal anestezi ve larengal maske hava yolu ile genel anestezinin etkinliği karşılaştırıldı.

Çalışma planı: Mayıs 2012-Aralık 2016 tarihleri arasında larengal maske hava yolu ile genel anestezi veya spinal anestezi altında radyofrekans ablasyon, varislerin çıkarılması ve perforan ven bağlanması yapılan toplam 2999 hasta (1067 erkek, 1932 kadın; ort. yaş 43 yıl; dağılım 19-70 yıl) retrospektif olarak incelendi. Hastanede yatış süresi, ameliyat sonrası Görsel Analog Ölçeği (GAÖ) skorları, hasta memnuniyeti, bulantı, kusma, boğaz ağrısı, baş ağrısı, sırt ağrısı ve üriner retansiyon dahil olmak üzere tıbbi kayıtlar kullanılarak veriler kaydedildi.

Bulgular: Hastaların 2512'sine larengal maske hava yolu ile genel anestezi ve 487'sine spinal anestezi uygulandı. Ortalama hastanede yatış süresi genel anestezi grubunda 10.7 saat ve spinal anestezi grubunda 22.5 saat idi ve bu fark istatistiksel olarak anlamlı idi ($p<0.001$). Ameliyat sonrası birinci saatteki ağrı skorları spinal anestezi grubuna kıyasla genel anestezi grubunda daha yüksekti (0.1 ± 0.1 cm'ye kıyasla 1.7 ± 0.1 cm) ($p<0.001$). Hasta memnuniyeti genel anestezi grubunda, spinal anestezi grubuna kıyasla, daha yüksekti (%92'ye kıyasla %97) ($p<0.001$). Kusma insidansı genel anestezi grubunda yüksek iken, bulantı, baş ağrısı ve üriner retansiyon insidansı spinal anestezi grubunda daha yüksek idi (tümü için $p<0.001$).

Sonuç: Radyofrekans ablasyon sırasında larengal maske hava yolu, spinal anesteziye kıyasla, hastaların erken taburcu olmasını sağlar ve hasta memnuniyetini artırır; ancak kusma ve boğaz ağrısı gibi yan etkiler görülebilir. Spinal anestezi ameliyat sonrası ağrının azalması ile larengal maske hava yolu ile genel anesteziye daha ilişkili olmasına karşın, bulantı, baş ağrısı ve üriner retansiyona neden olabilir.

Anahtar sözcükler: Larengal maske hava yolu; radyofrekans ablasyon; spinal anestezi.



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In the past, management of varicose veins consisted of several surgical procedures such as ligation, division of the trunk, stripping, and phlebectomy.^[1,2] Compared to these invasive surgical interventions, modern endovenous techniques, such as endovenous laser therapy, radiofrequency ablation, and endovenous foam sclerotherapy, are more effective and associated with lower complication rates.^[1-4] Nevertheless, while performing these endovenous techniques, patients still experience pain for which effective anesthesia is needed. Endovenous procedures are performed in the outpatient setting, and patients are discharged on the same day of the procedure; therefore, the method of anesthesia must also be suitable for the outpatient protocols. Appropriate anesthesia techniques include general anesthesia with a laryngeal mask airway (LMA), spinal anesthesia, epidural anesthesia, femoral nerve block, and tumescent local anesthesia.^[5-8]

The key components of anesthesia for outpatient procedures are the use of short-acting anesthetic agents and rapid patient recovery. Outpatient procedures are usually performed under general anesthesia, sedation, or regional anesthesia. Among these methods, general anesthesia can be administered via LMA. Its advantages over endotracheal intubation include the preservation of spontaneous breathing and the lack of the need for muscle relaxants. As these agents are not administered when using LMA, their prolonged effects are not seen during recovery.^[9] As endovenous interventions performed for the lower extremities do not require muscle relaxants, LMA is an appropriate method for such procedures.

Spinal anesthesia with hyperbaric local anesthetics administered with patients in the sitting position ensures adequate anesthesia for lower extremity surgery. Low-dose bupivacaine provides effective anesthesia with a low risk of adverse effects.^[6] As endovascular techniques have recently been introduced for the treatment of varices, data on the administration and efficacy of general anesthesia with a LMA versus spinal anesthesia are still limited. In the present study, therefore, we aimed to compare the efficacy of general anesthesia with a LMA and spinal anesthesia during radiofrequency ablation for varicose veins.

PATIENTS AND METHODS

This retrospective cohort study included patients with varicose veins treated using radiofrequency ablation. The medical records of patients who were treated due to varicose veins at Ankara Numune Training and Research Hospital, Department of Cardiovascular Surgery, Ankara, Turkey, between 1 May 2012 and

31 December 2016 were retrospectively reviewed after the ethical approval of the protocol. The study was conducted in accordance with the principles of the Declaration of Helsinki.

All patients who were administered general anesthesia with a LMA or spinal anesthesia for radiofrequency ablation, removal of varices, and perforating vein ligation were included in the study. However, the patients who underwent endovenous radiofrequency ablation for both legs were excluded. Since our hospital is a tertiary research and training hospital, the patients who attend or are referred to our clinic had serious pathologies (for all patients included in our study, Comprehensive Classification System for Chronic Venous Disorders (CEAP) classification of severity of varicose veins ≥ 3) with a high number of truncal varicose veins and high rate of recurrent veins.

Methods of anesthesia were explained to the patients and the preferences of the patients were considered. If there was any contraindication for the anesthesia method, another alternative was considered. Patients with incomplete data and those who underwent tumescent local anesthesia were also excluded from the study.

Spinal anesthesia and general anesthesia with a LMA were performed by a single anesthesiologist. The patients admitted to the operating room for general anesthesia with a LMA were monitored through electrocardiography (ECG), peripheral arterial oxygen saturation, and noninvasive arterial blood pressure. Venous access was achieved from the dorsum of the hand using a 20-G cannula through which NaCl 0.9% infusion was initiated. Induction of anesthesia was established via administration of midazolam 0.025 mg/kg⁻¹, fentanyl 1 μ g/kg⁻¹, and propofol 2 mg/kg⁻¹. Upon the loss of eyelash reflex, an appropriately-sized (3, 4, or 5) LMA Classic™ was inserted. Maintenance anesthesia was administered using nitrous oxide (60%), oxygen (40%), and sevoflurane (1.5-2.0%). After the surgical procedure was completed, anesthesia was terminated and the patients were taken to the cardiovascular surgery recovery room. All patients were monitored and were sent to the cardiovascular surgery recovery room ward, once the Aldrete recovery score was 9.^[10]

Patients admitted to the operating room for spinal anesthesia were monitored in a standard fashion. Venous access was achieved from the dorsum of the hand through which NaCl 0.9% infusion was initiated. Spinal anesthesia was administered with patients in the sitting position using hyperbaric bupivacaine 0.5% 2 mL (Marcaine Spinal Heavy, Astra, Sweden) from

Table 1. Baseline patient characteristics

	General anesthesia group (n=2512)			Spinal anesthesia group (n=487)			<i>p</i>
	n	%	Mean±SEM	n	%	Mean±SEM	
Age (year)			44.1±0.2			40.6±0.6	<0.001
Gender							<0.001
Male	814	32.6		253	52.0		
Female	1686	67.4		234	48.0		
ASA classification scores							<0.001
I	1510	60.1		348	71.5		
II	983	39.1		139	28.5		
III	19	0.8		0	0.0		

LMA: Laryngeal mask airway; SEM: Standard error of mean; ASA: American Society of Anesthesiologists.

the L3-L4 or L4-L5 intervertebral space using a 25-G Quinke needle under aseptic conditions.

Data including age, gender, the American Society of Anesthesiologists (ASA) classification scores, anesthesia method, duration in the operation room, duration of surgery, duration of the radiofrequency ablation procedure, duration of the spinal anesthesia procedure, duration of hospitalization, postoperative Visual Analog Scale (VAS) pain scores (cm), and patient satisfaction were recorded using the medical records. Procedure-related adverse effects such as nausea, vomiting, sore throat, headache, back pain, and urinary retention were also recorded.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows version 20.0 (IBM Corp., Armonk, NY, USA). The normality of the distribution of the data set was analyzed using the Shapiro-Wilk test. Even if the normality assumption was not satisfied, the t-test was used to compare the two patient groups, as each group included a sufficient number of patients. Homogeneity of variance between the groups was examined using the Levene's test. Data were expressed in mean ± standard error of mean (SEM) for continuous variables, and frequency (percentage) for categorical variables. The Pearson's chi-square test was performed to compare categorical variables. A two-sided *p* value of <0.05 was considered statistically significant.

RESULTS

Of a total of 2,999 patients, 2,512 underwent general anesthesia with a LMA and 487 underwent spinal anesthesia. Baseline characteristics of the patients are presented in Table 1.

The general anesthesia and spinal anesthesia groups differed significantly in terms of age and gender; a higher number of the patients in the general anesthesia group were older and female. Both groups included more ASA I patients. In the general anesthesia group, 19 patients were ASA III, while none of the patients in the spinal anesthesia group were ASA III. The mean duration of hospitalization in the general anesthesia group was 10.7 h and 22.5 h in the spinal anesthesia group, indicating a significant difference (*p*<0.001). The mean duration in the operation room was 43.9±0.4 min in the spinal anesthesia group and 45.2±0.2 min in the general anesthesia group, indicating a significant difference (*p*<0.01). Duration of surgery in the general anesthesia group (28.1±0.2 min) was significantly higher than in the spinal anesthesia group (26.5±0.3 min) (*p*<0.001). At one hour post-surgery, the mean VAS pain scores were significantly higher in the general anesthesia group (1.7±0.1 cm) than in the spinal anesthesia group (0.1±0.1 cm) (*p*<0.001) (Table 2). Despite a high rate in both groups, the patient satisfaction with anesthesia rate was significantly higher in the general anesthesia group than in spinal anesthesia group (97% vs 92%) (*p*<0.001) (Table 2). The incidence of vomiting was significantly higher in the general anesthesia group than in the spinal anesthesia group (*p*<0.001), and sore throat was observed only in the general anesthesia group. However, the incidence of nausea, headache, and urinary retention was significantly higher in the spinal anesthesia group (*p*<0.001, for all) (Table 2).

All patients underwent concomitant phlebectomy (4.6±3.2 phlebectomy incisions per patient) and surgical ligation of perforator veins (2.5±1.8 ligations per patient). There was no significant difference in terms of preoperative CEAP class between the groups.

Table 2. Perioperative findings in the general anesthesia group and spinal anesthesia groups

	General anesthesia group			Spinal anesthesia group			<i>p</i>
	n	%	Mean±SEM	n	%	Mean±SEM	
Duration in the operating room (min)			45.2±0.2			43.9±0.4	<0.01
Surgery time (min)			28.1±0.2			26.5±0.3	<0.001
Duration of spinal anesthesia procedure (min)						15.3±0.2	
Duration of hospitalization (h)			10.7±0.0			22.5±0.1	<0.001
Postoperative VAS pain score (cm)							
At 1 h			1.7±0.0			0.1±0.0	<0.001
At 4 h			0.9±0.0			0.8±0.0	0.072
Patient satisfaction with anesthesia technique							
Yes	2457	97		450	92.4		<0.001
No	55	2.2		37	7.6		
Nausea	625	24.9		846	45.4		<0.001
Vomiting	301	12.0		1	0.2		<0.001
Sore throat	148	5.9		0	0		<0.001
Headache	220	8.8		331	22.8		<0.001
Back pain	42	1.7		10	2.1		0.555
Urinary retention	15	0.6		69	14.1		<0.001

SEM: Standard error of mean.

DISCUSSION

The present study compared two methods of anesthesia administered for radiofrequency ablation therapy of varicose veins and found that duration of hospitalization was shorter in the patients who received general anesthesia with a LMA. The patient's preferences and physiological status also influenced which anesthetic method was applied. A total of 84% of the patients underwent general anesthesia with a LMA and 16% received spinal anesthesia. The length of stay at the hospital was two-times longer in the spinal anesthesia group than general anesthesia with a LMA. It is desirable for patients undergoing minor surgery, particularly those of short duration and minimal injury, to remain in hospital for as short a period of time as possible. In addition, rapid recovery from surgery is important for such patients. If anesthesia is administered in this case, it is preferable to minimize its prolonged effects and complications, which can facilitate a rapid return to full functionality needed for normal daily activities. General anesthesia with a LMA is used for short surgical procedures not associated with the need for muscle relaxants. General anesthesia with a LMA without muscle relaxants offers both rapid induction of anesthesia and improved recovery, resulting in minimal duration of hospitalization.^[9] Airway morbidities occur less often with general anesthesia with a LMA, compared to endotracheal intubation.^[9,11] Duration of hospitalization was investigated in a study which compared general anesthesia with a LMA and spinal

anesthesia in patients undergoing inguinal hernia repair. In a study, the mean duration of hospitalization was 261.7 min (range 223 to 293 min) in the general anesthesia group vs 285.4 min (range 251 to 317 min) in the spinal anesthesia group.^[12] Consistent with this finding, duration of hospitalization was shorter in our study in the general anesthesia group. It is also possible that the mean duration in the operating room was longer in the general anesthesia group due to the time needed to wait for the resolution of the effects of sevoflurane and nitrous oxide, which were used as the inhalation anesthetics for maintenance anesthesia. As no hypnotic agent was used in the spinal anesthesia group, the patients left the operating room as soon as the surgeon completed the radiofrequency ablation procedure and were followed in a specially-designed room to observe the resolution of the spinal block.

Radiofrequency ablation of varices is a minimally invasive technique,^[13] for which general anesthesia may not be required;^[14] however, this is only possible for uncomplicated and ablation-only cases. Indeed, radiofrequency ablation treatment for varices is a painful procedure, for which anesthesia improves the patient comfort.^[15] Radiofrequency ablation is performed under tumescent anesthesia in some hospitals.^[16,17] Our patients underwent perforating vein ligation and removal of varices, in addition to radiofrequency ablation. The administration of general or spinal anesthesia was chosen over tumescent anesthesia, as tumescent anesthesia requires multiple

injections for local anesthesia and was not appropriate for most of our patients. At one hour post-surgery VAS pain scores were significantly higher in the general anesthesia group than in the spinal anesthesia group. Similarly, a study which compared spinal and general anesthesia for laparoscopic total extraperitoneal inguinal hernia repair reported that VAS pain scores were 4.8 ± 0.8 cm and 0.2 ± 0.4 cm at one hour post-surgery in patients who underwent general and spinal anesthesia, respectively ($p < 0.001$).^[12] In the same study, spinal anesthesia was shown to be associated with less need for use of analgesics during the postoperative period, as compared to general anesthesia via LMA.

A study which compared general anesthesia via LMA, spinal, and epidural anesthesia in patients undergoing knee arthroplasty surgery showed that 12 of 16 patients in the general anesthesia via LMA and epidural anesthesia groups were very satisfied with their anesthesia, compared to eight patients in the spinal anesthesia group who were very satisfied.^[18] Similarly, patient satisfaction with the anesthetic technique was higher in our general anesthesia group than in the spinal anesthesia group. The aforementioned study^[18] also reported a higher incidence of headache and urinary retention in the patients who received spinal anesthesia, consistent with our study findings which showed higher incidences of headache and urinary retention in the spinal anesthesia group than the general anesthesia group. In addition, the higher rate of the patient satisfaction in the general anesthesia group in our study might have been due to the lower prevalence of adverse effects.

Furthermore, radiofrequency ablation can be performed with tumescent anesthesia. However, many of our patients were painful, due to the excision of many varicose veins. This procedure was unable to be done with local anesthesia. We discharged the patients who underwent general anesthesia via LMA for a mean duration of 11 hours, although we did not discharge others who underwent spinal anesthesia to monitor side effects of spinal anesthesia. Spinal anesthesia can lead to headache due to dural puncture.^[18] At the postoperative period, in patients undergoing spinal anesthesia, return of the central block is important. Supportive care with analgesics, fluid replacement, and bed rest is routinely applied in our clinic.

On the other hand, the retrospective design of the present study is the main limitation. There is a clear need for further large-scale, prospective, randomized clinical trials comparing anesthetic methods for radiofrequency ablation treatment.

In conclusion, general anesthesia with a laryngeal mask airway for radiofrequency ablation treatment decreases duration of hospitalization, promoting early discharge, and improved patient satisfaction. Nevertheless, adverse effects associated with a laryngeal mask airway, such as vomiting and sore throat, should be considered. Of note, spinal anesthesia decreases postoperative pain, but at the expense of a higher incidence of nausea, headache, and urinary retention.

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