

# Pogostost zgodnjih pooperativnih zapletov po spinalni anesteziji

## The incidence of early postoperative complications after spinal anaesthesia

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### Izvleček

**Namen:** Spinalna anestezija je učinkovita metoda področne anestezije. Namen raziskave je bil zbrati podatke o pogostosti zgodnjih pooperativnih zapletov po spinalni anesteziji v UKC Maribor. Proučevali smo vpliv spola, starosti in števila poskusov vstavljanja spinalne igle na pogostost zgodnjih zapletov.

**Metode:** V raziskavo smo vključili 90 bolnikov, ki so v spinalni anesteziji prestali operativni poseg na spodnjih okončinah. 24–72 ur po operaciji smo v obliki vprašalnika zbrali podatke o zgodnjih pooperativnih zapletih, zbirali pa smo tudi podatke o tehničnih težavah, povezanih s spinalno punkcijo.

**Rezultati:** Med 90-imi bolniki jih 23 (25,5 %) ni navajalo nikakršnih zapletov. Najpogostejša zapleta sta bila mravljinčenje v spodnjih okončinah (43 %) in slabost (31 %). Bolečina v hrbtu je bila prisotna pri 21 % bolnikov, glavobol pri 18 %, vrtogla-

### Abstract

**Purpose:** The purpose of our study was to gather data about the incidence of early post-operative complications after spinal anaesthesia at the University Medical Centre Maribor. We were interested in the impact of gender, age, and a number of attempts to insert the spinal needle on the incidence of these complications.

**Methods.** We studied 90 patients who underwent a surgical procedure involving the lower extremities under spinal anaesthesia. Twenty-four to 72 hours after spinal anaesthesia, we collected data about early complications from a questionnaire and data about technical difficulties associated with the spinal puncture.

**Results.** Among 90 patients, 23 (25.5 %) reported no complications. The most common complication was tingling in the lower extremities (43 %) and nausea (31 %). Back pain was present in 21 % of patients, 18 % had headaches, 19 % had vertigo, and 13

vica pri 19 %, dvojni vid pri 13 %. Glavobol, dvojni vid in vrtoglavica so bili pogostejši pri ženskem, bolečina v hrbtu pa pri moškem spolu. Pojavnost zapletov je naraščala s starostjo, še posebej dvojni vid, bruhanje in vrtoglavica. Višja pojavnost zapletov je bila pri tistih, kjer je za doseganje učinkovite spinalne punkcije spinalna igla bila vstavljena tri- ali večkrat.

**Zaključek:** Študija kaže, da se zgodnji pooperativni zapleti po spinalni anesteziji pogosteje pojavljajo pri ženskem spolu in pri bolnikih, starejših od 55 let. Večina bolnikov je tožila za mravljinčenjem v spodnjih okončinah, vrtoglavico in slabostjo. Pogostost poznih zapletov je bila višja pri bolnikih, pri katerih je bila za učinkovito spinalno punkcijo igla vstavljena tri- ali večkrat.

% had double vision. Headache, diplopia, and dizziness were more common in women, while backache was more common in men. There was a tendency towards an increase in the incidence of complications with age, especially diplopia, vomiting, and dizziness. The incidence of complications was also higher in patients requiring > 3 attempts for effective spinal puncture

**Conclusion.** Our study showed that complications after spinal anaesthesia occur more often in female patients and in patients > 55 years of age. The most common complications were tingling in the lower extremities, dizziness, and nausea. The incidence of complications was higher in patients requiring > 3 attempts for effective spinal puncture.

## INTRODUCTION

Spinal anaesthesia is an effective regional anaesthesia technique, commonly used for operative procedures on the lower extremities. Regional anaesthesia is associated with complications arising intra-operatively or in the early post-operative period. The most important complications of spinal anaesthesia occur early after the anaesthetic block is established and during surgery usually include an incomplete block, a very high block, haemodynamic consequences of the sympathetic block (hypotension and bradycardia), and difficulties with breathing due to a very high motor block affecting the intercostal nerves or the phrenic nerve (1). The most frequent early post-operative complications following subarachnoid anaesthesia occurring during the first and second post-operative days are headaches, diplopia, photophobia, dizziness with tinnitus and partial hearing loss, nausea, vomiting, rigid neck, lumbago, tingling in the lower extremities, and urinary retention (2,3). The incidence of early post-operative complications after spinal anaesthesia is an important parameter determining the quality of anaesthesia care in every institution; however, reliable data are difficult to obtain. There is no published data on the incidence of early post-operative complications after spinal anaesthesia in Slovenia. The data involv-

ing the parameters influencing the incidence of early post-operative complications after spinal anaesthesia are also incomplete.

The purpose of our study was to gather data about the incidence of early post-operative complications after spinal anaesthesia at the University Medical Centre Maribor. We were interested in the impact of gender, age, and number of attempts at spinal needle insertion on the incidence of early post-operative complications.

## PATIENTS AND METHODS

A prospective study was conducted from 1 February through 30 April 2015 in the Department of Traumatology and Department of Orthopaedic Surgery of the University Medical Centre Maribor. After obtaining approval by the Medical Ethics Committee of the University Medical Centre Maribor, we studied 90 patients who underwent surgery under spinal anaesthesia due to degenerative changes or injuries involving the lower extremities. Patients were informed about the purpose of the research and written consent was obtained from each patient.

During the study, we collected data from patients about demographic parameters, chronic diseases, and prescribed medications.

Data on spinal anaesthesia and early post-operative complications were gathered via a two-part survey. Part one included data on the technical performance of spinal anaesthesia and was completed by the anaesthesiologist administering the spinal anaesthesia. Part two included data on early post-operative complications and was completed during a personal discussion with the patients. Communication with the patients took place in the surgical departments between 24 and 72 hours after the surgical procedure. During the conversation all patients received a thorough explanation of any complication which occurred.

#### Questionnaire for anaesthesiologists

Data collected from the anaesthesiologist included the height of the location of spinal anaesthesia, thickness of the spinal needle, number of attempts of needle insertions, and form and dosage of the local anaesthetic used.

#### Questionnaire for patients

Data collected from the patients about early post-operative complications after spinal anaesthesia included headaches, double vision, photophobia, nausea, vomiting, dizziness, tinnitus, hearing loss, neck stiffness, back pain, tingling in the lower extremities, and difficulties urinating or defecating. We were also interested in the return of contractile detrusor function after spinal anaesthesia, thus we collected data

on the time of the first urinary output after surgery. We examined the differences in occurrence of early post-operative complications after spinal anaesthesia between males and females, various age groups, and the effect of the number of spinal needle insertion attempts. We also examined the differences in the rate of complications among healthy patients compared to patients with chronic diseases, and whether or not the frequency of complications correlated among patients with one or more chronic diseases.

#### Statistical methods

Individual groups of examined patients were compared with respect to the surveyed variables; possible differences among the patients were established. Statistical analysis of data was carried out using SPSS 17 (SPSS, Inc., Chicago, IL, USA). Variables are presented as real values, percentages (%), and mean values with standard deviation ( $\pm$  SD). The differences between groups were tested with a  $\chi^2$  test and two-sided Student's t-test. A  $P < 0.05$  was taken as a margin for statistical significance.

## RESULTS

We studied 90 patients (42 women and 48 men). The demographic data of patients, the accompanying diseases, and the region of surgery are shown in Table 1. The average age of patients was  $53 \pm 18$  years (range, 18–92 years). The most common accompanying diseases in our group of patients were hypertension (29 %), dyslipidaemia (14 %), and diabetes (10 %). Patients were operated on the lower extremities,

**Table 1.** Demographic data, accompanying diseases, and the surgical procedures of the study population (F=female, M=male, COPB=chronic obstructive pulmonary disease)

Demography	N=90	Disease	N (%)	Surgery	N (%)
Gender F/M	42 / 48	Hypertension	26 (29%)	Knee	58 (64%)
Age (y)	$53 \pm 18$	Dyslipidaemia	13 (14%)	Hip	25 (28%)
Height (m)	$1.7 \pm 0.1$	Diabetes	9 (10%)	Ankle	6 (7%)
Weight (kg)	$80 \pm 15$	Glaucoma	3 (3%)	Heel	1 (1%)
		COPD	2 (2%)		
		Osteoporosis	1 (1%)		
		Rheumatoid arthritis	1 (1%)		

Data are the number of patients (%) or mean  $\pm$  SD

**Table 2.** The incidence of complications after spinal anaesthesia and the impact of gender, age, and the number of spinal puncture attempts (A2 = 1 or 2 spinal puncture attempts, A3 = 3 or more spinal puncture attempts)

Complications	GENDER		AGE			Puncture attempts		Total (%)
	Female N=42	Male N=48	<46 Y N=31	46-65 Y N=36	>65 Y N=23	A2 N = 79	A3 N=11	
Headache	11 (26%)	5 (10%)	4 (13%)	8 (22%)	4 (17%)	12 (15%)	4 (36%)	16 (18%)
Diplopia	8 (19%)	4 (8%)	1 (3%)	4 (11%)	7 (30%)*	11 (14%)	1 (9%)	12 (13%)
Photophobia	2 (5%)	1 (2%)	1 (3%)	1 (3%)	1 (4%)	3 (4%)	0 (0%)	3 (3%)
Nausea	14 (33%)	14 (29%)	11 (35%)	10 (28%)	7 (30%)	23 (29%)	5 (46%)	28 (31%)
Vomiting	8 (19%)	5 (10%)	3 (10%)	2 (6%)	6 (26%)	9 (11%)	4 (36%)	13 (14%)
Dizziness, tinnitus, hearing loss	13 (31%)	4 (8%) *	3 (10%)	6 (17%)	8 (35%)	16 (20%)	1 (9%)	17 (19%)
Stiff neck	2 (5%)	0 (0%)	1 (3%)	1 (3%)	0 (0%)	2 (3%)	0 (0%)	2 (2%)
Backache	6 (14%)	13 (27%)	6 (19%)	6 (17%)	5 (22%)	18 (23%)	1 (9%)	19 (21%)
Tingling	17 (40%)	22 (46%)	17 (55%)	14 (39%)	8 (35%)	36 (46%)	3 (27%)	39 (43%)
None	9 (21%)	14 (29%)	13 (42%)	8 (22%)	2 (9%)*	21 (27%)	2 (18%)	23 (26%)

Data are the number of patients (%); \*= statistically significant ( $p < 0.05$ )

predominantly for knee (64 %) and hip surgery (28 %); 6 patients (7 %) underwent ankle surgery and 1 patient had heel surgery.

In all patients, spinal anaesthesia was introduced in the L3-L4 interspace with a 25-G Sprotte spinal needle. The local anaesthetic was bupivacaine or levobupivacaine.

The incidence of early post-operative complications after spinal anaesthesia is shown in Table 2. Twenty-three (26 %) patients reported no complications after spinal anaesthesia and surgery. Among 67 patients reporting complications, the most common complications were tingling in the lower extremities (43 %),

nausea (31 %), backache (21 %), headache (18 %), and dizziness (19 %). Of 17 (19 %) patients reporting dizziness, 12 (13 %) also experienced double vision.

Table 2 presents the impact of gender on the incidence of complications. The incidence of complications was higher in women compared to men. No complications were reported in 21 % of women and 29 % of men. The more common complications in women were headaches (women, 26 %; men, 10 %), diplopia (women, 19 %; men, 8 %), and dizziness (women, 31 %; men, 8 %); however, statistical significance was only achieved regarding the difference in the incidence of dizziness with tinnitus and hearing loss. The only complication that was more common

**Table 3.** Impact of age on the time to first urination and the number of catheterizations after spinal anaesthesia

Age group	Number of patients	Time to urination (h)	Catheterisation (N)
18 – 30 years	16	6.3 ± 2.5	0
31 – 45 years	15	7.9 ± 4.6	0
46 – 55 years	14	5.3 ± 2.1	1
56 – 65 years	22	6.0 ± 2.3	1
66 – 92 years	23	7.0 ± 4.6	3

Data are the mean ( $\pm$ SD) or number of patients.

in men was backache (men, 27 %; women, 14 %), but the difference was not statistically significant.

The impact of age on the incidence of complications is also shown Table 2. The total number of patients developing no complications was significantly higher in the younger group of patients. The complications more common with increased age were diplopia, vomiting, and dizziness (Table 2), but only the increase in the incidence of diplopia with age was statistically significant. By observing the total number of complications, we registered 23 complications in 14 patients between 46 and 55 years of age, 25 complications in 24 patients between 56 and 65 years of age, and 46 complications in 23 patients > 65 years of age.

Table 2 also shows the impact of the number of spinal puncture attempts on the incidence of complications. In 79 patients 1 or 2 attempts were required for spinal anaesthesia and in 11 patients > 3 attempts were required. The complications occurring more commonly in the group of patients who needed > 3 attempts for spinal anaesthesia were headaches (36 % vs. 15 %), nausea (46 % vs. 29 %), and vomiting (36 % vs. 11 %); these differences were not statistically significant. In contrast, the incidence of dizziness with tinnitus and hearing loss was higher in the group needing < 2 attempts (20 % vs. 9 %) as was the incidence of

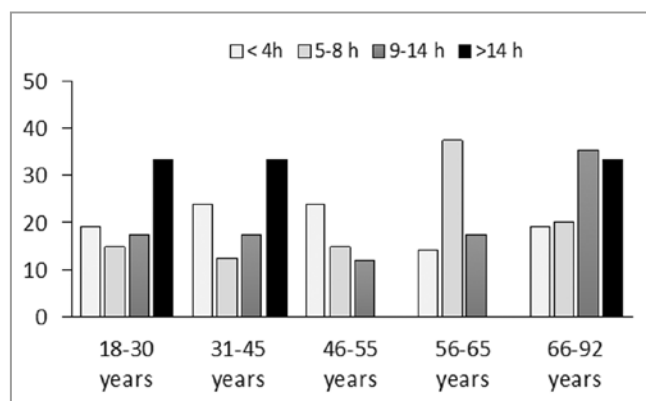
tingling in the lower extremities (46 % vs. 27 %). The difference in the incidence of dizziness was statistically significant.

The impact of age on the effect of spinal anaesthesia on the time needed for the first urinary output is shown in Table 3 and Figure 1. The time to first urinary output was slightly prolonged in the age group between 31 and 45 years of age in comparison to other groups, but the differences were not statistically significant (Table 3). In Figure 1 we can see that in the groups between 46 and 65 years of age, all of the patients needed < 14 hours for the first urinary output after spinal anaesthesia. In the age groups < 46 and > 65 years of age, approximately one-third of the patients needed > 14 hours for the first urinary output after spinal anaesthesia.

## DISCUSSION

In this study, we evaluated the incidence of early post-operative complications after spinal anaesthesia in patients undergoing trauma or orthopaedic surgery on the lower extremities under spinal anaesthesia. The overall incidence of early post-operative complications was 76 % and was higher in women in comparison to men. Headaches, diplopia, and dizziness were more common in women, while backaches were more common in men. There was a tendency towards an increase in the incidence of complications with age, especially diplopia, vomiting, and dizziness.

The overall incidence of complications after spinal anaesthesia varies considerably in the literature. Tarkilla and Kukinem (2) reported an incidence of complications after spinal anaesthesia as low as 24 %. The difference in the complication rate in our study can be explained by the design of the study. In our study, the symptoms of complications were collected during a personal interview with the patient, and any possible symptoms were actively searched. Therefore, it is likely that the symptoms associated with complications occurred more often than usually reported. Nearly all of the described symptoms occurred in patients > 55 years of age, except tingling in the lower



**Figure 1.** Percentage of patients with a return of urinary function in specified time intervals with respect to the age group of the patients (<4h - less than 4 hours to first urine output, 5-8h - 5-8 hours to first urine output, 9-14h - 9-14 hours to first urine output, >14h - more than 14 hours to first urine output)

extremities, which was more common in younger people. Diplopia and dizziness were increased in proportion with age.

Headache is a well-known complication after puncture of the spinal space due to diagnostic spinal puncture, myelography, spinal anaesthesia, or an unintentional puncture of the dura. A common characteristic of this type of headache is its dependence on body position; pain worsens in the sitting or standing position and improves or wears off in the lying position. Headaches usually appear between 12 and 72 hours after the procedure. A headache is not life-threatening, but represents a considerable and long-term limitation of daily activities. In our study, post-operative headache occurred in 18 % of patients, 69 % of whom were females. The incidence of post-dural puncture headache in the literature varies widely. Stein and Tovell (3), Lybecker et al. (4), and Lamacraft (5) reported that the occurrence of post-operative headaches is 20 %, 7.4 %, and 70 %, respectively. As reported by Gaiser (6), the incidence of post-operative headaches is higher when the dura is punctured accidentally (approximately 50 %).

Sixth nerve palsies occurring after spinal anaesthesia are a rare and reversible complication of dural puncture. Diplopia affected 13 % of the patients included in the current study. Nishio and co-workers (7) reported an incidence of 1/400–1/8000. It is important to mention that diplopia was reported in the three patients in our study who were treated for glaucoma. In this group of patients, the occurrence of double vision could have been caused by increased intraocular pressure.

Photophobia affected a minority of patients (3 %). Sprigge and Harper (8) reported a higher occurrence of photosensitivity in cases of accidental dura puncture (29 %). Hariharan (9) reported photophobia to be the most common symptom accompanying a post-dural puncture headache.

In the current study, 31 % of patients had nausea and 14 % had vomiting after spinal anaesthesia. A much lower incidence of these complications (nausea, 18 %;

and vomiting, 7 %) was reported by Carpenter and co-workers (10).

Nineteen percent of patients complained of dizziness, tinnitus, and hearing problems, while the incidence of these complications was significantly higher in females. According to Cosar and co-workers (11), the incidence of these complications was approximately 26.8 % of the patients.

An incision and subsequent penetration of a subarachnoid needle through the skin, subcutaneous tissue, muscles, and tendons can cause back pain. This type of pain is usually mild and wears off spontaneously, but can last up to a few weeks. At the same time, back pain can represent a clinically important manifestation of a more serious complication, such as an epidural haematoma or abscess. Back pain is a common complication of spinal anaesthesia. Schwabe and Hopf (12) estimate the occurrence of back pain to be approximately 10.7 %, while Smith and Gürtner (13) estimate back pain to be approximately 13.1 %. Based on our research, back pain occurred in 21 % of patients.

Tingling affected 43 % of the patients, which corresponds to the 37 % incidence in patients from Hample and co-workers (14).

In the current study, spinal anaesthesia was performed with a 25-G Sprotte spinal needle in all patients, so the effect of the needle thickness on the incidence of complications was not studied. It is well-known that the incidence of headaches is much higher if thicker needles are used for puncture (15). In the group of patients where more attempts were required for effective spinal anaesthesia, late complications occurred more frequently. In cases in which > 3 spinal needle insertions were attempted, complications occurred in 81 % of patients, the most common being headaches with accompanying nausea and vomiting.

Blockade of S2 – S4 roots decreases the urinary bladder tone and slows the urination reflex. The effect is more prominent in males, which is why it is recommended to insert a urinary catheter when a long-

lasting effect of a local anaesthetic is anticipated. In the case of a long-lasting inability to urinate (a few hours after spinal anaesthesia), the quantity of urine surpasses the bladder capacity, which leads to an acute post-operative bladder increment. Patients can feel pain and tension in the abdomen; catheterization is required in such circumstances. Dutta (16) reported a 38 % incidence of urinary retention after spinal anaesthesia. In the current study the average time of urination after spinal anaesthesia was  $6.7 \pm 3.6$  hours (between 1.5 and 23.5 hours), which corresponds with Zanfini and co-workers (17), who re-

ported an average time to the first urinary output of  $6.3 \pm 1.6$  hours (between 4 and 8 hours).

## CONCLUSION

In conclusion, our study showed that early post-operative complications after spinal anaesthesia occur more often in female patients and in patients > 55 years of age. Most patients complained of tingling sensations in the lower extremities, dizziness, and nausea. The incidence of late complications was higher in patients requiring > 3 attempts for effective spinal puncture.

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