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Discharge times for knee arthroscopy in spinal vs. general anesthesia

Research Article

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Abstract: Background. Spinal anesthesia (SPA) and general anesthesia (GA) are both safe techniques for knee arthroscopy. In this prospective, single-centre, randomised, clinical trial we compared the discharge times of SPA using 50mg hyperbaric prilocaine 2% and GA with propofol and sufentanil in patients undergoing ambulatory knee arthroscopy. Methods. 50 patients (18-80 years / American Society of Anaesthesiologists grade I-III) were randomized equally to receive either SPA or GA. The main outcome variable was the time until discharge from the day-surgery centre. Anesthesia related side effects, postoperative analgesics and patient satisfaction were assessed. Results. Two of the spinal blocks failed and GA had to be provided. Despite of a faster recovery (unassisted ambulation: SPA: 90 (90-295)min vs. GA: 156 (93-235)min, $p=0.0029$), spontaneous voiding led to a delayed discharge in the SPA group (SPA: 240 (135-295)min vs. GA: 156 (93-235)min, $p<0.0001$). There were no differences between the groups regarding other anesthesia related side effects, postoperative demand of analgesics or patient satisfaction. Conclusion. SPA with 50mg hyperbaric prilocaine 2% leads to a later discharge than GA with sufentanil and propofol. However, a reevaluation of existing discharge recommendations including obligatory micturition is necessary, to make SPA become even more advantageous for ambulatory surgery

Keywords: *Hyperbaric prilocaine 2% • Spinal anaesthesia • General anaesthesia • Knee arthroscopy • Day-care surgery*

1. Introduction

The number of outpatient orthopedic procedures has markedly increased in the last years [1]. Knee arthroscopy is one of the most commonly performed orthopedic operations and a high percentage is performed in an outpatient setting. Therefore, development and improvement of a safe, reliable and efficient anesthesia technique is important, as anesthesia plays a key role in facilitating the recovery process in the current outpatient fast-track recovery environment [2]. General (GA), spinal (SPA), epidural, and local anesthesia are possible techniques for outpatient arthroscopic knee surgery. Compared to GA, both epidural and local anesthesia has provided a more rapid discharge home in previous studies [3,4].

After the description of transient neurologic symptoms (TNS) following SPA using lidocaine and mepivacaine, the safety of these substances has been called into question [5,6]. Therefore, the establishment of an alternative local anesthetic for ambulant SPA became a higher priority. However, SPA performed with the long lasting bupivacaine led to a delay in discharge compared to GA and LA [1,7]. So many authors tried to optimize the dosage and concentration of bupivacaine for ambulatory knee surgery, but achieved only a recovery profile comparable to GA [8-10]. In 2010, after introduction of hyperbaric prilocaine 2% to the German market, a medium-long acting local anesthetic with pharmacological characteristics comparable to lidocaine and mepivacaine but a remarkable lower incidence of TNS, a nearly perfect substance for this indication seemed to

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be available [11]. We assumed that due to a shorter duration of action of prilocaine compared to bupivacaine, a SPA could lead to a faster recovery than a GA.

Following this hypothesis we conducted this trial and compared GA with propofol and sufentanil to SPA using 50 mg hyperbaric prilocaine 2% resulting in a volume of 2.5 ml. The aim of this study was to determine whether a SPA is superior to GA in patients undergoing outpatient knee arthroscopy in terms of the time until discharge from the day-surgery centre. Additionally we evaluated anesthesia related side effects as well as patient satisfaction.

2. Material and methods

After receiving a positive vote from the local ethics committee (Medical Ethics Commission II, Faculty for Medicine Mannheim, Germany, Nr: 2011-372N-MA, 20. December 2011), 50 patients were enrolled into this prospective, single-centre, randomized, controlled clinical trial. From March to October 2012, the participants were included. Verbal and written information was given to each of the patients before informed written consent was obtained.

2.1. Inclusion and exclusion criteria

All patients (male/female, American Society of Anesthesiologists physical status (ASA) I-III, age: 18-80 years) undergoing outpatient knee arthroscopy were eligible for this study. Exclusion criteria were general contraindications to one of both anesthesia techniques as well as allergies against one of the drugs used for anesthesia or for postoperative analgesia. The study protocol permitted the use of general anesthesia in case of an unsuccessful performance of SPA or an incomplete sensory block. We performed the statistic on an intention-to-treat basis.

2.2. Patients and procedures

Ahead of the scheduled surgery, all patients were interviewed by an anesthesiologist. They were allowed to drink small amounts of clear liquids until two hours before anesthesia induction. Patients received no oral premedication. After arrival at the day-surgery centre the patients were randomly allocated to receive either SPA or GA. We used a computerized block wise randomization.

Venous cannulation with a 20-G peripheral needle was performed in all patients and a balanced crystalloid solution (Deltajonin®, AlleMan Pharma, Rimbach, Germany) infusion was started with a maximum of 500 ml. Cardio-respiratory monitoring (continuous ECG and oxygen saturation as well as non-invasive blood pressure at 5 min intervals) was established. Perioperative anesthesia-related side effects were recorded by a study nurse. Anesthesia and surgery times were determined according to the common written statement of the German Society of Surgery and the German Society of Anesthesiology [12]. The duration of preparation and induction of anesthesia were documented.

2.3. Spinal anesthesia

SPA was performed under aseptic conditions in a standard midline approach while the patient was in an upright sitting position. The L_3-L_4 interspace was identified and after a local infiltration with mepivacaine 1% the subarachnoid space was punctured with a 27-G pencil-point needle. When cerebrospinal fluid was clear and free flowing, 50 mg hyperbaric prilocaine 2% was applied intrathecally. After injection, patients were immediately brought in supine position.

Optionally, if patients requested for sedation during the operation, propofol was administered until a mild level of sedation was reached – an Observer´s Assessment of Alertness / Sedation score of 4-5 [13]. Oxygen was applied via facemask at a flow of 8L/min and respiration was monitored measuring oxygen saturation and a semi-quantitative carbon dioxide detection.

2.4. Testing of sensory block and motor block

The sensory block was tested in two ways. First, haptically by using a wooden toothpick. Gentle pricks were set to the skin moving from the caudal dermatomes upwards until the prick felt spiky. Then the same procedure was performed with an ice-filled plastic tube until the patient felt a difference of temperature. The anaesthetized dermatomes were documented. Patients were eligible for surgery, when a sufficient block reached the Th_{10} segment. The motor block was measured by using the modified Bromage score (0=no motor block; 1=unable to lift the extended leg in the hips; 2=unable to flex hips and knees, but still able to flex ankles; 3=complete motor block of the lower extremity) [14]. The block was tested 10 and 90 min after intrathecally injection.

2.5. General anesthesia

After sufficient pre-oxygenation, anesthesia was induced with sufentanil (0.5-1µg/kg body weight (BW)) and propofol (2-3 mg/kg BW). Initially all patients received a laryngeal mask, the size was BW adapted. If ventilation via laryngeal mask was difficult or impossible the study protocol permitted the use of an endotracheal tube. For intubation 0.2 mg/kg BW of mivacurium (Mivacron ®, GlaxoSmithKline, Munich, Germany) was applied. For endotracheal intubation (Tracheal Tube, Kendall Curity, Tyco Healthcare, Neustadt / Donau, Germany) tubes of an inner diameter (ID) of 7.0mm for women and an ID of 7.5mm for men were used. Pressure-controlled ventilation was performed with a peak-pressure limit of 20mbar and a tidal volume of 6-8 ml/kg BW. Respirator frequency was adapted to reach normoventilation indicated by an end-tidal carbon dioxide concentration of 36-40mmHg. The fraction of inspired oxygen 0.4 was supplemented with air. Anesthesia was maintained with continuous propofol infusion via perfusor pump (8-12 mg/kg BW/h). Repetitive sufantanil and propofol boli were applied depending on the individual needs of the patient. If patients had a history of or high risk for postoperative nausea and vomitus (PONV) they received 1 mg granisetron and 4 mg dexamethasone as a prophylaxis.

2.6. Operative procedures

All patients underwent unilateral minor arthroscopic knee-surgery for small interventions like cartilage smoothing, tear section of the meniscus, synovectomy or resection of the plica patellaris. At the end of intervention an intra-articular injection of 10 ml bupivacaine 0.5% was performed.

2.7. Postoperative recovery and analgesia

At the end of the surgical procedure, all patients were brought to a post anesthetic care unit (PACU) for further cardio-respiratory monitoring. A study nurse recorded the first occurrence of pain and its intensity. Pain intensity was evaluated by using a numeric analogue scale with eleven steps (0-10), analgesics were administered according to the standardized analgesia scheme (Table 1). For discharge, all patients had to achieve at least 18 points on the modified Aldrete score [15]. Additionally, patients with a SPA had to show a complete regression of SPA tested clinically by patients´ possibility to get up and walk without assistance (“unassisted ambulation”) as well as spontaneous micturition. Complications and adverse side effects were also documented.

Table 1. Table for the administration of analgesia in the post anaesthesia care unit. Analgesics were given on demand only. When pain was persistent in patients with a numeric analogue scale (NAS) score of 7-10, the dosage of piritramid could be increased.

Step	NAS	Medication
1	0-2	No analgesics
2	3-4	2g metamizole i.v.
3	5-6	2g metamizole i.v. + 800mg ibuprofen p.o.
4	7-10	7-10 2g metamizole i.v. + 800mg ibuprofen p.o.

2.8. Patient satisfaction and follow up

When patients were ready for discharge and about to leave the day-surgery centre, patient satisfaction was evaluated with the help of a standard questionnaire based on the validated German translation of the nine-point Quality of Recovery (QoR-9) [16]. We also asked all patients to rate their overall satisfaction with the anesthesia technique, satisfaction with postoperative analgesia in the PACU, an uncomfortable feeling during induction and if they would choose the same technique again on a 4-point scale. Finally, patients had to give a school grade for the allocated anesthesia technique. One week after anesthesia a study nurse called each patient for a standardized telephone interview regarding a postoperative pain score and anesthesia related side effects like sore throat, TNS or postspinal puncture headache.

2.9. Statistics

The main outcome of our study was time to discharge. We felt that a difference of at least 45 min would be clinically relevant. Based on experience we know that the variability of these times is rather high; thus we assumed a standard deviation of 50 min. Under these preconditions we assessed a sample size of 21 for each group using the SAS procedure PROC POWER (assuming alpha=0.05, power=0.80 and equal sample sizes in both groups). Thus, we planned 25 patients in each group in order to achieve sample sizes of 21 even if we would have 10%–15% drop outs.

All statistical calculations have been done with the SAS system, release 9.3 (SAS Institute Inc., Cary, NC, USA). For qualitative parameters, frequencies are given. Quantitative variables are presented by their mean value, standard deviation and range; time intervals and ordinally scaled variables are described by median value and range.

In order to compare two groups regarding relative frequencies Chi^2-test or Fisher’s exact test has been used, as appropriate. For quantitative variables approximately normally distributed 2 sample t-tests have been performed. For the comparison of time intervals Mann-Whitney-U test has been used instead. Ordinally scaled parameters with a small number of categories (i. e. items of the QoR-9 questionnaire) have been evaluated by the Cochran-Armitage-trend test. A test result has been considered as statistically significant if the p value was less than 0.05.

3. Results

3.1. Demographic data

50 patients were enrolled to the study. In two patients SPA failed and both received a GA. Data from 50 patients were analyzed. More men than women received a SPA. There was no other difference between the groups regarding demographic data and the preoperative pain score (Table 2).

3.2. Spinal anesthesia

Twenty-five patients were randomized to receive SPA. In two patients SPA failed although the local anesthetic was successfully injected and cerebrospinal fluid was described as free flowing before application. Ten minutes after injection neither a sensory nor a motor block could be detected. Thus, both patients received GA following the study protocol. As the data were evaluated on an intention-to-treat basis, both patients were included in SPA group in the final statistic analysis.

Three patients received 2 mg midazolam i.v. before SPA as they announced anxiety. Although none of the patients in the GA group received midazolam before induction of anesthesia there was no significant difference regarding patients receiving i.v. premedication and those who did not (p=0.2347). One patient received 0.5 ml Akrinor®, a mixture of cafedrine and theodrenaline (Akrinor®, Ratiopharm, Ulm, Germany) due to intraoperative hypotension. In 6 patients more than one attempt was necessary for punctuation of the subarachnoid space and a successful intrathecal injection due to adverse anatomic conditions. Four patients mentioned discomfort or pain not related to the surgical interventions that were treated with 10-20µg sufentanil. A mild sedation was induced with propofol (1.06 ± 0.5 mg/kg BW) in five patients, who had requested to sleep during operation.

Table 2. Demographic data of patients. Quantitative parameters are given by mean, standard deviation and range, qualitative by frequencies. Pain score ist described by the median values. SPA, spinal anaesthesia, GA, general anaesthesia, BMI, body mass index.

	SPA	GA	p-value
Sex (m/f)	18/7	11/14	0.0449
Age (years)	53.6±13.6 (20-74)	47.0±14.5 (22-77)	0.1014
Body weight (kg)	85.8±18.4 (57-133)	80.6±15.0 (46-110)	0.2864
Body height (cm)	173.1±8.4 (158-192)	170.6±9.3 (153-190)	0.3361
BMI (kg/m²)	28.4±4.7 (21.6-39.3)	27.6±4.1 (18.0-34.7)	0.5070
ASA (1/2/3)	12/12/1	17/7/1	0.2172
Pre-operative pain-score (NAS 0-10)	4 (0-10)	3 (0-8)	0.3848

3.3. Sensory and motor block

Ten minutes after injection the median sensory block was Th_{10} (L_2-Th_6) tested by temperature discrimination, respectively Th_{10} (L_3-Th_6) using the wooden toothpick.

A Bromage Score (BS) of two or higher occurred in 80% of the patients 10 min after successful intrathecally injection (BS 3: n=9; BS 2: n=11). Three patients with a sensory block, which was sufficient for intervention, had an incomplete motor block (BS 1: n=1; BS 0: n=2). 90 min after application of the local anesthetic, the median sensory block was L_1 (L_5-Th_{11}) using the temperature method and respectively L_2 (S_1-Th_{12}) when sensory block was tested haptically. Patients were ready for “unassisted ambulation” after 90 (90-295) min.

3.4. General anesthesia

Out of the 25 patients, who received GA, in 9 patients the placement of the laryngeal mask was described as difficult. Problems could be solved by replacement or optimization of placement of the laryngeal mask. Only in one case ventilation via laryngeal mask was impossible, so that an endotracheal intubation was necessary. Anesthesia was induced with mean doses of 0.35 ± 0.08µg/kg BW sufentanil and 2.5 ± 0.3 mg/kg BW propofol and it was maintained with a continuous propofol infusion at mean rates of 14.8 ± 6 mg/kg BW/h. Additional intraoperative sufentanil boli (0.18 ± 0.5 µg/kg BW) were applied in seven patients and vasopressors were applied in four cases.

3.5. Postoperative recovery and analgesia

GA led to significantly shorter times for induction of anesthesia but to a longer time from end of surgery until arrival at the recovery room. Despite of a faster recovery (unassisted ambulation: SPA: 90 (90-295) min vs. GA: 156 (93-235) min, p=0.0029), spontaneous voiding led to a delayed discharge from the day surgery centre in the SPA group (SPA: 240 (135-295) min vs. GA: 156 (93-235) min, p<0.0001, Table 3). One patient suffered from urinary retention with the need of catheterization after SPA. This male patient had no history of urologic diseases; sensory block had regressed to the L_5 dermatome 90 min after induction of SPA.

There was a trend between the two study groups concerning the postoperative pain score (SPA: 2 (0–5) vs. GA: 3 (0–6), p=0.0731 but no difference in the demand of analgesics applied in the PACU to achieve NAS 2 or lower (Table 1); steps 1/2/3/4: SPA: 16/8/3/0 vs. GA: 12/11/2/0, p=0.3580. The fact that four patients with sufficient spinal block received sufentanil (10-20 μg) to alleviate discomfort not caused by the surgical intervention did neither influence the postoperative analgesics demand (p=1.0) nor the postoperative pain scores (p=0.4922). Although eight patients in the GA group received PONV prophylaxis due to their medical history, three of them suffered from PONV in the PACU.

Table 3. Comparison of time spans between spinal (SPA) and general anaesthesia (GA). Time spans marked with an * are measured from the end of induction; median and range are given. Unassisted ambulation: bromage score = 0. Discharge time: 18 points on the modified Aldrete score [15], complete regression of the spinal block tested clinically by patients´ possibility to get up and walk without assistance and spontaneous micturition in the SPA group.

	SPA (min)	GA (min)	p-value
Induction time	14 (2-25)	6 (3-22)	0.0004
Duration of surgery	24 (12-62)	24 (14-57)	0.6687
Time from end of surgery until arrival at the recovery room	6 (2-15)	9 (3-33)	0.0029
Unassisted ambulation*	90 (90-295)	156 (93-235)	0.0285
Discharge time* (after voiding in the SPA group)	240 (135-295)	156 (93-235)	< 0.0001
Occurrence of pain*	76.5 (18-161)	46 (6-132)	0.0528

3.6. Patient satisfaction and follow up

Patients of both groups had comparable values of patient satisfaction and quality of recovery. There was a trend that patients with GA suffered more frequently from “intermittent strong pain” (p=0.0845). We did not analyze the topics “could go to toilet myself” and “no problems with voiding” as patients with a GA were ready for discharge without micturition (Tables 4 and 5). Forty-eight follow-up interviews could be analyzed, as we failed to reach one patient out of each group. Pain scores one week after surgery were similar in both groups (SPA: 2 (0-7); GA: 2 (0-8), p=0.6131). Equal was also the number of patients in each group (n=3, p=1.0), who suffered from adverse anesthesia-related side effects. In the GA-group three patients suffered from sore throat postoperatively. Two patients with SPA reported of back pain without further symptoms of TNS. In one case headache occurred after SPA, but the symptoms were unspecific for postpunctural headache.

Table 4. Standardized QoR-9 questionnaire.

	SPA			GA			
	Yes	Partially	No	Yes	Partially	No	p-value
Felt well most of the time	24	1	0	24	0	1	1.0
Needed help from nurse or anaesthetist	23	2	0	25	0	0	0.4898
Could understand orders and explanations	24	1	0	21	4	0	0.3487
No problems with breathing	24	1	0	25	0	0	1.0
Muscle and back pain	1	2	22	0	1	24	0.6092
Nausea and vomiting	0	1	24	1	2	22	0.6092
Intermittent strong pain	1	7	17	0	14	11	0.0845

Table 5. Patient satisfaction concerning anaesthetic care.

	SPA	GA	p-value
Overall satisfied with anaesthesia technique Completely/Yes/Mostly/No	20/4/1/0	25/0/0/0	0.0502
Felt uncomfortable while induction Completely/Yes/Mostly/No	1/1/6/17	1/0/1/23	0.2427
Satisfied with postoperative analgesia Completely/Yes/Mostly/No	23/1/1/0	23/2/0/0	1.0
Would choose the same technique again Definitively/Yes/No/In no way	20/3/1/1	23/2/0/0	0.2376
School grades 1/2/3/4/5/6	18/5/1/0/1/0	20/5/0/0/0/0	0.3600

4. Discussion

SPA and GA are safe anesthesia techniques for knee arthroscopy in an ambulatory setting. Both of them have been studied well and were compared in several trials using different local anaesthetics for SPA as well as different anaesthetics for GA [1,9,10,17].

After lidocaine and mepivacaine were abandoned from clinical use due to the high incidence of TNS, the long acting bupivacaine gained in importance for SPA in patients undergoing outpatient surgery. With the admission of hyperbaric prilocaine 2%, a new medium-long acting substance, appeared on the German market in 2010 and seemed to be advantageous to bupivacaine in terms of recovery. Therefore, the main focus of this study laid on the time until discharge from the day-surgery centre.

Due to a potential risk of urinary retention after SPA, in our study spontaneous micturition was a necessary precondition to achieve home discharge criteria only in the SPA group [18]. Currently, there exists a recommendation published by the German Society of Anesthesiologists that the bladder function has to be taken into consideration before discharge in an ambulatory setting [19]. On the other hand, a recently published article by the American Society of Anesthesiologists Task Force on Postanesthetic Care stated, that the routine requirement for urination before discharge should not be part of discharge protocol and may only be necessary for selected patients [20]. In a recent review, Mulroy stated that low-risk patients, as studied in the present trial, are at no greater risk of retention than after general anesthesia, and may be discharged home with similar instructions regarding return if unable to void [21]. As a result of this ongoing discussion we defined an "unassisted ambulation" time that describes the ability to get up and walk (bromage score = 0) according to Camponovo et al. and Hampl et al. regardless the requirement for urination before discharge [6,25]. The manner in which local anaesthetics are administered may influence the duration of blockade, and thus time to voiding. Overall, it seems that the use of hyperbaric or unilateral blockade is less important than the choice and dose of the local anesthetic itself [21].

However, there have been concerns that the requirement of voiding simply prolongs the stay in a day-surgery centre unnecessarily. Up to 19% of the patients after SPA could be discharged earlier, if they were not supposed to void before [22]. Mulroy et al. could show that after ultrasound bladder-monitoring patients could be discharged up to 29 min earlier compared to a control group were voiding was obligatory [23]. The studies mentioned in the next section used the same discharge criteria than we did [1,6,24,25]. Camponovo et al. compared 40 mg vs. 60 mg of hyperbaric prilocaine 2% for outpatient surgery and reported times of 195 ± 60 min vs. 218 ± 56 min until first spontaneous micturition and 208 ± 68 min vs. 256 ± 85 min to reach eligibility for home discharge [25]. For a SPA using 60 mg of hyperbaric prilocaine 2% Raetsch et al. found 306 min until first micturition and 308 min until readiness for home discharge [24]. In a study conducted by Hampl et al. it took 253 ± 55 min to first spontaneous micturition after a SPA with 50 mg hyperbaric prilocaine 2%. The results of all mentioned authors are in line with our results.

After injection of 60 mg hyperbaric prilocaine 2% a maximum height of sensory block was documented at Th_8 in a study of Raetsch et al. In this study patients were laying supine with the head elevated at 30° after intrathecal injection [24]. Hampl et al., who used 50 mg hyperbaric prilocaine 2% and turned patients immediately supine and placed them in lithotomy position, found a median peak dermatomal level of Th_6 [6]. The higher volume of Raetsch et al. and the lithotomy position in the study of Hampl et al. may explain the differences to our results.

In the Camponovo trial 13% of the patients in the 40 mg-group and 3% of the patients, who received 60 mg needed a supplementation of anesthesia during intervention [25]. A failure rate of 9% defined as no block or insufficient for procedure and the need of analgesic supplementation was published by Raetsch at a dosage of 60 mg [24]. Fuzier described a failure rate of 3.2% after successful intrathecal injection of bupivacaine or ropivacaine [26]. Taking the failure rate of 8% (with 50 mg) of this study in account there seems to be a linear correlation between dosage and failure in SPA with hyperbaric prilocaine for lower limb surgery, at a dosage of 60 mg prilocaine 2% the failure rate is comparable to other local anaesthetics.

Camponovo found a time to unassisted ambulation, defined as bromage score is 0 of 92 ± 36 min vs. 118 ± 37 min (40 mg vs. 60 mg) while Raetsch mentioned 135 min using 60 mg hyperbaric prilocaine. Hampl described 165 ± 37 min until unassisted ambulation (bromage score=0) after intrathecal administration of 50 mg. These results are comparable with our data.

Laryngeal masks (LM) are a safe airway-device for GA in outpatient surgery with a failure rate of 1.1% defined as an airway event requiring LM removal and tracheal intubation [27]. The failure-rate in our study (n=1, 3.7%) may partly be explained by the small case number. Anesthesia related side effects had the same incidence in both groups. Higgins et al. mentioned an incidence of sore throats after LM with 17.5%, what is almost five-fold higher than in this study [28]. The incidences of adverse anesthesia-related side effects in the SPA group are likewise lower than described in literature. Raetsch et al. as well as Fritz and Seidlitz found rates of 15% vs. 17% for unspecific headache (4% in this study) and 10% vs. 20% for transient pain at the injection site (8% in our study) [24,29]. Postoperative nausea is mentioned in a review with an incidence of 17%, postoperative vomitus of 8% after office-based surgery [30]. Although patients received prophylaxis when they had a history or a high risk to develop PONV, we found an incidence of 12% what is in line with the results of the review.

Evaluation of patient satisfaction and quality of recovery is an important part of quality management. The quality of recovery has obvious resource implications as a poor recovery after anesthesia may delay discharge home [31]. It is important to differentiate quality of recovery and patients satisfaction, as there is evidence that also poor or incomplete recovery does not influence satisfaction [32]. We used the standardized QoR-9 scoring system to measure the quality of recovery and other not standardized questioning techniques to evaluate patients` satisfaction. The fact that non-standardized questions were used may be a lack of the investigation of satisfaction.

Comparing the QoR-9 items patients in both groups are equally satisfied with the recovery profile of their allocated anesthesia technique, although recovery took significantly longer in the SPA group. The trend that more patients in the GA group were completely satisfied may be explained by the need of additional analgesics to alleviate discomfort not caused by the procedure in patients who received a SPA. These findings sustain the assumption that patients are satisfied with the anesthesia technique offered to them [1,33,34].

Nevertheless, there are some limits of this current study. First, we must mention the very small patient sample permitting no conclusions regarding other outcome criteria except the “time to discharge”. This study was powered to show a difference in discharge time and not to detect anesthesia related side effects, which are crucial factors for the choice between two anesthesia techniques. Second, we used unstandardized questions to evaluate patients’ satisfaction. A recent review has shown that this topic is not an uncommon problem [31]. There is a lack of standardized questionnaires that are short and reevaluated after translations in different languages. Third, in this study we used different discharge criteria, namely the spontaneous micturition after SPA, for the compared anesthesia techniques but these criteria are widely used in clinical practice. Depending on the fact whether micturition is seen as an obligatory requirement for discharge, SPA with hyperbaric 2% can reduce or extend the discharge time compared to GA.

5. Conclusion

SPA with 50 mg hyperbaric prilocaine 2% leads to a later discharge than GA with sufentanil and propofol. However, a reevaluation of existing discharge recommendations including obligatory micturition is necessary, to make SPA become even more advantageous for ambulatory surgery.

Conflict of interest statement

M. Schmittner and V. Gebhardt received speaker fees and travel expences from Sintetica.
C. Weiss and M. Monnard declare no conflict of interest.

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