

## Local Anesthesia Reversal (LAR) of Spinal Anesthesia by Lipid Emulsion (Lipofundin 20%) for Day Case Surgery

Joseph Eldor<sup>1\*</sup>

Nguyen Trung Kien<sup>2</sup>

<sup>1</sup>Joseph Eldor, Theoretical Medicine Institute, Jerusalem, Israel

<sup>2</sup>Department of Anesthesia and Pain Medicine, Military Hospital 103. Vietnam Military Medical University, Vietnam

### Abstract

A 46 years old Male was diagnosed with penis fracture due to sexual intercourse. A 72 years old Male was diagnosed as having a tumor on the upper pole of the femur. A 41 years old Female had a Cesarean section. All of them underwent spinal anesthesia for their operations. All of them underwent at the end of their operations Local anesthesia reversal (LAR) of Spinal anesthesia by Lipid Emulsion (Lipofundin 20%) using Bolus and Infusion. The local anesthesia reversal was started in approximately 3 minutes after starting the bolus injection and completed in approximately 30 minutes afterwards. This new modality of LAR can make a great change in the use of spinal anesthesia in day case surgery facilities.

**Keywords:** Day case surgery, Bupivacaine, Intralipid, Lipofundin, Lipid emulsion, LE, Spinal anesthesia, Local anesthesia reversal, LAR.

### Case Reports

#### Case no. 1

A 46 years old Male was diagnosed with penis fracture due to sexual intercourse. He underwent an emergency surgery for penis repair on 21.2.2018 at the Military Hospital 103, Vietnam Military Medical University. The patient was anesthetized by spinal anesthesia with 8 mg of bupivacaine plus 20 mcg fentanyl in the sitting position at the L2-L3 level. The point time of the spinal block was 15h 35 min.

Onset time: 3 mins.

Anesthesia effect was very good for the surgery.

Dermatome check by the cold test with alcohol gauze was T\$ at 10 mins after the spinal block.

Duration of surgery: 30 mins.

Hemodynamic was stable during the surgery.

Surgery was completed at 16h 15min (50 mins after the performance of the spinal block).

Lipid emulsion (Lipofundin 20%) bolus injection was started at 16h 15 mins over 3 mins with the dose of 1.5 mg/kg (patient's weight 68 kg), then by continuous infusion with 0.25 ml/kg/min over 12 mins. Total volume of the Lipid emulsion was 300ml. The patient was monitored closely during the local anesthesia reversal (LAR) process (Table 1).

#### Videos:

Starting the bolus of lipofundin 20% injection: <https://youtu.be/cXIylBqO8CA>

### Article Information

**Article Type:** Research

**Article Number:** JHSD111

**Received Date:** 27 February, 2018

**Accepted Date:** 28 March, 2018

**Published Date:** 30 March, 2018

\*Corresponding author: Dr. Joseph Eldor, Theoretical Medicine Institute, Jerusalem, Israel. Tel: +972-2-5835528; Email: [cse\\_international@cse.com](mailto:cse_international@cse.com)

**Citation:** Joseph Eldor, Kien NT (2018) Local Anesthesia Reversal (LAR) of Spinal Anesthesia by Lipid Emulsion (Lipofundin 20%) for Day Case Surgery. Jor Health Sci Development. Vol: 1, Issu: 1 (79-85).

**Copyright:** © 2018 Joseph Eldor, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

1 minute after finishing bolus lipofundin injection:  
<https://youtu.be/ic9xoODVqXc>

2 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/BcPdXevSKvI>

19 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/FJpl22JFSEc>

28 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/9cxuynCwrvY>

32 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/5GuxnVucjzY>

34 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/yQuk2EEcNqM>

39 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/Rx8dCQPjXuY>

42 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/E85Xv2gfGOY>

47 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/GygRH6GYbW0>

48 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/25eBCScsVbk>

50 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/IBacn8MrbJU>

52 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/oleWEpuNZ5I>

61 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/AKt23S6FPpk>

69 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/ipWH95V4e0k>

73 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/WC-bKjpAmmg>

**Case no. 2**

A 72 years old Male was diagnosed as having a tumor on the upper pole of the femur. The patient performed a biopsy on March 9<sup>th</sup>, 2018 at the Military Hospital 103, Vietnam Military Medical University. The patient was anesthetized by spinal anesthesia with 9 mg of bupivacaine plus 20 mcg fentanyl in the sitting position at L2-L3 level. Point time of the spinal block: 9h 02, AM.

Anesthesia effect was very good for the surgery.

Onset time: 4 mins.

Dermatome check by cold test with alcohol gauze was T4 at 10 mins after the spinal block.

**Table: 1**

	16h 15	16h 20	16h 32	16h 40	16h 55	17h 10	17h 20	17h 30
	(Lipid bolus injection)	Continuous infusion						
<b>Bromage in the Right leg</b>	3	2	2	2	0	0	0	
<b>Bromage in Left leg</b>	3	3	3	3	2	1	0	
<b>Sensory level</b>	T4	T4	T5	T5	T7	T10	T12	
<b>Min after spinal block</b>	50	55	63	75	90	105	115	Full recovery of sensory block

Duration of surgery: 28 mins

Hemodynamic was stable during the surgery.

Surgery was completed at 9h40 which means 38 mins after the spinal block.

Lipid emulsion (Lipofundin 20%) bolus injection was started at 9h50 mins over 3 mins with the dose of 1.5 mg/kg (patient's weight 70kg), then continuous infusion with 175 ml over 30 mins (~0.08 mg/kg/min). Total volume of Lipid emulsion (Lipofundin 20%) was 275ml. The patient was monitored closely in the operating theatre during the lipid emulsion treatment.

Only 3 minutes after finishing the bolus injection the patient could move slightly both legs. The patient got a full recovery of his movement function at 30 minutes after finishing the bolus of Lipofundin 20% injection(Table2).

**Videos:**

Starting bolus injection:

<https://youtu.be/bBYHP-iFmZI>

<https://youtu.be/mVKwwLEfP8A>

2 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/63-EeqC7WL8>

4 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/6kj5OzFNTwQ>

5 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/nM3qjveWQOw>

6 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/EN4mKejZItM>

7 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/2lrZ82wcYk4>

9 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/cpTLMObFRn8>

13 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/CBx-05WQY4Y>

30 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/bfi5AGjVcLc>

32 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/vqjvxAO6bjA>

35 minutes after finishing bolus lipofundin injection:  
<https://youtu.be/NRxzoOr15Z0>

48 minutes after finishing bolus lipofundin injection:  
[https://youtu.be/q7Nt\\_xyBIqk](https://youtu.be/q7Nt_xyBIqk)

69 minutes after finishing bolus lipofundin injection: <https://youtu.be/ThRqH00mwmo>

74 minutes after finishing bolus lipofundin injection: <https://youtu.be/PuUdmVpmkKo>

**Case no. 3**

A 41 years old Female had a Cesarean section on March 15<sup>th</sup>, 2018 at the Military Hospital 103, Vietnam Military Medical University. The patient was anesthetized by spinal anesthesia with 8 mg of bupivacaine plus 20 mcg fentanyl in the left lateral position at L2-L3 level. Point time of spinal block: 11h AM.

Onset time: 3 mins.

Anesthesia effect was very good for surgery.

Case Reports T3 at 10 mins after the spinal block.

Duration of surgery: 50 mins.

Hemodynamic was stable during the surgery.

Surgery was completed at 11h55, meaning at 60 mins after the spinal block.

Lipid emulsion (Lipofundin 20%) bolus injection was started at 12h05 mins over 3 mins with the dose of 1.5 mg/kg (patient’s weight 60kg), then continuous infusion with 150 ml LE over 10 mins (0.25 mg/kg/min). Total volume of Lipid emulsion was 250ml. Patient was monitored closely in the operating theatre during the LE treatment.

Only 1-2 minutes after starting the bolus injection, the patient could move slightly the right foot. The left foot could be moved slightly after finishing the bolus of the Lipofundin 20% injection at 8 mins. The patient got a full recovery movement function at 48 minutes after finishing the bolus Lipofundin injection without any pain (VAS=0) although sensory block was reduced to T12(Table 3).

**Videos:**

Starting bolus lipofundin injection: <https://youtu.be/szUw4o3R30o>

1 minute after starting bolus injection: <https://youtu.be/LSSI5v9Tu-w>

Finish bolus lipofundin injection: <https://youtu.be/PIh-xj3-zfA>

1 minute after finishing bolus injection: <https://youtu.be/FNKKJU0VW0o>

2 minutes after finishing bolus injection: [https://youtu.be/xjS\\_PjtFpzY](https://youtu.be/xjS_PjtFpzY)

4 minutes after finishing bolus injection: <https://youtu.be/PDGEQYj1lxY>

5 minutes after finishing bolus injection: <https://youtu.be/9TZGxqC-G0A>

7 minutes after finishing bolus injection: <https://youtu.be/mzR96YM637g>

8 minutes after finishing bolus injection: <https://youtu.be/pfVsS2ChjAI>

10 minutes after finishing bolus injection: <https://youtu.be/roGW5YOAbK8>

11 minutes after finishing bolus injection: <https://youtu.be/QvZrAqBcBnY>

12 minutes after finishing bolus injection: <https://youtu.be/ejFnL4rPamQ>

15 minutes after finishing bolus injection: <https://youtu.be/vOk8LoBDHvo>

18 minutes after finishing bolus injection: <https://youtu.be/ucmm8nfFqeo>

21 minutes after finishing bolus injection: <https://youtu.be/msGDpCzQrIs>

25 minutes after finishing bolus injection: <https://youtu.be/>

**Table: 2**

	From 9h 50 (Lipid bolus injection) to 9h 54	9h 57	10h	10h 7	10h 24	10h 26	10h 29	10h 42	11h 02
	Continuous infusion								
<b>Bromage in the Right leg</b>	3	Little slight movement	3	2	1	1	0	0	0
<b>Bromage in Left leg</b>	3	Slight movement	2	1	1	1	0	0	1
<b>Sensory level</b>	T4	T4	T5	T6	T8	T8	T10	T10	T12
<b>Mins after finishing bolus injection</b>		3	6	13	30	32	35	48	
<b>Mins after spinal block</b>	48	55	58	65	82	84	87	100	130

Table: 3

	From 12h 05 (Lipid bolus injection) To 12h 08	12h 08	12h 10	12h 15	12h 18	12h 26	12h 53	13h 07	13h 10
	Continuous infusion								
<b>Bromage in the Right leg</b>	3	Little slight movement	2	2	1	1	0	0	0
<b>Bromage in Left leg</b>	3	3	3	3	3	1	1	0	0
<b>Sensory level</b>	T4	T4	T5	T6	T8	T8	T12	T12	T12
<b>Mins after finishing bolus injection</b>		3	5	10	13	18	35	48	62
<b>Mins after spinal block</b>	65	68	70	75	78	84	113	127	120

be/2L335DHPd-k

28 minutes after finishing bolus injection: <https://youtu.be/Vo4vNlcfv8>

31 minutes after finishing bolus injection: <https://youtu.be/sW0TI8PJSk>

43 minutes after finishing bolus injection: <https://youtu.be/YjNbSjuwd4Q>

45 minutes after finishing bolus injection: <https://youtu.be/auPwEHaMM08>

48 minutes after finishing bolus injection: <https://youtu.be/ZRFH2B7oDxk>

59 minutes after finishing bolus injection: <https://youtu.be/EQs5ggSEls>

62 minute2 after finishing bolus injection: <https://youtu.be/L4U-WrQ6qnQ>

## Discussion

Corning, a neurologist, was the first to attempt spinal anesthesia, although not in any way as we understand it today[1]. He was under the false impression that injecting cocaine between the spinous processes would result in rapid transportation of the drug to the spinal cord, thus producing anesthesia of the cord. Corning's experiments were carried out in a man and a dog. The man, receiving approximately 120 mg of cocaine which is about four times the lethal dose, was certainly lucky to survive the experiment and what was achieved was probably epidural anesthesia [2]; the dog, receiving approximately 13 mg, presumably had spinal anesthesia[2].

Both general and spinal anaesthesia with short-acting local anaesthetics are suitable and reliable for knee arthroscopy as an ambulatory procedure. Chloroprocaine (CP) 1% seems to be the ideal spinal local anaesthetic for this indication.

The aim of this study was to compare spinal anaesthesia using CP 1% with general for outpatient knee arthroscopy with regard to procedure times, occurrence of pain, patient

satisfaction and recovery, and also costs[3].

A randomised controlled single-centre trial. University Medical Centre Mannheim, Department of Anaesthesiology and Surgical Intensive Care Medicine, Mannheim, Germany. April 2014 to August 2015.

A total of 50 patients (women/men, 18 to 80 years old, ASA I to III) undergoing outpatient knee arthroscopy were included. A contra-indication to an allocated anaesthetic technique or an allergy to medication required in the protocol led to exclusion.

Either general anaesthesia with sufentanil, propofol and a laryngeal mask for airway-management or spinal with 40-mg CP 1% were used. We noted procedure times, patient satisfaction/recovery and conducted a 7-day follow-up[3].

Primary outcome was duration of stay in the day-surgery centre. Secondary outcomes were first occurrence of pain, patient satisfaction, quality of recovery and adverse effects. In addition, we analysed treatment costs.

Spinal had faster recovery than general anaesthesia with patients reaching discharge criteria significantly earlier [117 min (66 to 167) versus 142 min (82 to 228),  $P=0.0047$ ]. Pain occurred significantly earlier in the general anaesthesia group ( $P=0.0072$ ). Costs were less with spinal anaesthesia (cost ratio spinal: general 0.57). Patients felt significantly more uncomfortable after general anaesthesia ( $P=0.0096$ ). Spinal anaesthesia with 40mg CP 1% leads to a significantly earlier discharge and is cheaper compared with general[3].

Bupivacaine is an amide local anesthetic with a slow onset (5-10 minutes, longer with isobaric forms). It is a long acting spinal anesthetic appropriate for procedures that last 2-2.5 hours. It is comparable to tetracaine; however, tetracaine exhibits a more profound motor block and increased duration when vasoconstrictors are added. Available hyperbaric forms include concentrations of 0.5% and 0.75%, with dextrose 8.25%. Isobaric formulations are available in concentrations of 0.5% and 0.75%. When using isobaric solutions, the total mg dose is more important than the total volume of medication administered.

Spinal anesthesia (SPA) has not been popular for day-case surgery because of prolonged neurologic blockade with long-acting local anesthetics such as bupivacaine, thereby delaying discharge. Although the intermediate duration of action of lidocaine and mepivacaine appears to be more suitable for day-case surgery, their use is not deemed appropriate by many because of a high incidence of transient neurologic symptoms (TNSs).

Prilocaine has a similar intrathecal pharmacokinetic profile as lidocaine but with a significantly lower risk of TNSs. Onset of spinal after 2-chloroprocaine is comparable with lidocaine or prilocaine, but with a considerably shorter duration of action. Also, TNS is clearly less frequent compared with lidocaine. Although its intrathecal use has recently been approved in Europe, this is still considered to be off-label in the USA. Articaine provides an extraordinary fast onset and a short duration of spinal block, the latter being approximately intermediate between chloroprocaine and prilocaine. However, articaine is associated with a high risk for intraoperative hypotension and a small risk for TNS, albeit but less frequent than after lidocaine. Concerns regarding possible neurotoxicity of articaine remain to be resolved.

SPA for day cases might become a most valuable method for ambulatory surgery when using short acting local anesthetics. This, however, not only depends on drugs being used but also on infrastructure (post anaesthesia care unit) and organizational issues[4].

An increasing number of day-case surgical patients is challenging the presently used methods of anaesthesia: reliable surgical anaesthesia should be fast, with rapid recovery and minimal side effects. To compete with modern ambulatory general anaesthesia a knowledge of special spinal anaesthesia techniques is essential. For surgical procedures in one lower limb, a low dose of hyperbaric bupivacaine with standardized spinal anaesthesia technique produces a reliable block, with low incidence of side effects and home-readiness equal to spinal anaesthesia with lidocaine (50 mg) or general anaesthesia (desflurane), whereas ropivacaine has not shown benefits over spinal anaesthesia with bupivacaine. 'Walk-in, walk-out' spinals with an extremely low dose of lidocaine and opioids for gynaecological laparoscopy created the concept of selective spinal anaesthesia. Reintroduction of chloroprocaine may provide a solution for bilateral, short-acting spinal anaesthesia in the future.

To produce reliable spinal anaesthesia with a reasonable recovery time it is essential to understand the factors affecting the spread of spinal block and to choose the optimal drug and adequate dose for specific surgical procedures[5].

The local anaesthetics used in day-case spinal anaesthesia should provide short recovery times. We aimed to compare hyperbaric prilocaine and bupivacaine in terms of sensory block resolution and time to home readiness in day-case spinal anaesthesia[6]. Fifty patients undergoing perianal surgery were randomized into two groups. The bupivacaine-fentanyl group (Group B) received 7.5 mg, 0.5% hyperbaric

bupivacaine+20 µg fentanyl in total 1.9 mL. The prilocaine-fentanyl group (Group P) received 30 mg, 0.5% hyperbaric prilocaine+20 µg fentanyl in the same volume.

Time to L1 block and maximum block was shorter in Group P than in Group B (Group P  $4.6 \pm 1.3$  min versus Group B  $5.9 \pm 0.9$  min,  $P=0.017$ , and Group P  $13.2 \pm 7.5$  min versus Group B  $15.3 \pm 6.6$  min,  $P=0.04$ ). The time to L1 regression and S3 regression of the sensorial block was significantly shorter in Group P than in Group B ( $45.7 \pm 21.9$  min versus  $59.7 \pm 20.9$  min,  $P=0.024$ , and  $133.8 \pm 41.4$  min versus  $200.4 \pm 64.8$  min,  $P<0.001$ ). The mean time to home readiness was shorter for Group P than for Group B ( $155 \pm 100.2$  min versus  $207.2 \pm 62.7$  min ( $P<0.001$ )).

Day-case spinal anaesthesia with hyperbaric prilocaine + fentanyl is superior to hyperbaric bupivacaine in terms of earlier sensory block resolution and home readiness and the surgical conditions are comparable for perianal surgery[6].

The incidence of perianal surgery varies among institutions, accounting for up to 10% of general surgical procedures[7]. The procedure is suitable to perform on a day-case basis with spinal anaesthesia[8,9]. However, prolonged sensory and motor block and urinary retention can cause a delay in discharge[10,11]. Day-case spinal anaesthesia with short-acting local anaesthetics such as lidocaine and chloroprocaine can provide short times to discharge[12,13]. However, the association of lidocaine with transient neurologic symptoms (TNS) and chloroprocaine with neurologic injury has limited the use of these agents in spinal anaesthesia[14,15]. Bupivacaine is safe with a very low incidence of associated TNS, but the prolonged sensory and motor block are a disadvantage for day-case spinal anaesthesia[16]. The use of small doses of bupivacaine with the addition of opioids is proposed to enhance the recovery of the spinal block [17].

Spinal anaesthesia when compared to general anaesthesia has been shown to decrease postoperative morbidity in orthopaedic surgery. The aim of the present study was to assess the differences in thirty-day morbidity and mortality for patients undergoing hip fracture surgery with spinal versus general anaesthesia[18].

The American College of Surgeons National Surgical Quality and Improvement Program (NSQIP) database was used to identify patients who underwent hip fracture surgery with general or spinal anaesthesia between 2010 and 2012 using CPT codes 27245 and 27244. Patient characteristics, complications, and mortality rates were compared. Univariate analysis and multivariate logistic regression were used to identify predictors of thirty-day complications. Stratified propensity scores were employed to adjust for potential selection bias between cohorts.

6133 patients underwent hip fracture surgery with spinal or general anaesthesia; 4318 (72.6%) patients underwent fracture repair with general anaesthesia and 1815 (27.4%) underwent fracture repair with spinal anaesthesia. The spinal anaesthesia group had a lower unadjusted frequency of blood transfusions (39.34% versus



45.49%;  $p < 0.0001$ ), deep vein thrombosis (0.72% versus 1.64%;  $p = 0.004$ ), urinary tract infection (8.87% versus 5.76%;  $p < 0.0001$ ), and overall complications (45.75% versus 48.97%;  $p = 0.001$ ). The length of surgery was shorter in the spinal anaesthesia group (55.81 versus 65.36 min;  $p < 0.0001$ ). After multivariate logistic regression was used to adjust for confounders, general anaesthesia (odds ratio, 1.29; 95% confidence interval, 1.14-1.47;  $p = 0.0002$ ) was significantly associated with increased risk for complication after hip fracture surgery. Age, female sex, body mass index, hypertension, transfusion, emergency procedure, operation time, and ASA score were risk factors for complications after hip fracture repair (all  $p < 0.05$ ).

Patients who underwent hip fracture surgery with general anaesthesia had a higher risk of thirty-day complications as compared to patients who underwent hip fracture repair with spinal anaesthesia. Surgeons should consider using spinal anaesthesia for hip fracture surgery[18].

Spinal anaesthesia is an easy and reliable technique. Factors limiting its use in the ambulatory setting include delayed ambulation, risk of urinary retention and pain after block regression. On the contrary, general anaesthesia with fast-acting drugs provides a fast recovery that facilitates an early discharge. Although recovery after spinal anaesthesia has been improved by reducing the dose of the commonly used long acting local anaesthetics, discharge times are still prolonged compared with general anaesthesia. 2-Chloroprocaine is an amino-ester local anaesthetic with a very short half-life and a favourable evolution of spinal block for ultra-short outpatient procedures. Moreover, the preservative free 2-chloroprocaine solution showed a very low risk of urinary retention and transient neurological symptoms when compared with bupivacaine and lidocaine[19].

We compared the costs related to the clinical effectiveness of general anesthesia versus spinal anesthesia in inguinal hernioplasty ambulatory surgery[20]. An observational, retrospective cohort study measurement and analysis of cost-effectiveness, in the ambulatory surgery unit of a general hospital. All patients over 18 years of age diagnosed with primary inguinal hernia and scheduled for unilateral hernioplasty between January 2010 and December 2011 were included. Duration of anesthetic induction, length of stay in both the operating room, and in the post-anesthesia care unit, the anesthetic effectiveness (the incidence of adverse effects and the patient's comfort level), and variable economic costs associated with the use of drugs, as well as the use of human resources, were compared.

The final analysis included 218 patients, 87.2% male, with a mean age of 53 years (range: 18-85 years). Of these, 139 (63.76%) received subarachnoid anesthesia and 79 (36.2%) general anesthesia. The length of time a patient remained in the post-anesthesia care unit was  $337.6 \pm 160.2$  min in the subarachnoid anesthesia group, and  $210.0 \pm 97.5$  min for the general anesthesia group ( $P < 0.001$ ). Costs of drugs for general anesthesia were higher than that for subarachnoid anesthesia ( $86.2 \pm 8.3$  vs.  $18.7 \pm 7.2$ ). The total cost difference between the 2 techniques was €115.8 more for subarachnoid anesthesia ( $P < 0.001$ ).

Both techniques showed similar effectiveness. The

overall costs for subarachnoid anesthesia were greater than for the general. The cost-effectiveness of general anesthesia is better for outpatient inguinal hernia repair surgery[20].

Length of stay after total hip arthroplasty (THA) has decreased over the last two decades. However, published studies that have examined same-day and early discharge protocols after THA have been done in highly selected patient groups operated on by senior surgeons in a nonrandomized fashion without control subjects.

The purpose of this study was to evaluate and compare patients undergoing THA who are discharged on the same day as the surgery ("outpatient," less than 12-hour stay) with those who are discharged after an overnight hospital stay ("inpatient") with regard to the following outcomes: (1) postoperative pain; (2) perioperative complications and healthcare provider visits (readmission, emergency department or physician office); and (3) relative work effort for the surgeon's office staff[21].

A prospective, randomized study was conducted at two high-volume adult reconstruction centers between July 2014 and September 2015. Patients who were younger than 75 years of age at surgery, who could ambulate without a walker, who were not on chronic opioids, and whose body mass index was less than 40 kg/m<sup>2</sup> were invited to participate. All patients had a primary THA performed by the direct anterior approach with spinal anesthesia at a hospital facility. Study data were evaluated using an intention-to-treat analysis. A total of 220 patients participated, of whom 112 were randomized to the outpatient group and 108 were randomized to the inpatient group. Of the 112 patients randomized to outpatient surgery, 85 (76%) were discharged as planned. Of the remaining 27 patients, 26 were discharged after one night in the hospital and one was discharged after two nights. Of the 108 patients randomized to inpatient surgery with an overnight hospital stay, 81 (75%) were discharged as planned. Of the remaining 27 patients, 18 met the discharge criteria on the day of their surgery and elected to leave the same day, whereas nine patients stayed two or more nights.

On the day of surgery, there was no difference in visual analog scale (VAS) pain among patients who were randomized to discharge on the same day and those who were randomized to remain in the hospital overnight (outpatient  $2.8 \pm 2.5$ , inpatient  $3.3 \pm 2.3$ , mean difference  $-0.5$ , 95% confidence interval [CI],  $-1.1$  to  $0.1$ ,  $p = 0.12$ ). On the first day after surgery, outpatients had higher VAS pain (at home) than inpatients ( $3.7 \pm 2.3$  versus  $2.8 \pm 2.1$ , mean difference  $0.9$ , 95% CI,  $0.3$ - $1.5$ ,  $p = 0.005$ ). With the numbers available, there was no difference in the number of reoperations, hospital readmissions without reoperation, emergency department visits without hospital readmission, or acute office visits. At 4-week follow up, there was no difference in the number of phone calls and emails with the surgeon's office (outpatient:  $2.4 \pm 1.9$ , inpatient:  $2.4 \pm 2.2$ , mean difference  $0$ , 95% CI,  $-0.5$  to  $0.6$ ,  $p = 0.94$ ).

Outpatient THA can be implemented in a defined patient population without requiring additional work for

the surgeon's office. Because 24% (27 of 112) of patients planning to have outpatient surgery were not able to be discharged the same day, facilities to accommodate an overnight stay should be available[21].

## Conclusion

A 46 years old Male was diagnosed with penis fracture due to sexual intercourse. A 72 years old Male was diagnosed as having a tumor on the upper pole of the femur. A 41 years old Female had a Cesarean section. All of them underwent spinal anesthesia for their operations. All of them underwent at the end of their operations Local anesthesia reversal (LAR) of Spinal anesthesia by Lipid Emulsion (Lipofundin 20%) using Bolus and Infusion. The local anesthesia reversal was started in approximately 3 minutes after starting the bolus injection and completed in approximately 30 minutes afterwards.

This new modality of LAR can make a great change in the use of spinal anesthesia in day case surgery facilities.

It is the first time in the medical literature that spinal anesthesia motor block is successfully reversed by Lipid Emulsion (Lipofundin 20%) bolus and infusion.

## References

1. Corning JL (1885) Spinal anaesthesia and local medication of the cord. *N.Y.Med.J* 42: 483-485.
2. Fink BR (1980) History of local anesthesia. In: Cousins MJ, Bridenbaugh PO (eds). *Neural blockade* 1st ed. Philadelphia: JB Lippincott 6-7.
3. Gebhardt V, Zawierucha V, Schöffski O, Schwarz A, Weiss C, et al. (2018) Spinal anaesthesia with chloroprocaine 1% versus total intravenous anaesthesia for outpatient knee arthroscopy: A randomised controlled trial. *Eur J Anaesthesiol*.
4. Wulf H, Hampl K, Steinfeldt T (2013) Speed spinal anesthesia revisited: new drugs and their clinical effects. *Curr Opin Anaesthesiol* 26: 613-620.
5. Korhonen AM (2006) Use of spinal anaesthesia in day surgery. *Curr Opin Anaesthesiol* 19: 612-616.
6. Kaban OG, Yazicioglu D, Akkaya T, Sayin MM, Seker D, et al. (2014) Spinal anaesthesia with hyperbaric prilocaine in day-case perianal surgery: randomised controlled trial. *Scientific World Journal*.
7. Ergül Z, Akinci M, Ugurlu C, Kaya O, Kulacoglu H, et al. (2012) How did a training hospital change in ten years? *Journal of Clinical and Analytical Medicine* 3: 320-324.
8. Watson B, Howell V (2007) Spinal anaesthesia: the saviour of day surgery? *Current Anaesthesia & Critical Care* 18: 193-199.
9. Zoremba M, Wulf H (2010) Spinal anaesthesia in day case surgery old technique new trends. *Anesthesiologie Intensivmedizin Notfallmedizin Schmerztherapie* 45: 176-180.
10. Song D, Greilich NB, White PF, Watcha MF, Tongier WK (2000) Recovery profiles and costs of anesthesia for outpatient unilateral inguinal herniorrhaphy. *Anesthesia and Analgesia* 91: 876-881.
11. Pavlin DJ, Rapp SE, Polissar NL, Malmgren JA, Koerschgen M, et al. (1998) Factors affecting discharge time in adult outpatients. *Anesthesia and Analgesia* 87: 816-826.
12. Kamphuis ET, Kuipers PW, van Venroij GE, Kalkman CJ (2008) The effects of spinal anesthesia with lidocaine and sufentanil on lower urinary tract functions. *Anesthesia and Analgesia* 107: 2073-2078.
13. Sell A, Tein T, Pitkänen M (2008) Spinal 2-chloroprocaine: effective dose for ambulatory surgery. *Acta Anaesthesiologica Scandinavica* 52: 695-699.
14. de Weert K, Traksel M, Gielen M, Slappendel R, Weber E, et al. (2000) The incidence of transient neurological symptoms after spinal anaesthesia with lidocaine compared to prilocaine. *Anaesthesia* 55: 1020-1024.
15. Förster JG, Rosenberg PH (2011) Revival of old local anesthetics for spinal anaesthesia in ambulatory surgery. *Current Opinion in Anaesthesiology* 24: 633-637.
16. Gupta A, Axelsson K, Thörn SE, Matthiessen P, Larsson LG, et al. (2003) Low-dose bupivacaine plus fentanyl for spinal anesthesia during ambulatory inguinal herniorrhaphy: a comparison between 6 mg and 7.5 mg of bupivacaine. *Acta Anaesthesiologica Scandinavica* 47: 13-19.
17. Goel S, Bhardwaj N, Grover VK (2003) Intrathecal fentanyl added to intrathecal bupivacaine for day case surgery: a randomized study. *European Journal of Anaesthesiology* 20: 294-297.
18. Fields AC, Dieterich JD, Buterbaugh K, Moucha CS (2015) Short-term complications in hip fracture surgery using spinal versus general anaesthesia. *Injury* 46: 719-723.
19. Fanelli A, Ghisi D, Allegri M (2013) Is spinal anaesthesia a suitable technique for ultra-short outpatient procedures? *Acta Biomed* 84: 76-80.
20. Fernández-Ordóñez M, Tenías JM, Picazo-Yeste J (2014) Spinal anesthesia versus general anesthesia in the surgical treatment of inguinal hernia. Cost-effectiveness analysis. *Rev Esp Anesthesiol Reanim* 61: 254-261.
21. Goyal N, Chen AF, Padgett SE, Tan TL, Kheir MM, et al. (2017) Otto Aufranc Award: A Multicenter, Randomized Study of Outpatient versus Inpatient Total Hip Arthroplasty. *Clin Orthop Relat Res* 475: 364-372.