

# Emergency Medicine and Trauma Care Journal

## Research Article

Imbelloni LE, et al. Emerg Med Trauma. EMTCTJ-100048

## Combined Spinal Epidural Block for Major Orthopedic Surgery in Elderly Patients. Retrospective Analysis of 230 Patients

Imbelloni LE<sup>1\*</sup>, Viana EP<sup>2</sup>, Pöttker D<sup>3</sup>, Soares ARA<sup>4</sup>, Miranda Junior MG<sup>5</sup>, Pistarino MA<sup>6</sup> and de Moraes Filho GB<sup>7</sup>

<sup>1,2</sup>Anesthesiologist of Hospital Clínicas Municipal de São Bernardo do Campo, Brazil

<sup>3,4</sup>Resident in Anesthesiology of Hospital Clínicas Municipal de São Bernardo do Campo, Brazil

<sup>5,6</sup>Anesthesiology of Hospital Clínicas Municipal de São Bernardo do Campo, Brazil

<sup>7</sup>Master in Labour Economics, UFPB, João Pessoa, PB. Government employee of the State of Paraíba, PB, Brazil

**\*Corresponding author:** Luiz Eduardo Imbelloni, Anesthesiologist of Hospital Clínicas Municipal de São Bernardo do Campo, Brazil, Tel: + 55.83.99962-4101; Email: dr.imbelloni@hotmail.com

**Citation:** Imbelloni LE, Viana EP, Pöttker D, Soares ARA, Miranda Junior MG, et al. (2020) Combined Spinal Epidural Block for Major Orthopedic Surgery in Elderly Patients. Retrospective Analysis of 230 Patients. Emerg Med Trauma. EMTCTJ-100048

**Received date:** 29 May, 2020; **Accepted date:** 16 June, 2020; **Published date:** 22 June, 2020

### Abstract

**Background:** As life expectancy increases, the number of geriatric patients coming for surgery and anesthesia will make up an increasing portion of our practice. The primary aim of orthopedic treatment for these elderly patients can be a return to independent life, that is, independent walking, dressing, toilet functions and eating. This retrospective study with combined spinal-epidural anesthesia for femur and hip surgery in elderly patients from 1998 to 2010, with the aim of determine possible advantages and disadvantages of this technique.

**Methods:** Anesthetic records of 230 patients receiving combined spinal-epidural anesthesia over a 12-year period were analyzed retrospectively. All blockades were performed with patients in the left lateral position. Doses of 0.5% isobaric bupivacaine were administered according to the patient's height. Evaluated parameters were: puncture success, highest level of anesthesia, lower limb motor block, quality of anesthesia, need for additional doses, failures incidence, paresthesia, post-dural puncture headache, cardiovascular changes, mental confusion and delirium.

**Results:** The enrollments of patients 309 were selected and 109 excluded according to the inclusion criteria, making 230 patients retrospectively studied, 66% were female. The mean time for puncture and placement of the catheter was  $3.12 \pm 0.54$  min. The epidural puncture was easy in 179 patients and difficult in 51 patients. In the 230 patients the spinal puncture appeared the CSF with 4.3% of paresthesia. The introduction of the epidural catheter was easy in 185 patients and difficult in 45 patients. The cephalic dispersion was between T12 and T5. Mean isobaric bupivacaine initial dose was  $13.06 \pm 1.59$  mg and total dose was  $15.86 \pm 8.58$  mg, and 17 patients required to supplement the dose. The analgesia provided by anterior and posterior lumbar plexus blocks was  $19 \pm 3$  hours. Hypotension occurred in 10.4% patients and bradycardia in 3.4% patients. Low intensity headache lasting for 3 days has been observed in four patients. Mental confusion occurred in 21 patients. There has been no cauda equina syndrome or transient radicular irritation.

**Conclusion:** This retrospective study with 230 patients and dose of 0.5% isobaric bupivacaine according to height showed that CSE anesthesia technique is effective, safe, produces a stable hemodynamic with provision of prolonging surgical analgesia to any length of time depending upon the duration of surgery, with catheter supplementation in 7.3% of the patients in geriatric patients undergoing major orthopedic surgery.

**Citation:** Imbelloni LE, Viana EP, Pöttker D, Soares ARA, Miranda Junior MG, et al. (2020) Combined Spinal Epidural Block for Major Orthopedic Surgery in Elderly Patients. Retrospective Analysis of 230 Patients. Emerg Med Trauma. EMTCTJ-100048

**Keywords:** Combined spinal-epidural anesthesia; Elderly patients; Orthopedic; Perioperative care; Surgery

## Introduction

Each one of the two kinds of anesthesia practiced on the neuroaxis (spinal or epidural) has its advantages and disadvantages. A concept of combined spinal-epidural anesthesia (CSE) is considered the gold standard for labor analgesia. This technique was first used in 1937 [1]. In 1982 this technique was performed on patients for orthopedic surgeries of the hip and lower limbs and reported as Letter to the Editor [2,3]. CSE anesthesia provides a fast onset of action, efficacy and safety of spinal anesthesia with potential for improving an inadequate block, prolonging duration of transoperative anesthesia and adequate control of postoperative analgesia with the epidural catheter [4-6].

Femur fracture osteosynthesis and hip arthroplasty are common procedures in elderly patients. CSE block is a technique in which spinal anesthesia and epidural catheter are used simultaneously in the same patient. This CSE technique has been used in elderly patients for hip and femur surgery with excellent results, mainly due to hemodynamic stability and the non-need to remain in the intensive care unit [4-6]. In 1986, an epidural needle was described with a small hole behind the tip of the epidural needle (back eye) that allows the entry of a small and long spinal needle used in 500 patients [7]. The spinal needle is inserted into this hole and punctures the duramater. After withdrawing the spinal needle an epidural catheter is introduced through the epidural needle.

The needle to perform CSE block arrived in Brazil in 1990 starting to be used mainly for labor analgesia and elderly orthopedic surgery. In Brazil our group published several articles with the kit for CSE anesthesia [4-6,8]. Thus, we retrospectively assessed the number of CSE technique performed by our study group. Our objectives were to evaluate the use of CSE anesthesia, its efficacy, ease to use and safety over the 12-year period in elderly patients with hip and femur fractures.

## Materials and Methods

After obtaining institutional approval and informed consent from the subjects, this retrospective analysis was conducted the period from June 1998 to December 2010. All patients who submitted to femur osteosynthesis and partial or total hip replacement and received CSE carried out in this period were noted in an Excel spreadsheet designed for this monitoring and were reviewed. Inclusion criteria are shown in **Table I**.

|    |   |
|----|---|
| 1  | More than 60 years of age                                 |
| 2  | Physical status ASA I, II and III                         |
| 3  | No admitted to ICU  |
| 4  | Absence urinary bladder catheter                          |
| 5  | No receiving low molecular weight heparin before surgery  |
| 6  | No receiving spinal or epidural opioids                   |
| 7  | Peripheral nerve block for analgesia pre or postoperative |
| 8  | No history of mental confusion                            |
| 9  | Life compatible with age until fracture                   |
| 10 | Infection at the puncture site                            |
| 11 | Absence of preoperative hypovolemia                       |

**Table I:** Inclusion Criteria for Surgery.

Patients' demographic profiles, ASA physical status, comorbidities and clinical outcome were noted. Details of the CSE block, performance parameters, duration of surgery, intraoperative hemodynamic status and the usage of vasopressor and atropine were obtained from the anesthesia records. Associated diseases and drugs in use were also recorded.

No patient was premedicated. Monitoring in the operating room consisted of continuous ECG in CM5, non-invasive blood pressure and pulse oximetry. All patients had an upper limb vein punctured with an 18G venous catheter and a 3 L/min oxygen catheter or Hudson mask installed. After venous puncture, patients were given intravenous midazolam (0.5-1 mg). To place the patient in the blockade position, 0.1 mg/kg dextroketamine IV were injected, or anterior plexus lumbar blockade was performed in the position of dorsal decubitus, inguinal lumbar plexus block with neurostimulator (HNS12) and needle A50 and after quadriceps muscle contraction was injected 20 mL of 2% lidocaine with epinephrine 1:200.000 + 20 mL of 0.5% bupivacaine for preventive analgesia and placement in the spinal anesthesia position. In patients operated for partial or total hip arthroplasty, they received dextroketamine and posterior lumbar plexus block with 40 mL of 0.25% bupivacaine for postoperative analgesia with neurostimulator and needle A100 at end of surgery. Analgesia time was assessed.

With patients in the left lateral position, epidural puncture was paramedially performed at L2-L3 or L3-L4 interspace using the loss of resistance to air technique using a single interspace (Espocan®, B. Braun, Melsungen, Germany). Then, a 27G spinal anesthesia needle (Spinocan® 125 mm) was introduced through the Tuohy needle (Perican® 88 mm), and, after CSF return, 0.5% isobaric bupivacaine was injected in a dose depending on patient's height: <150 cm 10 mg, between 151 to 160 cm 12.5 mg and > 161 cm 15 mg 0.5% isobaric bupivacaine. If there was a need for complementation, 25 mg of 0.5% bupivacaine would be injected through the epidural catheter. After removing the spinal needle, the catheter was inserted into the epidural space of 3 - 5 cm in the cephalic direction. The following data were recorded: time taken for catheter insertion, perception of dural puncturing by spinal needle, difficulty of technique ("easy", "difficult", "impossible" or "perforation duramater"), highest level of sensory blockade, quality of motor blockade according to the Bromage scale, incidence of paresthesia, duration of the surgical procedure and neurologic complications. In case of pain or inadequate level, 25 mg of 0.5% bupivacaine were injected through the epidural catheter, until problem correction, which was removed at the end of surgery.

If accidental dural puncture were to occur during attempts to use an epidural approach with Tuohy needles, the catheter would have to be introduced into the subarachnoid space and such patients would be excluded from the study. In the event of failure to access the epidural space within 15 minutes, single-shot spinal anesthesia would be administered with 15 mg of 0.5% isobaric bupivacaine and such patients would be excluded.

Hypotension (defined as a 30% decrease in systolic blood pressure, in comparison with preoperative control levels) was treated with ethylphenylephrine 1 mg intravenously. Bradycardia (defined as HR less than 50beats/min) was treated with atropine

**Citation:** Imbelloni LE, Viana EP, Pöttker D, Soares ARA, Miranda Junior MG, et al. (2020) Combined Spinal Epidural Block for Major Orthopedic Surgery in Elderly Patients. Retrospective Analysis of 230 Patients. *Emerg Med Trauma*. EMTCTJ-100048

0.5 mg intravenously. The patients were followed up by telephone regarding the appearance of cauda equina syndrome or transient neurological symptoms.

### Statistical Analysis

The results were evaluated by the descriptive analysis of studied variables (frequencies, percentages, scatter plots and concentration ellipses) and, when possible, by the mean and standard deviation. For the association between two qualitative variables, Kendall's tau-b statistic was used. This simple *chi-square* calculator tests for association between two categorical variables.

### Results

Three hundred and thirty-nine patients underwent orthopedic surgery using CSE anesthesia during 12 years of the studied period. After using the exclusion criteria 230 patients were included in the final study. Patient recruitment and flow are summarized in **Figure 1**. Of these, 152 (66%) were females. Demographics data are shown in **Table II** and **Figure 2**. Mean isobaric bupivacaine initial dose was  $13.06 \pm 1.59$  mg and total dose was  $15.86 \pm 8.58$  mg. The analgesia provided by anterior and posterior lumbar plexus blocks was  $19 \pm 3$  hours.

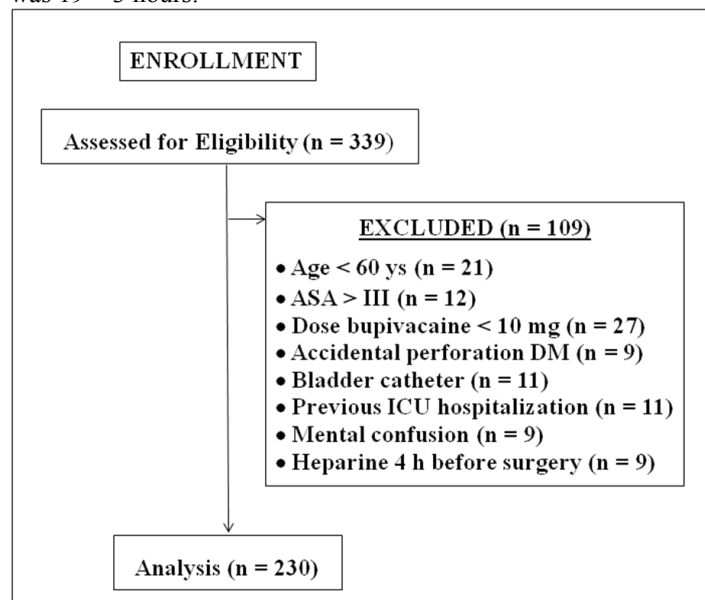


Figure 1: Consolidated Standards of Reporting Trials (CONSORT) flow diagram.

|                                   |                   |
|-----------------------------------|-------------------|
| Age (years)                       | $75.15 \pm 8.48$  |
| Weight (kg)                       | $67.72 \pm 11.83$ |
| Height (cm)                       | $162.62 \pm 7.88$ |
| Gender: Male/Female               | 78/152            |
| Physical status: ASA I / II / III | 27/173/20         |

Table II: Demographics Data.

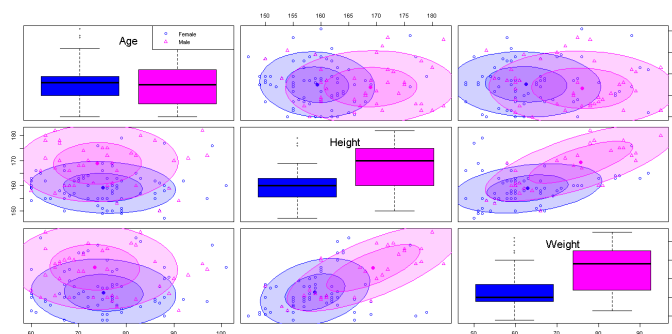


Figure 2: Age, weight and height distribution in 230 patients.

All of these CES anesthesia were carried with the 27G cut spinal needle, Tuohy epidural needle and epidural catheter. The time to perform CSE anesthesia was  $3:12 \pm 0:54$  minutes and the duration of surgery was  $2:12 \pm 0:34$  hours (1:10 to 3:45 hours). In 179 patients, epidural puncture with Tuohy needle was easy and in 51 patients it was difficult. The introduction of the spinal cut needle resulted in the appearance of CSF in all 230 patients with an incidence of paresthesia 4.3% of the patients. The introduction of the epidural catheter was easy in 185 patients and difficult in 45 patients and no paresthesia occurred (**Table III**).

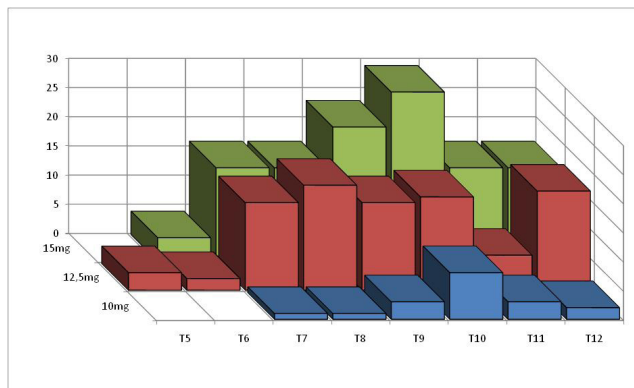
| Characteristics             | CSE             |
|-----------------------------|-----------------|
| Performance time (minutes)  | $3:12 \pm 0:54$ |
| (Extremes) (minutes)        | (1:35 to 7:35)  |
| Duration of surgery (hours) | $2.17 \pm 0.82$ |
| (Extremes) (hours)          | (1:10 to 3:45)  |
| Epidural puncture           | 230             |
| Easy                        | 179 (77.8%)     |
| Difficult                   | 51 (22.2%)      |
| Spinal puncture             | 230             |
| Easy                        | 230 (100%)      |
| Difficult                   | 0               |
| CSF                         | 230 (100%)      |
| Paresthesia                 | 10 (4.3%)       |
| Catheter insertion          | 230             |
| Easy                        | 185 (80.4%)     |
| Difficult                   | 45 (19.6%)      |
| Paresthesia                 | 0               |

Table III: CSE anesthetic characteristics in orthopedic surgery in 230 Patients.

Due to the injection of local anesthetic in the subarachnoid space and subsequently the catheter in the epidural space, the onset

of anesthesia was not evaluated. During the procedure, there was no block failure. In 17 (7.3%) of the patients, there was a need for supplementation with local anesthetic through the epidural catheter. There was no need for supplementation with general anesthesia in any patient.

The cephalic dispersion of anesthesia was observed between T12 and T5 and the mode obtained was in T10 (Table IV). Using Kendall's tau-b test, there was no significant correlation between the initial dose used and the cephalic sensory level of the block (Figure 3).



**Figure 3:** Correlation between the initial dose and the cephalic dispersion (Barblot).

In 213 patients, the dose programmed according to height was sufficient to perform the procedure. There was a need for a supplementary dose in 17 patients due to the level and/or insufficient time to perform the surgery. Maximum motor block (Bromage 3) was observed in 223 patients. The initial degrees of motor block are shown in Table IV.

| Characteristics    | CSE        |
|--------------------|------------|
| Sensory level      | 230        |
| - T12              | 35 (15.3%) |
| - T11              | 25 (10.8%) |
| - T10              | 53 (23.0%) |
| - T9               | 41 (17.8%) |
| - T8               | 35 (15.3%) |
| - T7               | 32 (13.9%) |
| - T6               | 6 (2.6%)   |
| - T5               | 3 (1.3%)   |
| - Mode             | T10        |
| <b>Motor block</b> | <b>230</b> |
| - Grade 3          | 223 (97%)  |
| - Grade 2          | 7 (3%)     |
| - Grade 1          | 0          |
| - Grade 0          | 0          |

**Table IV:** Cephalic dispersion of anesthesia and degrees of motor block.

Arterial hypotension was observed in 24 patients (10.4%) and bradycardia in 8 patients (3.4%) who required treatment with vasopressors and atropine. The chi-square suggests there is not significantly associated between initial dose of isobaric bupivacaine with bradycardia (p-value=0.1226) or with hypotension (p-value=0.511). Low-intensity headache and lasting three days was observed after CSE anesthesia in four patients (1.7%). Twenty-one (9.1%) patients presented postoperative mental confusion. The chi-square test suggests that there is no significant association between the initial dose with headache (p-value=0.6206), between the initial dose and paresthesia (p-value=0.1059) and neither between the initial dose and mental confusion (p-value=0.8263).

All catheters were removed at the end of the surgery and there was no presence of CSF in the dressing. There was no case of cauda equina syndrome or transient neurological symptoms. Most patients had multiple comorbidities. The most common comorbidities are hypertension (33%), diabetes mellitus (9%), moderate kidney disease (5%), chronic pulmonary disease (5%) and congestive cardiac failure (2%). Fourteen Jehovah's Witnesses' patients participated in the study, no need for blood transfusion.

## Discussion

Spinal anaesthesia is widely used in elderly orthopedic surgery. Spinal single shot, continuous spinal anesthesia and combined spinal epidural technique (needle-through needle technique or two needles in different interspaces) is gaining popularity in modern anesthesia practice [4-6,8]. The set for continuous spinal anesthesia was discontinued by the company [9], so the use of CSE block can adequately replace this technique in elderly patients over 60 years of orthopedic femur and hip surgery with safety and low incidence of hypotension and without complications neurological. The epidural catheter was used only during the surgical procedure and proved to be effective in correcting the spinal anesthesia, level complementation and insufficient time of sensory or motor block. The epidural catheter was removed at the end of the surgery as the analgesia was obtained with block of the lumbar plexus via the anterior before the block or psoas compartment at the end of the surgery, lasting 19 hours.

Combined spinal-epidural block is a technique in which spinal anesthesia and the catheter epidural are simultaneously used in the same patient. This technique is winning popularity in orthopedic surgery due to the fast block produced spinal anesthesia while the epidural catheter provides flexibility to extend and prolong the perioperative block and provide analgesia postoperative. The association of the two techniques can be accomplished using one or two intervertebral spaces [4,5].

The average time to install the CSE set was 3:12 minutes, slightly longer than 2:42 minutes [5] and 2:90 minutes [8] in previous publications. The insertion of the epidural catheter was easy in 80.4% of the patients and difficult in 19.6% of the patients. The epidural catheter was sufficient to supplement anesthesia due to insufficient level or time in 17 (7.3%) patients, with no need for supplementation with general anesthesia in any patient. All catheters were removed at the end of the surgical procedure without problems.



The level of sensory and motor block was easily obtained with the recommended doses according to the patients' height. The mode of cephalad dispersion of analgesia at these doses remained at T10, the same obtained with lower doses [8]. Likewise, complete motor block (grade 3) was 96.9%, slightly higher than 93.9% with lower doses [8]. The level of final sensory block was not assessed, as there could be need for subsequent doses without what occurred in 7.3% of patients. However, it is known that the injection of saline or local anesthetic increases the cephalad dispersion of analgesia and also the degree of motor block [10]. In the 17 patients where the injection of bupivacaine in the epidural catheter was necessary, the cephalic dispersion of this injection was not evaluated. Unlike other authors who used sequential combined spinal epidural anesthesia [11,12], our retrospective CSE anesthesia was performed with doses of 10 to 15 mg 0.5% isobaric bupivacaine and the catheter used only for complementation in 7.3% of patients for improvement in quality anesthesia or prolonged surgery time.

In elderly patients, mental confusion may occur in a transient manner and its etiology is unknown. Different studies of elderly patients with hip or hip fractures were unable to correlate mental confusion with the technique employed. There are several factors that can affect the incidence of mental confusion or delirium, including postoperative pain [13]. It is known that regional anesthesia provides better quality and fewer incidences in the treatment of postoperative pain and this can contribute to the reduction of mental confusion. Despite the use of CES blockade, postoperative analgesia was performed with lumbar plexus block before or after blockade with bupivacaine providing 19-hour analgesia. Mental confusion incidence was 9.1% slightly higher than the 6.3% in the previous article [6] and disappeared within 1 or 2 postoperative days.

Potential problems with needle though needle-single interspace technique as failure to obtain CSF was not observed, difficulty in introducing epidural catheter was observed in 19.5% of cases, and migration of the epidural catheter to the intravascular space or subarachnoid catheter migration was not observed in retrospectively 230 cases.

In 2020 the incidence of elderly people over 60 is 11.1% men and 14% women [14]. In this study with patients over 60 years old and hip and hip fractures 66% of the population were women, showing a predominance of this gender in this pathology. Results similar to 62% [6], 65% [8] and 67% [6] of other published articles.

## Conclusion

The number of patients not studied or excluded from the study is high. A retrospective analysis of data collected for a purpose other than the specific study intent has methodological limitations [15]. From the results of retrospective study with 230 patients and dose of 0.5% isobaric bupivacaine according to height, we concluded that CSE anesthesia technique is effective, safe, produces a stable hemodynamic with provision of prolonging surgical analgesia to any length of time depending upon the duration of surgery. With the recommended doses, the use of the epidural catheter was necessary in 17 (7.3%) of the patients in geriatric patients undergoing major orthopedic surgery.

## References

1. Soresi AL (1937) Episubdural anesthesia. *Anesth Analg* 16: 306-310.
2. Coates MB (1982) Combined subarachnoid and epidural techniques. Letter to Editor. *Anaesthesia* 32: 89-90.
3. Mumtaz MH, Daz M, Kuz M (1982) Another single space technique for orthopaedic surgery. Letter to Editor. *Anaesthesia* 32: 90.
4. Imbelloni LE, Gouveia MA, Carneiro JA (1998) Continuous spinal anesthesia versus combined spinal epidural block for major orthopedic surgery: prospective randomized study. *Rev Bras Anesthesiol* 48: 177-183.
5. Imbelloni LE and Gouveia MA (2000) Comparison between continuous spinal anesthesia with around-needle catheter and combined spinal-epidural anesthesia for orthopedic surgery. *Rev Bras Anesthesiol* 50: 419-424.
6. Imbelloni LE and Beato L (2002) Comparison between spinal, combined spinal-epidural and continuous spinal anesthesia for hip surgeries in elderly patients. A retrospective study. *Rev Bras Anesthesiol* 52: 316-325.
7. Hanaoka H (1986) Experience in the use of Hanaoka's needles for spinal-continuous epidural anaesthesia (500 cases). Abstracts, 7<sup>th</sup> Asian-Australasia Congress of Anaesthesiologists, Hong Kong. *Excerpta Med Asia Pacific Congr Serv*.
8. Imbelloni LE, Gouveia MA, Cordeiro JA (2009) Continuous spinal anesthesia versus combined spinal epidural block for major orthopedic surgery: prospective randomized study. *São Paulo Med J* 127: 7-11.
9. Imbelloni LE, Gouveia MA, Moraes Filho GB, Sakamoto JW, Viana EP, et al. (2020) Continuous spinal anesthesia with Spinocath® catheter. A retrospective analysis of 455 orthopedic elderly patients in the past 17 years. *Orthop & Spo Med Op Acc J*.
10. Salman C, Kayacan N, Ertugruel F, Bigat Z, Karsl B (2013) Combined spinal-epidural anesthesia with epidural volume extension causes a higher level of block than single-shot spinal anesthesia. *Rev Bras Anesthesiol* 63: 267-272.
11. Barsgade WS, Ankalwar VR, Harde YR (2019) Sequential combined spinal epidural anesthesia (CSEA): A safe choice for elderly patients posted for major orthopedic surgery. *Med Pulse International Journal of Anesthesiology* 12: 15-19.
12. Bhattacharya D, Tewari I, Chowdhuri S (2007) Comparative study of sequential combined spinal epidural anaesthesia versus spinal anaesthesia in high risk geriatric patients for major orthopaedic surgery. *Indian J Anaesth* 51: 32-36.
13. Rizk P, Morris W, Oladeji P, Huo M (2016) Review of postoperative delirium in geriatric patients undergoing hip surgery. *Geriatric Orthopaedic Surgery & Rehabilitation* 7: 100-105.
14. Presidency of the Republic. Human Rights Secretariat. General Coordination of the Rights of the Elderly, Brazil.
15. Hoffman RS (2007) Understanding the limitations of retrospective analyses of poison center data (Editorial). *Clinical Toxicology* 45: 943-945.

**Citation:** Imbelloni LE, Viana EP, Pöttker D, Soares ARA, Miranda Junior MG, et al. (2020) Combined Spinal Epidural Block for Major Orthopedic Surgery in Elderly Patients. Retrospective Analysis of 230 Patients. *Emerg Med Trauma*. EMTCTJ-100048