Al-Azhar Med. J. *Vol. 49(1), January, 2020, 197-208*
DOI : 10.12816/amj.2020.67550
https://amj.journals.ekb.eg/article_67550.html

COMPARATIVE STUDY BETWEEN CONTINUOUS SPINAL ANESTHESIA AND COMBINED SPINAL EPIDURAL ANESTHESIA IN KNEE ARTHROPLASTY

By

Sayed Ahmed Abd El-Ali, Amr Soliman Abd El-Magid and Abd Allah Ahmed Abd El-Sadek Sayed*

Department of Anesthesiology and Intensive Care, Faculty of Medicine, Al-Azhar University

***Corresponding Author:** Abd Allah Ahmed Abd El-Sadek Sayed,

Email: doctorxp2000@gmail.com

ABSTRACT

Background: Continuous spinal anesthesia (CSA) and combined spinal epidural anesthesia (CSE) are safe and reliable anesthesia methods in knee arthroplasties.

Objectives: This study aimed at comparing the efficacy and hemodynamic changes of CSA technique versus single interspace CSE technique in knee arthroplasties intra & postoperatively, and the potential adverse effects for both techniques.

Patients and Methods: After approval of Institutional ethical committee and obtaining written informed consents, forty patients aged 18 to 55 years of both sexes and American Society of Anesthesiologists (ASA) class I, II, were scheduled for elective knee arthroplasties. All Patients were assigned randomly by using a computerized program to one of the two equal groups:

Group CSA: Patients undergoing elective knee arthroplasty received continuous spinal anesthesia.

Group CSE: Patients undergoing elective knee arthroplasty received single interspace combined spinal epidural anesthesia.

The following parameters were assessed:

Hemodynamics: including heart rate and systolic (SBP) and diastolic arterial blood pressures (DBP), and percentage of oxygen saturation (SpO2) were obtained then recorded at 5th, 15th, 30 minutes, and at 1st, 2nd, 4th hours intra-operatively till the end of surgery. Postoperatively, they were obtained at 0, 1 hour and every four hours for first 24 hours.

Anesthetic complications: PDPH, urine retention, and Postoperative nausea and vomiting (PONV). Postoperative pain was evaluated at rest using a 10-cm Visual analogue scale (VAS) (0 cm=no pain; 10 cm=worst pain possible) and pain scores were recorded at 30 min and 1st, 2nd, 4th, 6th, 12th and 24th hours post-operatively. This prospective randomized clinical trial study was conducted at Al- Azhar University Hospitals (Al- Hussein and Bab-Al-Shaarya) at the orthopedics operating theatre from March 2019 till September 2019.

Results: No significant difference between the two groups regarding the length of surgery, hypoxia, post-operative nausea and vomiting (PONV), post-operative pain score. The application time of the anesthetic technique was significantly shorter in the CSA group than CSE group. The heart rate was significantly higher in the CSE group at 1st minutes while SBP and DBP were significantly lower in the CSE group at 1st minutes

than the CSA group. Post dural puncture headache (PDPH), and urine retention was significantly higher in the CSA group than the CSE group. PDPH occurred in 35% of the CSA group compared to 10 %. Urine retention occurred in 25% of the CSA group compared to 5% of the CSE group. The total dose of bupivacaine (0.5%) collectively given intra-operatively and morphine postoperatively were significantly lower in the CSA group than the CSE group.

Conclusion: The study revealed that CSA and CSE were both effective and safe techniques for knee arthroplasties with superiority of CSA in hemodynamic stability intraoperative at 1st minutes of surgery. CSA offered many advantages over epidural anesthesia by using smaller anesthetic dose with rapid onset and recovery of motor and sensory blockade with better cardiovascular stability than CSE.

Keywords: Anesthesia, spinal, epidural, Knee arthroplasties.

INTRODUCTION

Continuous spinal anesthesia appears to be a safe and appropriate anesthetic technique in lower leg surgeries *(Lux, 2012).*

Continuous spinal anesthesia (CSA) is the technique of producing and maintaining spinal anesthesia with small doses of local anesthetic which are injected intermittently into the subarachnoid space via an indwelling catheter *(Alonso et al., 2009).*

CSA provided better cardiovascular stability with a smaller anesthetic dose *(Imbelloni et al., 2009).*

Continuous spinal anesthesia has clear advantages over epidural and single shot spinal anesthesia *(Tao et al., 2015).*

CSA provides a number of potential advantages over other forms of anesthesia including hemodynamic stability and extended analgesia *(Palmer, 2010).*

Whereas traditional single-shot spinal anesthesia usually involves larger doses, afinite, unpredictable duration, and greater potential for detrimental hemodynamic effects including hypotension, and epidural anesthesia via a catheter may produce lesser motor block and suboptimal anesthesia in sacral nerve root distributions *(Moore, 2009).*

This work was aiming to compare the efficacy & hemodynamic changes of continuous spinal anesthesia technique versus combined spinal epidural technique in knee arthroplasties intra and postoperatively, and the potential adverse effects for both techniques.

PATIENTS AND METHODS

After approval of Institutional ethical committee and obtaining written informed consent, forty patients aged from 18 to 55 years, of both sexes classified according to American Society of Anesthesiologist (ASA) I and II, scheduled for elective knee arthroplasties were included in the study, this prospective randomized clinical trial study was conducted at Al-Azhar University Hospitals (Al- Hussein and Bab-Al-Shaarya), at the orthopedics operating theatre from March 2019 till September 2019.

All Patients were assigned randomly by using a computerized program to one of the two equal groups:

Group CSA: Patients who received continuous spinal anesthesia.

Group CSE: Patients who received combined spinal epidural anesthesia.

Exclusion criteria:

1. Uncooperative patients.

2. Patients with known hypersensitivity to local anesthetics.
3. Infection at the injection site.
4. Coagulopathy.
5. Pre-existing peripheral nerve neuropathies.
6. Sepsis.
7. Severe hypovolemia.
8. Increased intracranial pressure.

Basic Monitoring: included electrocardiogram (ECG), pulse-oximetry (SpO2), and non-invasive blood pressure (NIBP) to all the patients, starting before anesthesia till the end of the surgery and recovery.

Anesthetic Techniques: All blockades were performed in the L3-L4 interspace with the patient in the sitting position. For CSA group, patients were in the sitting position. Under full aseptic precautions the intervertebral space was identified and an 18-G Tuohy needle was advanced through the epidural space until cerebrospinal fluid was observed. Then, the spinal catheter was advanced 6 cm into the subarachnoid space and was fixed using a sterile tape.1 ml isobaric bupivacaine 0.5% and 0.5 ml of fentanyl (25 μg) was injected intrathecally over 30 seconds through catheter. Patients were turned to supine position after 5 min.

In CSE group, it was performed by using a single interspace. The blockade was consisted of performing a spinal block via a 25- G spinal needle that was introduced paramedian, 3 ml plain bupivacaine 0.5% and 0.5 ml fentanyl (25 μg) was injected intrathecally over 30 seconds via the spinal needle while the patients in the sitting position, then The Tuohy needle 18 G was inserted median at the same space till reached epidural space which was identified by loss of resistence to air from a syringe connected to Tuohy needle through epidural space, then the epidural catheter was introduced 6 cm into the epidural space and was fixed using a sterile tape. Patients were turned to supine position.

In both groups, the motor block level was evaluated with the Modified Bromage scale (scale 0 = full flexion of foot, knee and hip, i.e. no motor block; scale 1 = full flexion of foot and knee, unable to hip flexion; scale 2 = full flexion of foot, unable to knee and hip flexion; scale 3 = total motor block; unable to foot, knee, and hip flexion) three times with an interval of 5 minutes.

In both groups, the catheter was left in position for administration of post-operative analgesia. 0.2 mg morphine was injected intrathecaly at the end of surgery for CSA group slowly for postoperative analgesia, while 4mg morphine was injected at the end of surgery for CSE group through epidural catheter for postoperative analgesia. In cases of insufficient analgesia another dose of 0.1 mg and 2 mg morphine will be injected in CSA and CSE groups consecutively.

Statistical analysis:

Data were analyzed using Statistical Package for Social Science (SPSS) version 20.0. Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

Independent-samples t-test of significance was used when comparing

between two means. Chi-square (X2) test of significance was used in order to compare proportions between two qualitative parameters. The confidence interval was set to 95% and the margin of error accepted was set to 5%. P-value <0.05 was considered significant.

RESULTS

There were no statistically significant differences between the CSA and CSE groups as regards demographic data; Age, Sex or BMI and length of surgery, but as regards the application time of the anesthetic technique, it was significantly shorter in the CSA group when compared to CSE group **(Table 1)**.

Table (1): Comparison between the two groups regarding demographic data, length of surgery and application time of anesthetic technique

Groups / Parameters	Group CSA (N=20)	Group CSE (N=20)	p-value
Age (years)	36.52±7.30	35.50±7.10	>0.05
Sex			
Male	13 (65%)	11 (55%)	>0.05
Female	7 (35%)	9 (45%)	
Body Mass Index	33.2±8.3	34.7±7.90	>0.05
Length of surgery (hours)	3.76±1.34	4.12±0.74	>0.05
Application time of anesthetic technique (min)	6.71±1.68	15.31±3.83	<0.001*****

Data were represented as Mean ± SD.

The heart rate was significantly higher in the CSE group at 5 min and 15 min when compared to CSA group **(Table 2)**.

Table (2): Comparison between the two groups regarding the heart rate (b/min)

Groups / Heart Rate (b/min)	Group CSA (N=20)	Group CSE (N=20)	p-value
Preoperative	63.05±5.73	63.68±5.79	>0.05
Intraoperative			
At 5 min.	88.20±8.02	92.61±8.10	0.020*****
At 15 min.	102.90±9.35	108.05±9.45	0.021*****
At 30 min.	98.00±8.91	98.98±9.00	>0.05
At 1 hr.	89.91±8.17	90.81±8.26	>0.05
At 2 hr.	89.82±8.17	90.72±8.25	>0.05
At 4 hr.	89.73±8.16	90.63±8.24	>0.05
Post-operative in [PACU]			
At 0 hr.	89.55±8.14	90.45±8.22	>0.05
At 1 hr.	89.46±8.13	90.35±8.21	>0.05
At 4 hr.	89.37±8.12	90.26±8.21	>0.05
At 8 hr.	89.28±8.12	90.17±8.20	>0.05
At 12 hr.	89.19±8.11	90.08±8.19	>0.05
At 16 hr.	89.10±8.10	89.99±8.18	>0.05
At 20 hr.	89.09±8.10	89.98±8.18	>0.05
At 24 hr.	89.01±8.09	89.90±8.17	>0.05

Data were represented as Mean ± SD

As regard SBP, it was significantly lower in the CSE group at 5 min and 15 min when compared to the CSA group **(Table 3)**.

Table (3): Comparison between the two groups regarding the changes in systolic blood pressure

Groups / Systolic blood pressure (mmhg)	Group CSA (N=20)	Group CSE (N=20)	p-value
Preoperative	121.25±8.66	120.04±8.75	>0.05
Intraoperative			
At 5 min.	97.00±6.93	92.15±7.00	0.015*****
At 15 min.	98.00±7.00	93.10±7.07	0.018*****
At 30 min.	122.50±8.75	121.28±8.84	>0.05
At 1 hr.	124.88±8.92	123.63±9.01	>0.05
At 2 hr.	124.75±8.91	123.50±9.00	>0.05
At 4 hr.	124.63±8.90	123.38±8.99	>0.05
Post-operative in [PACU]			
At 0 hr.	124.38±8.88	123.13±8.97	>0.05
At 1 hr.	124.25±8.88	123.01±8.96	>0.05
At 4 hr.	124.13±8.87	122.88±8.95	>0.05
At 8 hr.	124.00±8.86	122.76±8.95	>0.05
At 12 hr.	123.88±8.85	122.64±8.94	>0.05
At 16 hr.	123.75±8.84	122.51±8.93	>0.05
At 20 hr.	123.74±8.84	122.50±8.93	>0.05
At 24 hr.	123.63±8.83	122.39±8.92	>0.05

Data were represented as Mean ± SD

As regard DBP, it was significantly lower in the CSE group at 5 min and 15 min when compared to the CSA group **(Table 4)**.

Table (4): Comparison between the two groups regarding the changes in the diastolic blood pressure

Groups / Diastolic Blood pressure (mmHg)	Group CSA (N=20)	Group CSE (N=20)	p-value
Preoperative	72.75±5.20	72.02±5.25	>0.05
Intraoperative			
At 5 min.	63.05±4.50	59.90±4.55	0.034*****
At 15 min.	63.70±4.55	60.52±4.60	0.034*****
At 30 min.	73.50±5.25	72.77±5.30	>0.05
At 1 hr.	74.93±5.35	74.18±5.41	>0.05
At 2 hr.	74.85±5.35	74.10±5.40	>0.05
At 4 hr.	74.78±5.34	74.03±5.39	>0.05
Post-operative in [PACU]			
At 0 hr.	74.63±5.33	73.88±5.38	>0.05
At 1 hr.	74.55±5.33	73.80±5.38	>0.05
At 4 hr.	74.48±5.32	73.73±5.37	>0.05
At 8 hr.	74.40±5.31	73.66±5.37	>0.05
At 12 hr.	74.33±5.31	73.58±5.36	>0.05
At 16 hr.	74.25±5.30	73.51±5.36	>0.05
At 20 hr.	74.24±5.30	73.50±5.36	>0.05
At 24 hr.	74.18±5.30	73.43±5.35	>0.05

Data were represented as Mean ± SD

There was no statistically significant difference between the two groups as regards the percentage of oxygen saturation (SpO2%) **(Table 5)**.

Table (5): Comparison between the two groups regarding the percentage of oxygen saturation (SpO2%)

Groups / SpO2 %	Group CSA (N=20)	Group CSE (N=20)	p-value
Preoperative	93.12±3.10	93.03±3.10	>0.05
Intraoperative			
At 5 min.	93.12±3.10	93.03±3.10	>0.05
At 15 min.	94.08±3.14	93.99±3.13	>0.05
At 30 min.	94.08±3.14	93.99±3.13	>0.05
At 1 hr.	95.90±3.20	95.81±3.19	>0.05
At 2 hr.	95.81±3.19	95.71±3.19	>0.05
At 4 hr.	95.71±3.19	95.62±3.19	>0.05
Post-operative in [PACU]			
At 0 hr.	95.52±3.18	95.42±3.18	>0.05
At 1 hr.	95.42±3.18	95.33±3.18	>0.05
At 4 hr.	95.33±3.18	95.23±3.17	>0.05
At 8 hr.	95.23±3.17	95.14±3.17	>0.05
At 12 hr.	95.14±3.17	95.04±3.17	>0.05
At 16 hr.	95.04±3.17	94.94±3.16	>0.05
At 20 hr.	95.03±3.17	94.94±3.16	>0.05
At 24 hr.	94.94±3.16	94.85±3.16	>0.05

Data were represented as Mean ± SD

As regarding the incidence of post dural puncture headache (PDPH) and urine retention there were significantly higher in the CSA group than the CSE group, but there were no statically significant differences between the two groups regarding post-operative nausea and vomiting **(PONV-Table 6)**.

Table (6): Comparison between the two groups regarding the incidence of anesthetic complications

Groups / Anesthetic complications	Group CSA (N=20)	Group CSE (N=20)	p-value
PDPH	7 (35%)	2 (10%)	0.042*****
Urine retention	5 (25%)	1 (5%)	0.048*****
PONV	3 (15%)	2 (10%)	>0.05

Data were represented as numbers (N), and percentage (%)

There was no statistically significant difference between the two groups regarding the post-operative pain score **(Table 7)**.

Table (7): Comparison between the two groups regarding the post-operative pain score using visual analogue scale

Groups / Visual analogue scale [Post-operative]	Group CSA (N=20)	Group CSE (N=20)	p-value
At 30 min.	2 (1)	2 (1)	>0.05
At 1 hr.	4 (1)	5 (2)	>0.05
At 2 hr.	5 (2)	4 (1)	>0.05
At 4 hr.	5 (2)	5 (2)	>0.05
At 6 hr.	5 (2)	5 (1)	>0.05
At 12 hr.	4 (1)	4 (2)	>0.05
At 24 hr.	2 (1)	2 (1)	>0.05

Data was represented as Median (Interquartile range)

The total dose of bupivacaine 0.5% mg collectively given intraoperative and morphine postoperatively was significantly lower in the CSA group than the CSE group **(Table 8)**.

Table (8): Comparison between the two groups regarding the total dose of bupivacaine 0.5% and Morphine

Groups / Total Dose	Group CSA (N=20)	Group CSE (N=20)	p-value
Bupivacaine 0.5 % (mg)	6.63±2.88	20.11±5.37	<0.001*
Morphine (mg)	0.22±0.05	4.5±1.07	<0.001****

Data was represented as Mean ± SD

DISCUSSION

CSA and CSE are both effective and safe techniques for knee arthroplasty with superiority of CSA in hemodynamic stability intraoperative at 1st minutes of surgery according to this study.

The results of this study are in agreement with *Lux et al. 2012* and they concluded that continuous spinal anesthesia appears to be a safe and appropriate anesthetic technique in lower leg surgeries.

This study revealed that CSA technique is easier to perform than CSE, also the intrathecal positioning of the catheter is easily confirmed by aspiration of cerebrospinal fluid. However, continuous spinal anesthesia has potential complications: worsening hypotension in situation of major blood loss, myocardial ischemia, post dural puncture headache, persistent paresthesia, low back pain, and risk of infection *Lux (2012)*.

In the CSE technique, spinal anesthesia and epidural catheter placement are performed sequentially in the patient. This has gained popularity because of the short onset time of spinal anesthesia, while the catheter provides flexibility to allow the blockade to be extended when needed.

However, use of CSE anesthesia or analgesia also introduces the potential for complications, such as technical failure, altered spread of epidural drugs in subarachnoid space *Stamenkovic et al. (2012)*.

In this study, there were no statistically significant differences between the CSA

and CSE groups as regards demographic data; Age, Sex or BMI. According to the application time of the anesthetic technique, there was significantly lower in the CSA group when compared to CSE group.

In the current study, according to the heart rate, there was significantly higher in the CSE group at 5 min and 15 min when compared to CSA group. As regard SBP and DBP, there was significantly lower in the CSE group at 5 min and at 15 min compared to the other group. These results came in agreement with the findings of the study done by *Imbelloni and Colleagues. (2009)* which compared CSA with combined spinal epidural block, CSA provided better cardiovascular stability with a smaller anesthetic dose.

There were statistically significant differences between the two groups regarding the incidence of post dural puncture headache (PDPH), and urine retention. PDPH occurred in 35% of the CSA group which was significantly higher than the CSE group where it occurred in 10% cases. These results came in agreement with *Palmer (2010)* and *Radke et al. (2013).*

In the current study, urine retention occurred in 25% of the CSA group which was significantly higher than the other group where it occurred in 5% of cases. The incidence of post-operative nausea and vomiting (PONV) occurred in 15% of the CSA group and 10 % of the CSE group. This difference has no statistically significant difference between the two groups.

There was no statistically significant difference between the two groups regarding the postoperative pain score. Several works have shown the benefits of regional anesthesia when it is extended to the postoperative period *Imbelloni et al. (2009)* and *Lux (2012).*

A single preoperative intrathecal morphine injection controls the pain equally for the first 24 hours with less pruritus and with less adverse events. *Milbrandt et al. (2009).* Intrathecal morphine dose higher than 0.3 mg has a risk of respiratory depression. *Bujedo (2014).*

CSA allows titration of the local anesthetic dose which allows controlling the level of the sensory and motor blockade according to surgical needs and provides safe anesthesia (*Jaitly et al. 2009).*

The current study did not assess the quality of the patients' hospital stay postoperatively, and the degree of patients' satisfaction.

CONCLUSION

CSA and CSE were both effective and safe techniques for knee arthroplasties, but CSA offered many advantages over epidural anesthesia by using smaller anesthetic dose with rapid onset and recovery of motor and sensory blockade with better cardiovascular stability than CSE. CSE seemed to be particularly useful in ambulatory surgery, because it facilitated early patient ambulation and discharge to home.

REFERENCES

1. **Alonso, E., Gilsanz, F., Gredilla, E., Martinez, B., Canser, E., and Alsina, E. (2009):** Observational study of continuous spinal anesthesia with the catheter-over-needle technique for cesarean delivery.

International Journal of Obstetric Anesthesia, 18(2): 137-141.

2. **Bujedo, B. M. (2014):** Spinal opioid bioavailability in postoperative pain. Pain Practice, 14(4): 350-364.
3. **Imbelloni, L. E., Gouveia, M. A. and Cordeiro, J. A. (2009):** Continuous spinal anesthesia versus combined spinal epidural block for major orthopedic surgery: prospective randomized study. Sao Paulo Medical Journal, 127(1): 7-11.
4. **Jaitly, V. K., and Kumar, C. M. (2009):** Continuous spinal anaesthesia for laparotomy. Current Anaesthesia and Critical Care, 20(2): 60-64.
5. **Lux EA (2012):** Continuous spinal anesthesia for lower limb surgery: a retrospective analysis of 1212 cases. Local and Regional Anesthesia, 5:63–67.
6. **Milbrandt, T. A., Singhal, M., Minter, C., McClung, A., Talwalkar, V. R., Iwinski, H. J. and Sucato, D. J. (2009):** A comparison of three methods of pain control for posterior spinal fusions in adolescent idiopathic scoliosis. Spine, 34(14): 1499-1503.
7. **Moore, J. M. (2009):** Continuous spinal anesthesia. American Journal of therapeutics, 16(4): 289-294.
8. **Palmer CM (2010):** Continuous Spinal Anesthesia and Analgesia in Obstetrics. Anesthesia and Analgesia, 111(6): 1476-1479.
9. **Radke K, Radke OC (2013):** Post-dural puncture headache. Anaesthesist, 62:149-161
10. **Stamenkovic, D. and Karanikolas, M. (2012):** Combined spinal epidural anesthesia and analgesia. Epidural Analgesia-Current Views and Approaches. Croatian: In Tech: 115-134.
11. **Tao, W., Grant, E. N., Craig, M. G., McIntire, D. D. and Leveno, K. J. (2015):** Continuous spinal analgesia for labor and delivery: an observational study with a 23-gauge spinal catheter. Anesthesia and Analgesia, 121(5): 1290-1294.

دراسة مقارنة بين التخدير النصفي المستمر تحت الأم العنكبوتية والتخدير النصفي المزدوج تحت الأم العنكبوتية و فوق الأم الجافية في جراحات تقويم مفصل الركبة

سيد احمد عبد العلي، عمرو سليمان عبد المجيد، عبد الله احمد عبد الصادق

قسم التخدير والرعاية المركزة، كلية الطب، جامعة الازهر

خلفيـــة البحـــث: التخـــدير الشـــوكي المســـتمر والتخـــدير الشـــوكي فـــوق الجافيـــة المشـــترك هما طرق تخدير آمنة وموثوق بها في مفاصل الركبة.

الهـــدف مـــن البحـــث: مقارنـــة الفعاليـــة والتغيـــرات الديناميكيـــة الدمويـــة لتقنيـــة التخـــدير الشـــوكي المســـتمر والتخـــدير الشـــوكي فـــوق الجافيـــة المشـــترك فـــي جراحـــات تقـــويم مفصل الركبة أثناء وبعد العملية الجراحية والآثار الضارة المحتملة لكل منهما.

المرضـــى وطـــرق البحـــث: بعـــد موافقـــة اللجنـــة الأخلاقيـــة المؤسســـية والحصـــول علـــى موافقـــة خطيـــة مـــن المرضـــى، تـــم تضـــمين أربعـــين مريضًـــا لإجـــراء عمليـــات تقـــويم مفاصـــل الركبـــة بشـــكل اختيـــاري تتـــراوح أعمـــارهم بـــين 18 و 55 عامًـــا مـــن كـــلا الجنســـين مـــن الدرجـــة الأولـــى والثانيـــة وفقـــا للجمعيـــة الأمريكيـــة لأطبـــاء التخـــدير، تـــم تعيـــين جميـــع المرضـــى عشـــوائياً باســـتخدام برنـــامج محوســـب لإحـــدى المجمـــوعتين المتساويتين:

- مجموعة من المرضى التي تلقت التخدير الشوكي المستمر.
- مجموعة أخرى تلقت التخدير الشوكي فوق الجافية المشترك.

وقد تم تقييم المعايير التالية:

ديناميكـــا الـــدم: وتشـــمل معـــدل ضـــربات القلـــب وضـــغط الـــدم الشـــرياني الانقباضـــي و الانبســـاطي، ونســـبة تشـــبع الـــدم بالأكســـجين وقـــد تـــم تســـجيلها عنـــد الدقيقـــة الخامســـه و الخامســـة عشـــر والدقيقـــة الثلاثـــون وكـــذلك بعـــد ســـاعه ثـــم ســـاعتين ثـــم اربـــع ســـاعات أثنـــاء العمليـــة الجراحيـــة حتـــى نهايـــة الجراحـــة. بعـــد العمـــل الجراحـــي تـــم

الحصول عليها مباشرة ثم بعد ساعة ثم كل أربع ساعات خلال الاربع وعشرون ساعة الأولى.

مضاعفات التخدير: صداع ما بعد ثقب الأم الجافية، احتباس البول، والغثيان والقيء بعد العملية الجراحية. تم تقييم الألم بعد العملية الجراحية باستخدام مقياس بصري 10 سم 0) (VAS) سم = لا ألم ؛ 10 سم = أسوأ ألم ممكن) وسجلت درجات الألم بعد ثلاثون دقيقة و عند الساعه الاولى والثانية والرابعه والسادسه والثانية عشر والرابعه وعشرون من العملية.

وقد أجريت هذه الدراسة التجريبية العشوائية في مستشفيات جامعة الأزهر (الحسين وباب الشريعة) ، في غرف عمليات جراحة العظام في الفترة من مارس 2019 إلى سبتمبر 2019.

نتائج البحث: لا يوجد فرق كبير بين المجموعتين فيما يتعلق بمدة اجراء العملية الجراحية ، اونقص نسبة الأكسجين بالدم ، اوالغثيان اوالقيء بعد العملية الجراحية ،او درجة الألم بعد العملية الجراحية.كان وقت تطبيق تقنية التخدير أقصر بكثير في مجموعة التخدير الشوكي المستمر من مجموعة التخدير الشوكي فوق الجافية المشترك. كان معدل ضربات القلب أعلى بكثير في مجموعة التخدير الشوكي فوق الجافية المشترك في الدقائق الأولى بينما كان معدل ضغط الدم أقل بشكل ملحوظ في مجموعة التخدير الشوكي فوق الجافية المشترك في الدقائق الأولى من مجموعة التخدير الشوكي المستمر. كان صداع ما بعد ثقب الام الجافية ، واحتباس البول أعلى بكثير في مجموعة التخدير الشوكي المستمر من مجموعة التخدير الشوكي فوق الجافية المشترك ، حدث صداع ما بعد ثقب الام الجافية في (35 ٪) من مجموعة التخدير الشوكي المستمر مقارنة بـ (10 ٪) من مجموعة التخدير الشوكي فوق الجافية المشترك ، في حين حدث احتباس البول في (25 ٪) من مجموعة التخدير الشوكي المستمر مقارنة بـ (5 ٪) من مجموعة التخدير الشوكي فوق الجافية المشترك. كانت الجرعة الإجمالية من بوبيفاكايين 0.5 ٪ التي تعطى مجتمعة أثناء العملية الجراحية والمورفين الذي يعطى بعد العملية الجراحية أقل بكثير في مجموعة التخدير الشوكي المستمر من مجموعة التخدير الشوكي فوق الجافية المشترك.

الاســـتنتاج: كشـــفت الدراســـة أن التخـــدير الشـــوكي المســـتمر و التخـــدير الشـــوكي فـــوق الجافيـــة المشـــترك كلاهمـــا تقنيـــات فعالـــة وآمنـــة لاجـــراء عمليـــة تقـــويم مفاصـــل الركبـــة مـــع تفـــوق التخـــدير الشـــوكي المســـتمر فـــي اســـتقرار الـــدورة الدمويـــة أثنـــاء العمليـــة الجراحيـــة فـــي الـــدق الأولـــى مـــن العمليـــة الجراحيـــة.كما يـــوفر التخـــدير الشـــوكي المســـتمر العديـــد مـــن المزايـــا علـــى التخـــدير الشـــوكي فـــوق الجافيـــة المشـــترك عـــن طريـــق اســـتخدام جرعـــات مخـــدرة أقـــل مـــع بدايـــة ســـريعة للتخديروكـــذلك ســـرعة التعـــافي للاعصـــاب الحســـية والحركيـــة مـــع اســـتقرار اكبـــر للعلامـــات الحيويـــة مـــن التخـــدير الشـــوكي فـــوق الجافيـــة المشترك.